Fostering Innovation on Digital Platforms:

From Two to Multi-Sided Platforms

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Abstract

Two-sided markets and digital platforms are becoming increasingly relevant in the modern scenario. Companies like Airbnb and Uber are inspiring many other firms in different fields that share their basic structure: they match two (or more) groups of customers. This research aims at exploring the innovation strategies the companies such as these rely on to expand their basic structure towards more complex models. Being inspired by previous models in the field and considering the role that big data seems to play in these businesses a first conceptual model is presented. Therefore, 100 companies–using mobile apps as the empirical setting–are explored in this research to understand the common behaviors concerning evolution. In the end, three strategies are presented: Supply (Side) Expansion, Transactional Advertising, and Data Trading. These strategies are further discussed to highlight two main directions of innovation–ecosystem Innovation and Data Push Innovation– which may be merged giving birth to Multi-Sided Epiphanies. The paper contributes to the literature showing various strategies and their implication to foster innovation on two-sided platforms. Moreover, it shows possible ways to exploit the value embedded in the complex ecosystems of relationships they create.

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Introduction

Over the last few decades, the relevance of platforms in the business environment increased exponentially. Many start-ups have been able to scale up and to spread globally leveraging network effects and the power of platforms, evolving from companies with linear and straightforward business models into tech giants. At the same time, many established companies took inspiration from the platform paradigm to open up and search for new directions in innovation (Libert et al., 2016).

Facebook represents an excellent example in this direction. It was launched in 2004 and has grown continuously and evolved over the years. Facebook moved from the platform that links friends as in a yearbook to a platform that gets together many groups of players. From the original platform connecting senders and receivers of messages, in 2006 it expanded by opening to advertisers, to developers in 2007 and then to companies with brand pages and companies interested in the data gathered through the platform (Evans & Schmalansee, 2016). Similarly, Amazon started as a traditional digital business based on a linear value chain (selling books through a digital channel) and then became a two-sided platform acting as an intermediary between buyers and sellers. However, its evolution did not stop there, it continued to add various kinds of services to its portfolio, for example, by welcoming video content producers and creating its streaming service, and by becoming an intermediary between employers and job-seekers through its Mechanical Turk.

These two examples can easily be used to explore the world of two- (or multi-) sided platforms. Two-Sided Platforms are those businesses that create a service that brings together two groups of the platforms' customers, as Airbnb or Uber bring together the end-users and the hosts (homeowners) or drivers. These platforms design a model that make the matching between the sides a meaningful experience for the parties involved. In some cases, the groups of customers may even be more than two, becoming multi-sided platforms (Hagiu & Wright, 2015). These platforms are becoming more and more relevant both for scholars and practitioners. Indeed, they have often been linked with great opportunities such as their ability to scale up at a fast pace or the possibility to rely on zero-marginal-cost mechanisms (Choudary et al., 2016; Libert et al., 2016). Nevertheless, they are also characterized by significant challenges that concern different elements, from the launching phase (Caillaud & Jullien, 2003; Strummer et al., 2018) to the value proposition design (Muzellec et al., 2015). From a managerial perspective, the relevance of these platforms is increasing. Indeed, according to the yearly report on technological trends by Accenture "The next wave of disruptive innovation will arise from the technology-enabled, platform-driven ecosystems now taking shape across industries. Having strategically harnessed technology to produce digital businesses, leaders are now creating the adaptable, scalable, and interconnected platform economy that underpins success in an ecosystem-based digital economy" (Accenture, 2016).

Research on this kind of businesses is gradually moving from the original perspective in the field of industrial economics (Parker Van Alstyne, 2005; Rochet & Tirole, 2003) to a broader view in the management field (Muzellec et al., 2015; Täuscher & Laudien, 2018; Trabucchi et al., 2017). At the same time, the business world is keener about understanding more about these peculiar businesses as clearly represented both by practitioner-oriented literature (Choudary et al., 2016) and the increasing diffusion of such companies as Uber, Airbnb, Coursera and many others, eventually linked with the concept of disruption (Trabucchi et al., 2019).

The all-pervasive diffusion of digital technologies may be considered the enabling factor for the growing relevance of this market structure. Indeed, the fundamental value proposition of each two-sided platform is to reduce market frictions by matching two different players who are searching for each other (Evans & Schmalansee, 2016), this is making the digital technologies a relevant factor for this system. Nevertheless, the role of technology in these businesses is broader. These platforms have the chance to create many data streams which are opening many opportunities for further development (Sriram et al., 2014). Moreover, recent researches showed a clear connection between the logical structure of two-sided markets and the emerging opportunities regarding data (Trabucchi et al., 2017) showing, for examples, how user-generated data can have a role in creating new business models.

This research aims at searching and showing the opportunities that two-sided platforms may offer and may help them evolving in multi-sided platforms once they overcome the initial challenges.

In this paper, an exploratory approach has been adopted in studying 100 platforms clustered based on the similarity of their patterns to define a framework. The platform providers can use the framework to plan the strategies that might create and capture value by using big data.

Theoretical Background

Two-sided markets have been defined as markets in which two or more groups of customers are linked through a platform that appropriately charge each side (Rochet & Tirole, 2006). A typical example of a two-sided market structure is represented by credit and debit cards in which the two sides consist of buyers and merchants. Of course, both the merchants and the customers would be interested to know how many people from the other group are using a card before deciding to use that card. A card that is not accepted by many merchants is not likely to be adopted by many potential customers. On the other hand, merchants will not want to adopt a card that the majority of their customers do not use (Rysmann, 2009). This effect is typical of indirect network externalities, which in the case of two-sided markets are often defined as cross-side network externalities (Katz & Shapiro, 1985).

Hagiu and Wright (2015) report that the term initially meant industries that had "two-sided platforms," such as the credit cards (Rysman, 2009) that intrinsically need two sides to create the idea of the service itself. However, as they note, "two-sidedness" is a characteristic of businesses, not always of industries. Due to this latter remark, "Two-Sided Markets" and "multi-sided platforms" have often been used to mean the same thing. There is not a unique definition (Evans & Schmalansee, 2016; Hagiu & Wright, 2015; Rochet & Tirole, 2003) and often the concept of Two-Sided Markets is misunderstood with the wider term "platform" (Gawer, 2014). Specific descriptions have been given from various points of view, but often the existing definitions might prove to be too specific or overinclusive or too vague to be of use (Hagiu & Wright 2015). This research relies on one of the first definitions that define the necessary conditions that a business must meet to be considered a two-sided business: i) two or more distinct groups of customers exist; ii) cross-side network externalities among the groups of customers; and iii) an intermediary–the platform provider–able to internalize the externalities (Evans, 2003). Network externalities represent one of the key opportunities for this kind of businesses. Indeed, the chances to rapidly scaling up (Van Alstyne et al., 2016) are mainly related to the shift that this model enhances from the concept of owning to the concept of access (Ndubisi et al., 2016), enabling a zero-marginal-cost economy (Rifikn, 2014).

Among the other peculiarities of this kind of businesses, there is the need to have two groups of customers on board at the same time to let it start. The value of the entire business is null for customers on the first side if there are no customers on the second side and vice versa. This leads to the creation of the chicken and egg paradox (Caillaud & Jullien, 2003). Even if strategies to face this ignition issue have been identified (Stummer et al., 2018), the launch of these businesses is particularly tricky, making it one of the key challenges till they reach the critical mass (Choudary et al., 2016).

Typologies of Two-Sided Markets

The fact that different definitions of two-sided platforms exist opened to a debate on what can be considered a multi-sided business (Luchetta, 2014). Nevertheless, scholars mainly agree on the existence of different kinds of two-sided businesses (Evans, 2003; Filistrucchi et al., 2014).
Evans (2003) identifies three main categories: i) Market-Makers (the platforms that enable transactions between two sides, such as shopping malls or eBay), ii) Audience-Makers (the platforms that enable a unilateral communication between advertisers and consumers, such as newspapers or television) and iii) Demand-Coordinators (the platforms that provide goods or services that generate cross-side network effects between the two sides such as operative systems and game consoles that make what are not strictly "selling transactions"). These categories have been aggregated in two broader categories (Figure 1): "Transaction" and "Non-Transaction" (Filistrucchi et al., 2014), using the observability of the transaction between the two sides as the main rationale (e.g., there is a transaction between a merchant and the end-users through a

credit card provider, as well as between a gamer and a developer of the game through the game console, whereas, between a reader and an advertiser there does not arise a media-enabled transaction).
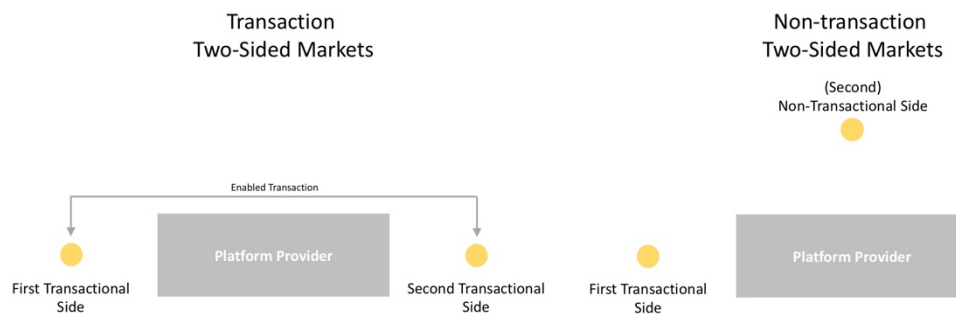

Figure 1. Transaction and Non-Transaction Two-Sided Markets (adapted from Filistrucchi et al., 2014)

The first category has been the object of many studies (e.g., Muzellec et al., 2015; Täuscher & Laudien, 2018). Scholars have focused on the maturity level of the platforms (i.e., whether they are nascent or mature) and its impact on the attractiveness of the platform for the supply side (Landsman & Stremersch, 2011). Other researchers have focused on the need for a double value proposition targeted in each side and the evolution to the specific level of maturity (Muzellec et al., 2015). Furthermore, along with several studies on the pricing mechanisms (e.g., Armstrong, 2006), the chance to leverage the reward mechanisms has been considered as one of the ways to increase participation on one side to attract greater participation on the other side (Lu et al., 2013). In the same vein, the role of Value-Added Services (VAS) has been considered as a strategy to increase participation and profit for the entire platform (Dou et al., 2016).

The second category—Non-Transaction two-sided platforms—has been mainly referring to newspapers and advertising media (Ihlström Eriksson et al., 2016). In this field, scholars focused mainly on two topics. One, the pricing dynamics have been considered extremely relevant. In this case (Gundlach & Hofmann, 2017), since the basic idea of the model is to use the second side, namely, the advertisers, as the subsidizer for the first one that is the readers who do not pay or pay less than the cost price to receive the service, from a client-as-a-target perspective this platform offers the first side the attention of their customers (Filistrucchi et al., 2014). Two, the "quality" perspective, in particular, the number of advertising messages and the perception of quality by end-users (Godes et al., 2009) and the overall platform quality related to the reduction of the entry barriers (Lau & Wydick, 2014).

Recently, the same structure has been used to define another strategy, namely, Client-As-a-Source, showing the potentialities of big data. This second view considers the end-users of a digital service as the first side, which provides the platform with a vast amount and variety of data generated through the delivery of the service. The data may be used as a trigger point to enhance the value-capturing mechanisms for the entire system (Trabucchi et al., 2017; 2018). Indeed, these user-generated big data have been considered as an innovation trigger that can enable companies in fostering both service innovation on the current business, or business model innovation expanding to new groups of customers in an outbound open innovation

perspective (Trabucchi et al., 2018). The first category, transactional two-sided platforms, represent the starting point of this research.

The research gap and the theoretical framework

Traditionally, the view on two-sided markets and two-sided platforms has been particularly static, aiming to study the intrinsic characteristics of these businesses. Nevertheless, the spread of digital technologies, which are often used as enablers of such platforms, are letting emerge a significant variety of firms based on this business structure. Therefore, some companies starting as two-sided transaction platforms that rely on network externalities to links two sides (Rochet & Tirole, 2003) and reduce frictions through match-making (Evans & Schmalansee, 2016), become much more complex entities. Facebook, mentioned in the introduction, is just one example, but companies like Amazon or Alibaba went through similar evolutionary paths, involving different groups of customers such as businesses, private vendors, and advertisers (Evans & Schmalansee, 2016).

This research aims at understanding how the two-sided platforms can go beyond the basic match-making mechanism to eventually become multi-sided platforms.

To provide a robust means to achieve the evolution of two-sided platforms into multi-sided platforms, we built a theoretical framework based on previous literature, identifying possible directions of expansion or evolution.
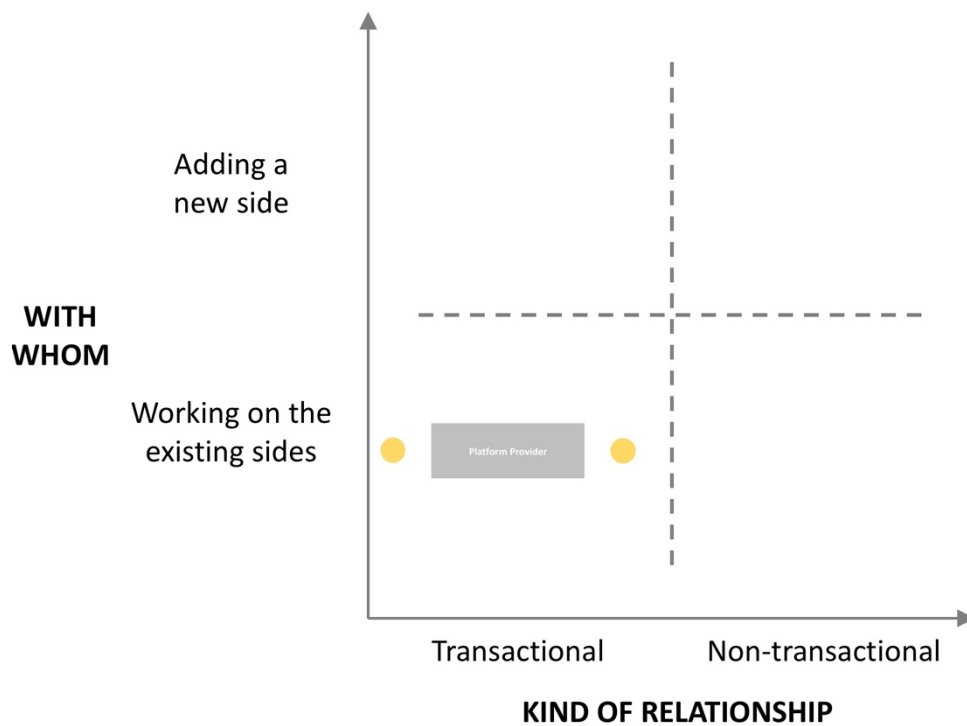

Figure 2 – Theoretical Framework (built on dimensions taken from Filistrucchi et al., 2014 and Hagiu and Wright, 2015)

Relying on the macro classification provided by Filistrucchi and colleagues (Filistrucchi et al., 2014), we identified the two directions in which a two-sided platform may progress to mature into a multi-sided platform; namely, by adding new sides and/or by facilitating different kinds of relationships, transactional or non-transactional, between the sides.

This means that platforms may move from the origin of the framework to the right side to add non-transactional dynamics among the players involved. The previously mentioned Client-as-a-Target and Client-as-a-Source strategy may be used to complement the transactions enabled by the platform, either between the two existing sides (low-right quadrant) and/or by adding new side/s (high-right quadrant). In the first case, the platform would enlarge its job in creating a relationship between the two sides; in the second it would become a multi-sided platform involving a new side for the Non-Transaction dynamics.

Further, we relied on the concept of multi-sided platforms (Hagiu & Wright, 2015), highlighting the players involved in the evolutionary path: the existing sides or the chance of adding new players in new sides. In this perspective, platforms may directly move from two- to multi-sided platforms, adding new sides in the system. This implies that the number of transactional sides may be added (high-left quadrant), or that new sides with a Non-Transaction relationship may enter in the fame, moving the platform into the farther into the lower right quadrant. Relying on previously mentioned researches, a theoretical framework (Figure 2) is proposed. It is going to be used as a first theoretical lens to read the cases that are going to be presented, aiming to understand if and how the different quadrants may be used to foster innovation in companies based on the classical transactional two-sided structure.

Research Design

Due to the exploratory intent of this research, aiming to expand existing theories in the field, we leveraged multiple case studies (Yin, 2013) allowing for replication logic. As previous researches did when dealing with the early stages of research on a topic (e.g., Amit & Zott, 2001; Galunic & Eisenhardt, 2001). As papers with similar goals rely on similar approaches, we used two papers in particular as the main inspirations for the Research Design. Amit and Zott (2001) proposed a model defining four value drivers for digital businesses through qualitative analyses of 59 companies selected through convenient sampling. From this research, we took the qualitative inductive approach and the indications for data analysis. Täuscher and Laudien (2018) propose a classification based on different kinds of marketplaces. They relied on a search engine to get a sample of 100 companies and further relied on secondary sources for obtaining their qualitative and quantitative analyses. This research suggested to us the use of search engines for sampling and the data gathering, and the qualitative data analysis approaches. In the following section, the sampling procedure and the data gathering, and analysis are presented.

Empirical setting and Sampling

The smartphone application industry is used as the empirical field for this research. The reason is, the increasing pervasiveness of smartphone apps. The number of smartphone users is expected to reach 2.87 billion by 2020 (Statista, 2016). Therefore, the economic relevance of smartphone apps is growing, and the revenues from mobile apps are expected to reach US$188.99 billion in 2020, up from US$ 69.7 billion in 2015 (Statista, 2017). Moreover, recent papers used the smartphone application industry as the empirical field for their analyses (Trabucchi et al., 2017; Trabucchi & Buganza, 2019) because mobile apps are considered the common channel through which the matching between the sides is enabled (Täuscher & Laudien, 2018).

The selection of the sample has been achieved through four main steps: i) definition of the research goal; ii) initial sampling based aimed at heterogeneity; iii) enlargement of the sample through a snowballing technique, and iv) definition of the final sample.

First, accordingly to the aim of the research, the sample needs to contain transaction two-sided platforms. Therefore, we searched for companies aligned with the previously mentioned definition of two-sided platforms in a transactional perspective (i.e., the existence of two groups of customers affected by cross-side network externalities, which are linked together through a platform provider that enables direct transactions between the two sides).

Second, based on the empirical field selected for this research (the smartphone application industry), we selected the Google Play Store, which is the biggest app provider. This phase was necessary since there are no exhaustive lists of two-sided businesses. Therefore, the app store has been used as the starting point to define the basic structure upon which to build the final sample. In October 2017, the top 200 free apps chart was screened to search for two-sided platforms and cross-checked by the two authors of this paper. The first

sample of 78 mobile apps has been defined. This step was aimed at finding the most diverse and heterogeneous kinds of applications based on a two-sided structure. It was necessary due to the difficulties in finding a comprehensive sample of two-sided platforms. Indeed, other similar studies in this field focused on subgroups (such as Täuscher and Laudien, 2018, which focused specifically on marketplaces).

Third, to remove the biases in the choice of the day on which the first screening was done, and in particular to create a sample that may represent the overall population of transactional two-sided platforms, we relied on the snowballing technique in the search for comparable companies. Through a search engine for mobile apps (http://www.appcrawlr.com), we searched for some similar apps for each of the 78 apps identified in the first round. The gathering process leads to a sample of 936 apps, 280 met the requirements of the first step (being transactional two-sided platforms), which with the original 78, gave a sample of 358 mobile apps. This kind of approach has previously been used to enlarge an initial sample in the smartphone application industry (see Trabucchi et al., 2017).

Finally, the apps have been aggregated under the categories they were assigned by the app store (e.g., Communication, House & Home, Maps and Navigation among others). In order to have a sample that was representative of the overall two-sided environment and was manageable (emulating similar other studies such as Amit and Zott, 2001; Täuscher and Laudien, 2018, that relied on samples of 59 and 100 companies) for the aim of this research, we selected ten most widely used apps (according to the download ranges provided by the Play store) in the ten most dense categories (Books & reference, Business, Entertainment, Food & Drink, House & Home, Lifestyle, Maps & Navigation, Music & Audio, Shopping, and Travel & Local), leading to the final sample of 100 mobile apps, which included 24 apps from the original sample of 78 apps. Table 1 summarizes the final sample.

Data Gathering and Analysis

Emulating the previous research with similar goals (e.g., Amit & Zott, 2001; Täuscher & Laudien, 2018) we chose to collect data ourselves based on secondary sources. Data has been gathered from firms' websites, online databased (among them we also find the app store itself) as well as books and online articles of newspapers and journals. Moreover, we considered the privacy policy of the mobile apps from the end user's perspective for all the cases included in the sample, to understand the companies right on the use of data (as was done in the previous researches, e. g., Trabucchi et al., 2017).

Secondary sources for each case were searched and analyzed, using sources such as official websites to map the different services offered, official blogs of the platforms and, industry magazines. In particular, the existence of other sides–on top of the first two highlighted in the screening procedure—was explored. In the same way, evidence of the kinds of relationships created with the different sides (transactional or non-

Category	Mobile apps
Books & Reference	Amazon Kindle; Audiobooks from Audible; Scribd - Reading Subscription; Kobo Books - eBooks & Audiobooks; NOOK: Read eBooks & Magazines; OverDrive; Librivox; Aldiko; Universal Book Reader; Audio Books by Audiobooks
Business	Job Search by ZipRecruiter; Job Search with Snagajob; Shine - Job Search & Job Alert; MagicBricks Property Search; Yammer; TimesJobs; Naukri.com Job Search; Box; Glassdoor Job Search, Salaries & Reviews; Indeed Job Search
Entertainment	Youtube; Google Play Movies & TV; Fandango Movies - Times + Tickets; Hulu: Stream TV, Movies & more; Crunchyroll - Everything Anime ; Twitch; BookMyShow–Movie Tickets,Plays; Steam; Netflix; Dailymotion: Videos for now
Food & Drink	BeyondMenu Food Delivery; JUST EAT - Takeaway delivery; Talabat: Food Delivery; Eat24 Food Delivery & Takeout; Deliveroo; Zomato - Restaurant Finder; foodpanda - Food Delivery; UberEATS: Food Delivery; Grubhub Food Delivery/Takeout; OpenTable: Restaurants Near Me
House & Home	Real Estate & Rentals - Zillow; Trulia Real Estate & Rentals; Realtor.com Real Estate: Homes for Sale and Rent; Trulia Rent Apartments & Homes; HotPads Apartments & Home Rentals; Apartments & Rentals - Zillow; Common Floor; Domain; Zip Realty Real Estate; Homesnap Real Estate & Rentals
Lifestyle	Care.com; Woo – Dating App – Find, Chat, Meet.; Redfin Real Estate; Housing-Real Estate & Property; Keller Williams Real Estate; Hot or Not; Tinder; Find Me Gluten Free; Real Estate by Movoto; SurveyMini
Maps & Navigation	mytaxi - L'App per i taxi; Easy - taxi, car, ridesharing; Lyft; Uber; Via - Affordable Ride-sharing; Flywheel - The Taxi App; Gett - Car Service & Rideshare; Grab - Cars, Bikes & Taxi Booking App; Ola cabs - Book taxi in India; zTrip-Black Car & Taxi Service
Music & Audio	Google Play Music; Apple Music; Pandora Music; Spotify Music; SoundCloud - Music & Audio; TuneIn Radio: Stream NFL, Sports, Music & Podcasts; Deezer - Music Streaming, Songs, Albums & Radio; Amazon Music; Gaana Music: Bollywood Songs & Radio; Saavn Music & Radio
Shopping	Geek - Smarter Shopping; letgo: Buy & Sell Used Stuff; Wallapop - Buy & Sell Nearby; AliExpress Shopping App - Coupon For New User; Wish - Shopping Made Fun; Flipkart Online Shopping App; eBay - Buy, Sell & Save Money. Deals & Discounts; Amazon shopping; Snapdeal: Online Shopping App; Groupon - Shop Deals & Coupons
Travel & Local	MakeMyTrip-Flights Hotels Cabs; Skyscanner; Goibibo - Flight Hotel Bus Car IRCTC Booking App; Hotels.com – Hotel Reservation; KAYAK Flights, Hotels & Cars; Agoda – Hotel Booking Deals; trivago: Hotels & Travel; Airbnb; Expedia Hotels, Flights & Cars; Booking.com Hotels & Vacation Rentals

Table 1 – Final sample

transactional) was investigated. For each of the possible extensions detailed on the kind of customers involved and on the existing relationship with the two-sided platform were explored. In this phase, the existence of advertisers' side was not considered, since it represents a classic case of Non-Transaction two-sided mechanism, that may be applied to any single-side business, which was not relevant for the aim of this research.

In inductive research, data analysis and data gathering are often hard to distinguish, since the findings are grounded in the data, and the final model emerges through an iterative process in which the emergent models is compared systematically with evidence from each case (Amit & Zott, 2001; Corbin & Strauss, 2008; Eisenhardt, 1989). Data was, therefore analyzed through qualitative content analysis and the observations about the relevant variables that emerged in the literature review were codified and declared in the conceptual framework. The companies that relied on similar strategies—according to the two dimensions presented in the theoretical framework were clustered together, through a non-exclusive procedure (the same company may implement more than one strategy). The data was analyzed by building matrices to compare the dimensions that emerged during the data gathering (Miles & Huberman, 1984).

Empirical Results: 3 strategies to foster innovation on a Two-Sided Platform

In the following chapter, we present the different strategies that emerged from the analysis of the sample made based on the theoretical framework previously introduced: Supply (Side) Extension, Transactional Advertising, and Data Trading. For each section a few representative cases are used to describe the overall strategy, then the presence of the strategy in the sample—and, therefore, in other cases—are briefly discussed.

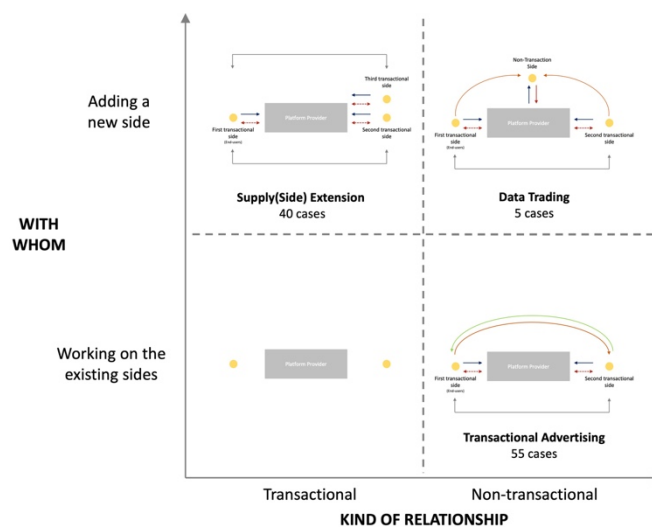Figure shows graphically the three strategies and how they fit the theoretical model previously presented.

Figure 3 – The three strategies

Supply (Side) Extensions

Airbnb in 2017 enlarged its primary business of connecting travelers and hosts to offer a new hotelier experience. They opened their platform to a new kind of supply side, welcoming not only hosts but also the experience providers. They tried to expand the activity chain covered by their company offering the travelers who decided to use their service not only place to stay but also what to do during the travel.

Similarly, Uber started using the drivers on board their platform for the additional purpose of linking end-users and restaurants through their Uber Eats service. The platform started welcoming restaurants as well, offering the end-users the chance to eat at the restaurants on the network created by Uber.

These two examples show how the potentialities of a two-sided platform can also be related to broader business expansion, still relying on the primary mechanisms of a transactional two-sided platform. In general, this strategy enables the platform to identify new meaningful transactional sides that may be linked to the first transactional side to enlarge, de facto, the supply side and define different levels of transactions. The business expansion may prove to be even particularly relevant, for example, Uber Eats proved more profitable than the taxi-like service in some cities (Shead, 2017).

It is interesting to note how this last strategy maintains the essential transactional relationship between the two seminal sides and adds a second level of the transaction, involving a third side and linking it with the seminal first side.

This strategy exploits the value of the customers who join the platform on the first side to attract a new (third) transactional side, building de facto a new two-sided business over the previous one (Figure 4). As the figure shows, the expansion opens to a new data source, not necessarily to a new revenue flow (if the pricing is directed only to the first side).

Our analysis reveals that 40 companies relied at least once on this strategy to move from a purely transactional two-sided platform to a transaction-based multi-sided platform.

A lot of companies (9 out of 10) in the Travel category relied on this strategy, adding different kinds of offers to the original. For example, Booking.com added to the original supply side (Accommodation providers) the chance to book flights and to rent cars; Expedia offers to their customers the chance to get in touch with flight providers, car rental, bus services, and trains, and so on, on top of hotels.

Also, the apps in the navigation industry relied massively on this strategy (6 out of 10), having, for example, Uber added to the original drivers (Uber Pop) professional drivers (Uber Black), and the restaurants, and so on. Similarly, Grab, the Singapore ride-hailing service recruited many supply sides for the end-users such as drivers, hitchers (for carpooling), ride-sharing, shuttles, restaurants, bikes, and couriers (Grab Express). Grab is also an outlier in the with eight different supply sides.
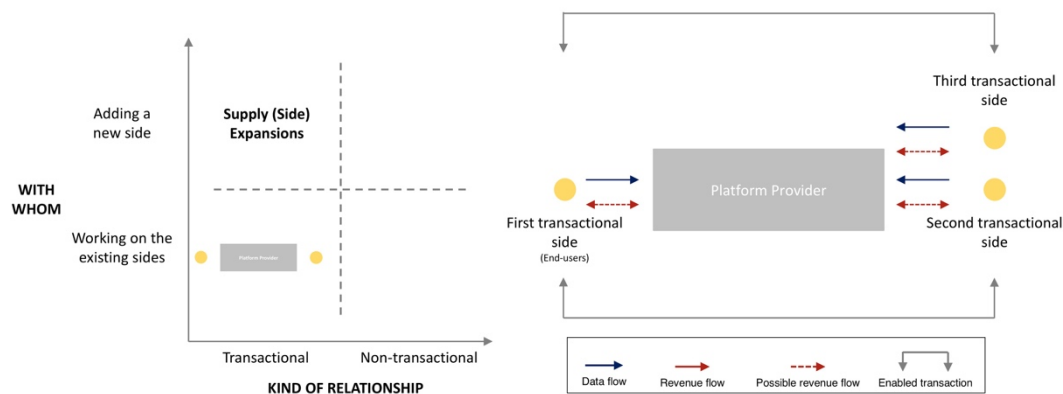
Figure 4 – Supply (Side) Extensions

Transactional Advertising

Booking.com is one of the first platforms created in the field of online booking. Created as a two-sided platform back at the beginning of the 21st century to connect travelers and hotels that sought visibility and awareness through the internet. Therefore, Booking has all the classical characteristic of transactional two-sided platforms, enabling a direct transaction between the two sides.

The platform provider now offers the second side (hotels) advertising mechanisms within the platform. It uses the end-users' data gathered from the present query and the previous bookings to show its hotels that could be a meaningful choice among the first search results. In this way, the transactional relationship expands towards Non-Transaction mechanisms.

Indeed, if traditionally Non-Transaction platforms have been based on advertisement mechanisms, also transactional based platforms have the chance to rely on a similar mechanism.

Interestingly, using a transactional structure as the starting point of the analysis, we might have found some peculiarities related to the use of the data gathered through the service delivery and the matching process between the two sides.

Having a transactional side on board enables the use of the basic data accumulated data from the transactions to evolve into something more relevant (Figure 5) and creating certain revenue flows related to advertising.

The platform provider has the chance to create a second relationship with a second side, moving from the pure transactional perspective (i.e., matching the first and the second side) to a Non-Transaction relationship, using the first side both as the target and as a source. In other words, relying on the data gathered through the service delivery on the first side, the platform provider can offer a transactional advertising strategy to (some) of the players of the second side, facilitating the matching through a promotion-based strategy.

From our analysis, this is an oft-used strategy as it is implemented by 55 companies in the sample. The strategy is spread in the different categories, significantly in the House and Home category (with apps such as Zillow, Hot Pads, Domain, Zip Reality Estate), Travel & Local (Booking.com, Expedia, KAYAK, Skyscanner), in Entertainment (with apps such as YouTube and Twitch) and in the Food & Drink (with apps such as

Deliveroo, OpenTable or Just Eat). At the same time, it is not very much used in the Transportation category and the Lifestyle.
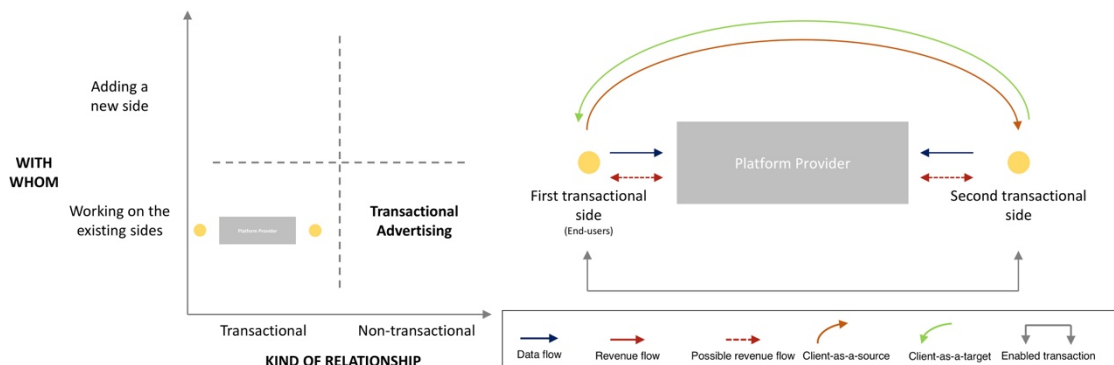

Figure 5 – Transactional Advertising

Data Trading

The third strategy that emerged is represented companies like Skyscanner or, once again (demonstrating the non-exclusivity of the strategies) by Uber.

Skyscanner is the digital platform that links flyers and airlines and is a gatherer of a massive amount of information on to where, when, and how often people travel. Their core business lets them have information on the different alternatives that the customers evaluate—according to the various offers available for a particular fare. Relying on these data, the company launched a second service, labeled Skyscanner Partners, which offers to the players in related fields (airports, airlines) some statistics and insights that they might be looking for.

Similarly, Uber created a service labeled Uber Movement, collecting all the data gathered through their service of matching riders and drivers. The overall aim of the service is to "find smarter ways forward" to capturing the value embedded in the data they own. They provide anonymized data from over two billion trips to help urban planning around the world (e.g., the insights they provide to avoid traffic congestion caused by specific events or holiday traffic).

In the sample, only five companies offer evidence of relying on this strategy. Besides the two mentioned above, there are Airbnb, Indeed Hiring Lab, and Naukri Database. The first created Airbnb Citizen, a service through which they release the data for the top 300 cities and 80 regions worldwide. Indeed, Hiring Lab provides insights into the global labor market. Naukri Database provides an accessible database for companies and consultants who are interested in hiring them. Interestingly, even though the basic services were all launched before 2009, all the services mentioned above have been launched recently (Airbnb Citizen in 2015; Uber Movement 2017; Skyscanner Partners, 2014; Indeed, Hiring Lab, 2014, and Naukri Database, 2016). These cases show how the companies find ways to leverage Non-Transaction relationships (in this case, from a Client-As-a-Source perspective), to add a new side.

In some cases, platforms can identify what may potentially be a new side—a group of players—interested in the data and able to extract the value embedded in those data. This strategy is labeled "Data Trading," finding a market opportunity for selling the gathered data, usually to create a new revenue inflow (Figure 6). It is important to highlight the role of privacy policies in implementing this strategy. Usually, companies reserve the rights to use the gathered data, even if the data is aggregated in an anonymized way, to avoid violation of the privacy of the players on the two sides.
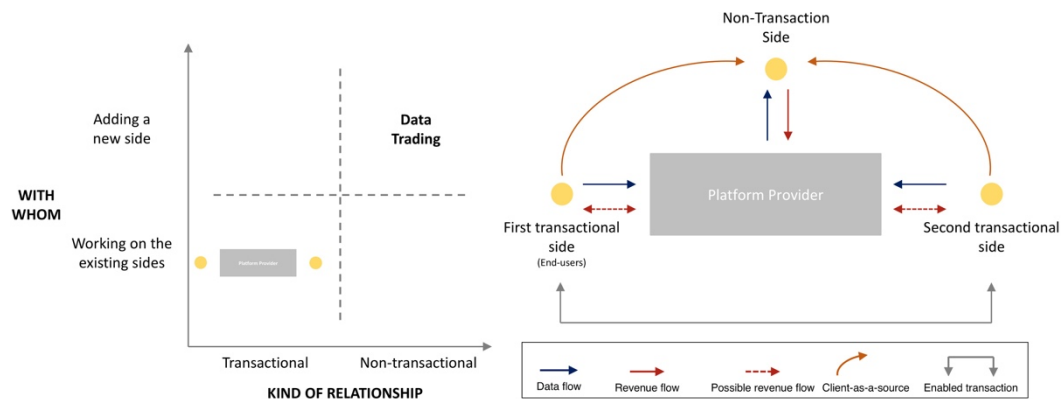

Figure 6 – Data Trading

Summary of the three strategies

It is important to note two things. First, that the possibility of the companies to rely on more than one strategy highlights the non-exclusivity of these strategies. Second, the relative diffusion on the three strategies over the sample shows how supply (Side) Extensions (40 cases) and Transactional Advertising (55 cases) are relatively much more diffused than the third one, Data Trading (5 cases). This is summarized in Table 2. The starting point of all the cases is the basic transactional structure with two sides as 34 of the cases, according to the analyses, are based on the basic structure without any expansion.

Data suggests that implementing Data Trading is far less diffused than the others, which highlights the challenging nature of the effort for identifying the potential non-transactional customers.

There are two companies—Skyscanner and Airbnb—that implemented all the three strategies, Uber implemented the Supply Side Extension and the Data Trading, while Indeed and Naukri implemented the Transactional Advertising and the Data Trading jointly. In the end, 27 companies implemented both Supply Side Extension and the Transactional Advertising jointly, showing how the two most adopted strategies are often implemented together.

Furthermore, it is interesting to see how the Supply Side Extension and the Data Trading strategies are implemented similarly in platforms that may involve only consumers on both sides or both consumers and businesses on the two sides. Nevertheless, Transactional Advertising adopted more frequently when businesses are involved, in keeping with the traditional advertising mechanisms.

Strategy	Companies implementing it
Supply Side Extension (40 cases)	Scribd - Reading Subscription; Kobo Books - eBooks & Audiobooks; OverDrive; MagicBricks Property Search; Youtube; BookMyShow–Movie Tickets,Plays; Steam; Deliveroo; foodpanda - Food Delivery; UberEATS: Food Delivery; Real Estate & Rentals - Zillow; Realtor.com Real Estate: Homes for Sale and Rent; Trulia Rent Apartments & Homes; HotPads Apartments & Home Rentals; Apartments & Rentals - Zillow; Common Floor; Domain; Care.com; Redfin Real Estate; Housing-Real Estate & Property; Keller Williams Real Estate; Tinder; Lyft; Uber; Flywheel - The Taxi App; Gett - Car Service & Rideshare; Grab - Cars, Bikes & Taxi Booking App; Ola cabs - Book taxi in India; SoundCloud - Music & Audio; AliExpress Shopping App - Coupon For New User; Amazon shopping; MakeMyTrip-Flights Hotels Cabs; Skyscanner; Goibibo - Flight Hotel Bus Car IRCTC Booking App; KAYAK Flights, Hotels & Cars; Agoda – Hotel Booking Deals; trivago: Hotels & Travel; Airbnb; Expedia Hotels, Flights & Cars; Booking.com Hotels & Vacation Rentals
Transactional Advertising (55 cases)	Scribd - Reading Subscription;Kobo Books - eBooks & Audiobooks;Job Search with Snagajob;MagicBricks Property Search;Naukri.com Job Search;Box;Glassdoor Job Search, Salaries & Reviews;Indeed Job Search;Youtube;Fandango Movies - Times + Tickets;Hulu: Stream TV, Movies & more;Crunchyroll - Everything Anime ;Twitch;BookMyShow–Movie Tickets,Plays;Netflix;JUST EAT - Takeaway delivery;Talabat: Food Delivery;Eat24 Food Delivery & Takeout;Deliveroo;Zomato - Restaurant Finder;foodpanda - Food Delivery; Grubhub Food Delivery/Takeout;OpenTable: Restaurants Near Me;Real Estate & Rentals - Zillow;Trulia Real Estate & Rentals;Realtor.com Real Estate: Homes for Sale and Rent;Trulia Rent Apartments & Homes;HotPads Apartments & Home Rentals;Apartments & Rentals - Zillow;Common Floor;Domain;Zip Realty Real Estate;Care.com;Housing-Real Estate & Property;Real Estate by Movoto;Flywheel - The Taxi App;Grab - Cars, Bikes & Taxi Booking App;SoundCloud - Music & Audio;TuneIn Radio: Stream NFL, Sports, Music & Podcasts;Deezer - Music Streaming, Songs, Albums & Radio;Amazon Music;AliExpress Shopping App - Coupon For New User;Wish - Shopping Made Fun;eBay - Buy, Sell & Save Money. Deals & Discounts;Amazon shopping;Snapdeal: Online Shopping App;MakeMyTrip-Flights Hotels Cabs;Skyscanner;Hotels.com – Hotel Reservation;KAYAK Flights, Hotels & Cars;Agoda – Hotel Booking Deals;trivago: Hotels & Travel;Airbnb;Expedia Hotels, Flights & Cars;Booking.com Hotels & Vacation Rentals
Data Trading (5 cases)	Naukri.com Job Search; Indeed Job Search; Uber; Skyscanner; Airbnb
No expansion strategies (34 cases)	Amazon Kindle; Audiobooks from Audible; NOOK: Read eBooks & Magazines; Librivox; Aldiko; Universal Book Reader; Audio Books by Audiobooks; Job Search by ZipRecruiter; Shine - Job Search & Job Alert; Yammer; TimesJobs; Google Play Movies & TV; Dailymotion: Videos for now; BeyondMenu Food Delivery; Homesnap Real Estate & Rentals; Woo – Dating App – Find, Chat, Meet.; Hot or Not; Find Me Gluten Free; SurveyMini; mytaxi; Easy - taxi, car, ridesharing; Via - Affordable Ride-sharing; zTrip-Black Car & Taxi Service; Google Play Music; Apple Music; Pandora Music; Spotify Music; Gaana Music: Bollywood Songs & Radio; Saavn Music & Radio; Geek - Smarter Shopping; letgo: Buy & Sell Used Stuff; Wallapop - Buy & Sell Nearby; Flipkart Online Shopping App; Groupon - Shop Deals & Coupons

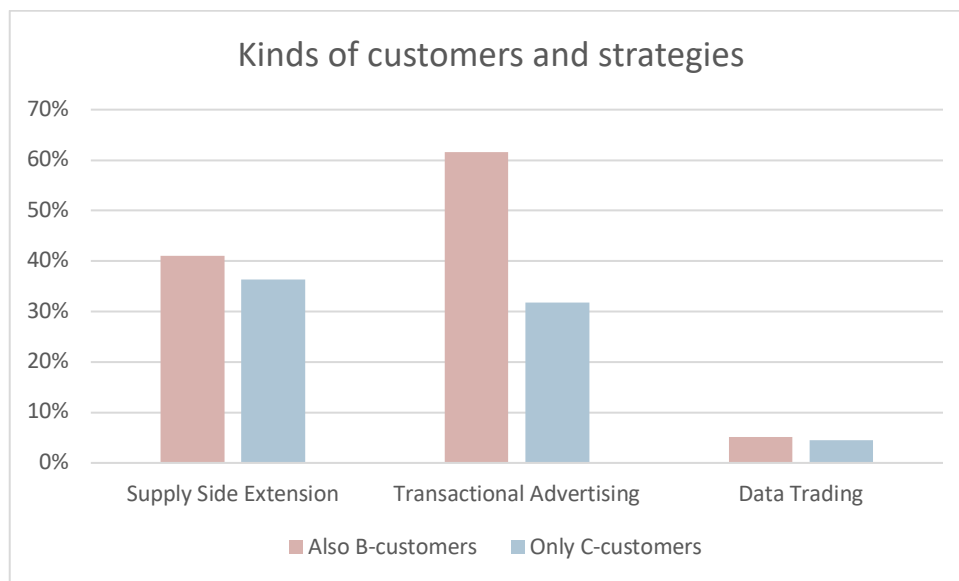**Table 2 – List of cases per each strategy**

Figure 7 – Percentage of platforms applying the strategies on the basis of the kinds of customers involved (78 companies in the sample involve both B and C-customers, 22 companies in the sample involved only C-customers)

Discussion: different innovation directions

According to the cases developed and the analyses performed, three main strategies emerged, which are going to be further discussed based on the axes that give birth to the theoretical framework.

Relying only on transactional relationships, companies can pursue a Supply (Side) Expansion by adding new groups of players in the system. Similarly, to what Sawhney and colleagues (2004) referred to as "studying the role of services in letting businesses grow", the chance to work on the adjacent activity chain by adding new activities in the so-called Spatial Expansion, is what enables companies to add new sides to their basic two-sided structure.

To add new activities, the platform providers should be able to identify new activity chains that may be relevant for the players on the platform's first side, and they should be able to add a new transaction dimension to the system by which they engage with a third side (becoming multi-sided platforms).

From the point of view of literature on two-sided market, this evolution of the system is fascinating. One of the greatest issues for these businesses is to overcome the chicken and egg paradox (Caillaud & Jullien, 2003; Stummer et al., 2018) since the platform itself is not valuable if the two sides are not on board at the same time (Rochet & Tirole, 2003). Nevertheless, this expansion strategy lets the business to overcome this paradox, by exploiting the value embedded in the first side when the first side is already on board. In other words, there is a chance to exploit the value of the cross-side network externalities that the first two sides creates (Rysman, 2009) to involve a new group of customers.

This strategy is particularly interesting from a service design perspective since there is the need to define a new value proposition looking at the third side, but which needs to be aligned with what is offered to the first side (Muzellec et al., 2015). This is coherent with the emerging concept of Hub Companies, which considers those companies which enlarge their business in other fields leveraging network effects (Iansiti and Lakhani, 2017).

Moving to a different kind of relationship, considering Non-Transaction dynamics, recent literature, showed how traditional advertising mechanisms of two-sided markets (e.g., Filistrucchi et al., 2014) might use big data for expansion. The most straightforward strategy, however, is related to the chance to propose an Enhanced Advertising model (Trabucchi et al., 2017). The strategy entails taking the Client-As-a-Source perspective to enlarge the traditional Client-as-a-Target relationship between a Non-Transaction player (i.e., advertisers) and the first side (i.e., end-users). The relationship between the platform provider and the advertisers is made more meaningful by reliance on the data gathered from the first side, having the chance to provide customized messages, and increasing the relevance of the exposure. Interestingly, this strategy has been identified initially as a Non-Transaction mechanism (Filistrucchi et al., 2014; Ihlström Eriksson et al., 2016), since advertising is the underlying mechanism of that kind of two-sided platforms.

Indeed, even if the main mechanism implemented through the platform is a transaction two-sided market, (some) of the players start having a Non-Transaction behavior by becoming involved in a Client-as-a-Target strategy and becoming Transaction and Non- Transaction players at the same time and this permits mixed relationships to emerge with the players on the second side (Evans, 2003; Filistrucchi et al., 2014; Ihlström Eriksson et al., 2016). The data gathered through the basic service delivery represents the enabling factor for this enhanced relationship with the second side (Trabucchi et al., 2017), offering de facto a service extension to the second side, giving them the chance to emerge on the platform. This can also emerge as a second revenue stream. It is clear how, in this case, the service expansion is incremental as compared with the original structure of the two-sided platform.

Relying on a similar approach, but adding a new side, a third strategy emerged: Data Trading. It is based on the expansion of the overall model from a pure Transaction Two-Sided Platform to a Hybrid Two-Sided Platform that has both Transaction and Non-Transaction Sides.

This strategy is coherent with the previous research on the Client-As-a-Source strategies, based on the identification of external players that can see the value embedded in the data gathered through the delivery of the service. It gives birth to a Non-Transaction Two-Sided Market (Trabucchi et al., 2017). The chance to integrate data coming from two different sides and through their interaction may increase the relevance of these data. Scholars working on big data often mention the relevance of the volume, variety, and velocity dimensions of big data (McAfee & Bynjolfsson, 2012), but in this case there is the additional dimension of the veracity—related to the reliability of the data (Wamba-Fosso et al., 2015)—that may be enhanced through the linking process of the two sides. From a service perspective, this expansion may be seen as an

enlargement of the primary activity chain, adding new activities (Sawhney et al., 2004) that involve new players in the system.

Different innovation directions

The three strategies can be read from different innovation directions, offering broader insights. Supply (Side) Extension and Data Trading are based on the chance to expand the basic transactional two-sided structure by adding a new side (such as AirBnb adding the experience providers, or Skyscanner adding Skyscanner Partners), chaining the system around the platform provider. It becomes something alive, not only because the players on it exchange value in different ways, but also because it is a living system that grows. Therefore, we labeled these two strategies as ecosystem innovation, enlarging the entities that are part of the network (Gawer & Cusumano, 2014; Thomas et al., 2014).

At the same time, Transactional Advertising and Data Trading belong to a different literature stream. First, they show how different kinds of two-sided platforms may co-exist, merge the transactional and non-transactional dynamics with the same system, and even with the same sides (as shown for example mentioning Booking.com). Second, they show how Client-As-a-Source strategies highlighted in non-transactional platforms (Trabucchi et al., 2017; Trabucchi & Buganza, 2019) may be relevant and implemented in transactional based structures.

Both strategies are based on the chance to expand the basic transactional two-sided structure by adding a non-transactional perspective, relying on the power of big data. Therefore, we labeled these two strategies as Data-Push innovation, which enlarges the mechanisms implemented in the platform.

Therefore, Data Trading shows a double soul: it is both, ecosystem and Data-Push Innovation. It does not only merge the dynamics of the two innovation directions that have been mentioned but conceal something more interesting.

The strategy of moving simultaneously in two innovation directions seems to be relatively more complicated than the other strategies. Indeed, the new players to be added to the system must be more than complementary to the first side, unlike in the case of the Supply (Side) Extension. They need to have a problem or a need that can be solved using the data gathered during the interaction between the platform provider and the sides. Though finding players with such problems or needs may be difficult, finding solutions to problems or meeting the needs can be a powerful motivation for the new players to enter in the system. Indeed, as a Data Push strategy, this enables the company to exploit the value of the assets that are already within the company (the gathered data) and possibly convert something which is a by-product of the system into a source of new revenue flow. Uber, with the creation of Uber Movement, is a clear example here;

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indeed, they initially launched the service as a beta version to understand who may be interested and how to use those data,

Therefore, this strategy not only merges transactional and non-transactional dimensions (Evans, 2003; Filistrucchi et al., 2014; Ihlström Eriksson et al., 2016) and creates the chance to move from two- to multi-sides (Hagiu & Wright, 2015); it also enables the firm to enlarge the primary activity chain by adding new activities (sides) to exploit the value of existing assets (Sawhney et al., 2004; Trabucchi et al., 2018). This needs as a prerequisite the ability to realize that assets within the system may have value for someone outside the platform, and creating and capturing that value. Therefore, we label this last strategy as Multi-Sided Epiphany, highlighting the discovery process in Figure 8 below.
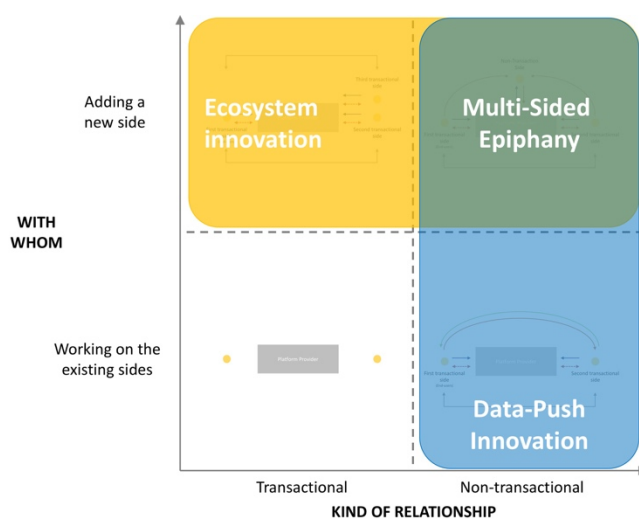

Figure 8 – Multi-Sided Epiphanies and comprehensive model

In the end, this model shows how companies that start from a transactional two-sided structure have various alternatives to evolve in multiple directions. All the strategies tend to exploit the value embedded in the system. The value may derive from the users who are already on board (and therefore, the externalities they create) or the data generated by the system in two main ways: i) by involving new sides and ii) by implementing non-transactional dynamics. Both cases affect the value creation and capturing process, thus creating new potential revenue flows and expanding the value proposition of the platform provider.

Conclusion, Implications, and Limitations

The goal of the paper is to highlight the strategies that two-sided platforms may use to foster innovation starting from their basic transactional structure. Ecosystem and Data-Push innovations are identified as the two directions that can be used to exploit the value of a transactional two-sided platform. Operationally, three different strategies can be highlighted: Supply (Side) Extension, Transactional Advertising, and Data Trading.

From a theoretical perspective, this research continues in the path of recent researches that have a strong managerial orientation on the concept of two-sided market (e.g., Muzellec et al., 2015; Strummer et a., 2018). However, this research also adopts an innovation perspective. It offers a first perspective on the different ways in which these businesses may evolve starting from a transactional structure. It builds on previous researches and takes different perspective in a comprehensive model in which transactional and non-transactional perspectives are merged (Evans, 2003; Filistrucchi et al., 2014; Ihlström Eriksson et al., 2016; Täuscher & Laudien, 2018) and bring the Client-As-a-Source perspective on a transactional structure (Trabucchi et al., 2017). Furthermore, this research enlarges, on the one hand, into a discussion on the role that big data may have in innovation (e.g., Del Vecchio et al., 2018; Ostrom et al., 2015; Trabucchi et al., 2018).

The managerial contribution of the paper is first of all related to the different strategies that entrepreneurs and managers of two-sided may implement to foster innovation to seek growth of their businesses. This research contributes both to those companies that are searching for new ways to innovate their core offering to the players involved in the transactional structure to enhance the relationship with them, and it offers insights to those companies that are searching for the ways to enlarge their business model by moving from two to multi-sided businesses. Nevertheless, the greatest implication of this research, from a managerial perspective, is related to the overall meaning of these three strategies. They suggest that, once the two-sided platforms are successfully established, there are different ways to exploit further the value embedded in the created system. First, these platforms may further exploit the value of the demand side, searching and enabling different transaction lines that create value for new players, while enhancing the value capturing ability of the platform provider. Second, these platforms may further exploit the value of the data gathered during service delivery, while enhancing the existing relationships on the platforms. Finally, these platforms may exploit the embedded value – in forms of data – involving other sides that can leverage those data. In other words, this research suggests that managers of two-sided platform may go beyond the transactions at the basis of the platforms, to further exploit the embedded value while enlarging the ecosystem of relationships they are working on.

It is important to highlight the limitations of this research, which is based on a sample that tends to take into consideration many different fields (as categories) but it is limited to mobile apps due to the sampling procedure. These limitations may be the starting point for future researches, including other settings, and especially developing in-depth case studies also focusing on the unexplored dimensions of one strategy or the other and defining the opportunities and challenges involved in the implementation of those strategies.

References

Accenture. (2016). Accenture Technology Vision 2016. People First. The Primacy of People in a Digital Age. https://www.accenture.com/t20170227T030304__w__/us-en/_acnmedia/PDF-20/Accenture-Technology-Trends-Technology-Vision-updated.pdf

Amit, R., & Zott, C. (2001). Value creation in e-business. *Strategic Management Journal, 22*(6–7), 493–520.

Armstrong, M. (2006). Competition in two-sided markets. *The Rand Journal of Economics, 37*(3), 668–691.

Caillaud, B., & Jullien, B. (2003). Chicken & egg: Competition among intermediation service providers. *Rand Journal of Economics,* 309–328.

Choudary, S. P., Parker, G. G., & Van Alstyne, M. W. (2016). *Platform revolution: How networked markets are transforming the economy and how to make them work for you.* WW Norton & Company.

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research.*

Del Vecchio, P., Di Minin, A., Petruzzelli, A. M., Panniello, U., & Pirri, S. (2018). Big data for open innovation in SMEs and large corporations: Trends, opportunities, and challenges. *Creativity and Innovation Management, 27*(1), 6–22.

Dou, G., He, P., & Xu, X. (2016). One-side value-added service investment and pricing strategies for a two-sided platform. *International Journal of Production Research, 54*(13), 38083821.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532–550.

Evans, D. S. (2003). The antitrust economics of multi-sided platform markets. *Yale Journal on Regulation,20*(2), 325-381.

Evans, D. S., & Schmalensee, R. (2016). *Matchmakers: The new economics of multi-sided platforms.* Harvard Business Review Press.

Filistrucchi, L., Geradin, D., Van Damme, E., & Affeldt, P. (2014). Market definition in two-sided markets: Theory and practice. *Journal of Competition Law and Economics, 10*(2), 293–339.

Galunic, D. C., & Eisenhardt, K. M. (2001). Architectural innovation and modular corporate forms. *Academy of Management Journal, 44*(6), 1229–1249.

Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy, 43*(7), 1239–1249.

Gawer, A., & Cusumano, M. A. (2014). Industry platforms and ecosystem innovation. *Journal of Product Innovation Management*, *31*(3), 417–433.

Godes, D., Ofek, E., & Sarvary, M. (2009). Content vs. advertising: The impact of competition on media firm strategy. *Marketing Science, 28*(1), 20–35.

Gundlach, H., & Hofmann, J. (2017). Preferences and willingness to pay for tablet news apps. *Journal of Media Business Studies, 14*(4), 257–281.

Hagiu, A., & Wright, J. (2015). Multi-sided platforms. *International Journal of Industrial Organization, 43*, 162–174.

Hitt, M., Harrison, J., Ireland, R. D., & Best, A. (1998). Attributes of successful and unsuccessful acquisitions of US firms. *British Journal of Management, 9*(2), 91–114.

Iansiti, M., & Lakhani, K. R. (2018). Managing Our Hub Economy. *Harvard Business Review*, 96(1), 17-17.

Ihlström Eriksson, C., Åkesson, M., & Lund, J. (2016). Designing ubiquitous media services: Exploring the two-sided market of newspapers. *Journal of Theoretical and Applied Electronic Commerce Research, 11*(3), 1–19.

Katz, M. L., & Shapiro, C. (1985). Network externalities, competition, and compatibility. *The American Economic Review, 75*(3), 424–440.

Landsman, V., & Stremersch, S. (2011). Multihoming in two-sided markets: An empirical inquiry in the video game console industry. *Journal of Marketing, 75*(6), 39–54.

Lau, M., & Wydick, B. (2014). Does new information technology lower media quality? The paradox of commercial public goods. *Journal of Industry, Competition and Trade, 14*(2), 145–157.

Lu, X., Goldsmith, R. E., & Pagani, M. (2013). Two-sided markets and social media. Organizations and Social Networking: Utilizing Social Media to Engage Consumers (pp. 197–213). doi:10.4018/978-1-4666-4026-9.ch010

Luchetta, G. (2014). Is the Google platform a two-sided market? *Journal of Competition Law & Economics, 10*(1).

McAfee, A., & Brynjolfsson, E. (2012). Big data: The management revolution. *Harvard Business Review, 90*(10), 61–67.

Miles, M. B., & Huberman, A. M. (1984). Drawing valid meaning from qualitative data: Toward a shared craft. *Educational Researcher, 13*(5), 20–30.

Muzellec, L., Ronteau, S., & Lambkin, M. (2015). Two-sided internet platforms: A business model lifecycle perspective. *Industrial Marketing Management, 45,*139–150.

Ndubisi, N. O., Ehret, M., & Wirtz, J. (2016). Relational governance mechanisms and uncertainties in nonownership services. *Psychology & Marketing, 33*(4), 250–266.

Ostrom, A. L., Parasuraman, A., Bowen, D. E., Patrício, L., & Voss, C. A. (2015). Service research priorities in a rapidly changing context. *Journal of Service Research, 18*(2), 127–159. doi:10.1177/1094670515576315

Parker, G. G., & Van Alstyne, M. W. (2005). Two-sided network effects: A theory of information product design. *Management Science, 51*(10),1494–1504.

Rifkin, J. (2014). *The zero marginal cost society: The internet of things, the collaborative commons, and the eclipse of capitalism.* St. Martin's Press.

Rochet, J. C., & Tirole, J. (2003). Platform competition in two-sided markets. *Journal of the European Economic Association, 1*(4), 990–1029.

Rochet, J. C., & Tirole, J. (2006). Two-sided markets: A progress report. *RAND Journal of Economics, 37*(3),645–667.

Rysman, M. (2009). The economics of two-sided markets. *The Journal of Economic Perspectives, 23*(3), 125–143.

Sawhney, M., Balasubramanian, S., & KrisMhnan, V. V. (2003). Creating growth with services. *MIT Sloan Management Review, 45*(2), 34–44.

Shead, S. (2017, Dec 26). Uber's food-delivery company is outgrowing the taxi business in some cities. *Business Insider*. Retrieved from https://www.businessinsider.com/ubereats-is-outgrowing-uber-in-some-cities-2017-12?IR=T

Sriram, S., Manchanda, P., Bravo, M. E., Chu, J., Ma, L., Song, M.,...Subramanian, U. (2015). Platforms: A multiplicity of research opportunities. *Marketing Letters, 26*(2),141–152. doi:10.1007/s11002-014-9314-1

Statista. (2016). Available at: https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Statista. (2017). Available at: https://www.statista.com/statistics/269025/worldwide-mobile-app-revenue-forecast/

Stummer, C., Kundisch, D., & Decker, R. (2018). Platform launch strategies. *Business & Information Systems Engineering,*1–7.

Täuscher, K., & Laudien, S. M. (2018). Understanding platform business models: A mixed methods study of marketplaces. *European Management Journal*, *36*(3).

Thomas, L. D., Autio, E., & Gann, D. M. (2014). Architectural leverage: Putting platforms in context. *Academy of Management Perspectives, 28*(2), 198–219.

Trabucchi, D., & Buganza, T. (2019). Data-driven innovation: Switching the perspective on big data. *European Journal of Innovation Management*, *22*(1), 23–40.

Trabucchi, D., Buganza, T., Dell'Era, C., & Pellizzoni, E. (2018). Exploring the inbound and outbound strategies enabled by user-generated big data: Evidence from leading smartphone applications. *Creativity and Innovation Management, 27*(1), 42–55.

Trabucchi, D., Buganza, T., & Pellizzoni, E. (2017). Give away your digital services: leveraging big data to capture value. *Research Technology Management, 60*(2), 43–52.

Trabucchi, D., Talenti, L., & Buganza, T. (2019). How do Big Bang Disruptors look like? A Business Model perspective. *Technological Forecasting and Social Change*, 141, 330-340.

Van Alstyne, M. W., Parker, G. G., & Choudary, S. P. (2016). Pipelines, platforms and the new rules of strategy. *Harvard Business Review, 94*(4), 54–62.

Wamba, S. F., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics, 165*, 234–246.

Yin, R. K. (2013). *Case study research: Design and methods.* Sage Publications.