A solution for the chicken and egg paradox in taxi e-hailing platforms: some evidence from the MyTaxi – FreeNow case

Mario Tani
Dipartimento di Economia, Management, Istituzioni, Università degli Studi di Napoli Federico II, Napoli, Italy

Ciro Troise
Dipartimento di Economia, Università degli Studi della Campania Luigi Vanvitelli, Caserta, Italy, and

Gianpaolo Basile
Department of Tourism Science, Universitas Mercatorum, Rome, Italy

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Abstract

Purpose – This study aims to explore the chicken and egg paradox in the taxi e-hailing business contributing to define a condition of system emergence. This paradox is a meaningful one as these platforms represent a system where the passengers systems have no reason to participate if they have no drivers-systems to answer their call, but, at the same time, the platform is not useful to the drivers-system if there are no passengers-systems using the platform.

Design/methodology/approach – To understand how this paradox has been dealt with in the taxi e-hailing business, this study focused on a case study on a best practice in Italian taxi e-hailing industry (i.e. MyTaxi/FreeNow). This study wants to comprehend which actions have been implemented to solve this paradox and has tried to identify the interconnections between the various strategies to create a closed loop diagram for further testing.

Findings – This study has found that the company did not choose a single "subsystem" (passenger or driver), but it has stimulated the creation of several mutually reinforcing motivation for have both subsystems interact to help the company grow.

Originality/value – To the best of the authors' knowledge, this paradox has never been studied using the complex adaptive system perspective. This perspective is particularly useful in this case and in the similar ones with several different interacting factors that cannot be really studied without using a higher order perspective.

Keywords Service science, Network theory, Complex adaptive system, Two-sided platforms, Chicken and egg paradox, Taxi-hailing

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1. Introduction

In recent years, digital platforms are proliferating all over the world, and they are used in the most different industries. Their diffusion has been favored by the development of ICT and by the rise of the sharing economy. The diffusion of ICTs has a positive effect on economic growth (Sassi and Goaied, 2013), and it allows the creation of new distribution channels based on the exchange of data between users and information systems. Sharing economy creates new competition across several industries (e.g. hotel, retail, taxi), and it asks people to exchange information, knowledge, data and goods/services (Richter *et al.*, 2017).

This condition is characterized by a many-to-many approach that underpins an emergent system based on numerous and heterogeneous interactions between social and economic systems aimed to satisfy mutual needs to better their quality life (Chen *et al.*, 2019; Stallkamp and Schotter, 2019).

Digital economy presents intriguing challenges and opportunities for many businesses, and now it is a vibrant area in which the digital platforms are an established feature. Nowadays, these platforms have become important new players in the service ecosystem (Parker *et al.*, 2016), and they represent the main driver behind the development of the new economy (Kenney and Zysman, 2016).

The actual high level of connectivity between numerous and heterogeneous actors that find useful opportunities to reach their mutual survival conditions and the spread of apps are the key elements for increasing the potential of "complex adaptive digital systems" (Morowitz, 2018); therefore, these systems are complex as its components are numerous and heterogeneous, and they are in a nonlinear relationship; these conditions are the focus on which they base their dynamic adaptability (Holland, 1992; Basile *et al.*, 2016).

These digital systems have transformed many traditional sectors, favored the rise of new businesses based on app services and have driven several companies to modify their original business model. In this vein, the taxi industry is one of the most significant examples; in fact among the new players that entered the sector, taxi-hailing companies are now a consolidated reality.

In the taxi-hailing industry, many players – such as Uber, Lyft, MyTaxy/FreeNow – have developed apps to allow potential users to get to their destinations quicker and in a more cost-effective way. Taxi-hailing platforms are a typical example of two-sided platforms (Rochet and Tirole, 2006) and leverage mobile apps to act as intermediaries by arranging transportation service between passengers and drivers.

These platforms are systems with a governance and an organization, and they can be easily seen as a complex adaptive system (CAS) as they survive, or market success, is not only tightly linked to the emergence of new behaviors that come out of agents' self-organization (Kauffman, 1993; Dominici and Levanti, 2011), but it depends on the past stimuli and behaviors as well (Barile *et al.*, 2013). The platform survives if it is able to create and maintain lasting structural coupling between driver and passenger that in their turn find to reach survival satisfying social and economic mutual needs.

Recent literature on online taxi-hailing mainly focused on regulations (Geradin, 2015; Jiang and Zhang, 2019; Witt *et al.*, 2016), consumer behavior (Dias *et al.*, 2017; Rosenblat *et al.*, 2017; Xu *et al.*, 2017) and comparison with traditional taxi systems (Donald and Anderson, 2014; Rayle *et al.*, 2016).

Most of the studies in this field have focused on the Uber case (Dudley *et al.*, 2017; Meelen and Frenken, 2016; Isaac, 2014; Skok and Baker, 2018; Urbinati *et al.*, 2018), but less attention has been paid to the other new players that have appeared in the current scenario and how they have entered the arena.

We decided to put the focus of our paper on a new Italian platform for the taxi e-hailing industry: MyTaxi/FreeNow. This company is a well-known open digital platform intermediating third-party services in return for a commission (Remane *et al.*, 2017). This digital platform had a disruptive impact on the taxi-hailing scenario in Europe and, in particular, in Italy (CERTeT, 2018).

This study investigates these topics looking to find an answer to two compelling research questions: How has MyTaxi/FreeNow addressed the chicken and egg paradox? Which strategies have they implemented?

Finding an answer to these questions not only may be useful for the players in the taxi e-hailing industry but also may prove to be useful in solving even the need of the other two-sided platforms (Rochet and Tirole, 2006; Belleflamme and Pleitz, 2018). Moreover, this paper may prove to be a good contribution to the existing literature on multisided platforms, on e-hailing and, it may be useful even for system thinking scholars.

In doing this, we explore the steps of an intriguing case study, i.e. MyTaxi/FreeNow. First, we explore the regulation environment that allows MyTaxi/FreeNow to leverage an emerging opportunity, and then we focus on the impact and effects of these platforms by analyzing how it tries to solve the chicken-egg issue.

The paper is organized as follows. In Section 2, we review the dedicated literature streams; in particular, we present the two-sided platforms, the role of network in services, the chicken and egg paradox and the taxi e-hailing sector. In Section 3, we present the research design including research context, data and methodology. In Section 4, we display the results, whereas in Section 5, we discuss them and provide conclusions.

2. Literature review

2.1 Two-sided platforms

As reported by Armstrong and Wright (2008):

> [...] a growing number of industries are organized as so-called two-sided markets in which platforms enable interactions between two groups of users, each of which cares about the size and attributes of the other group on the same platform.

Two-sided platforms connect two groups of users apparently in a linear relationship and mediate transactions between them (Eisenmann *et al.*, 2006; Hagiu and Wright, 2011) helping to create a multidimensional platform ecosystem (Yablonsky, 2020). Accordingly, these platforms exhibit cross-network externalities between the parts of the system, and they may leverage the mutual influence among the subsystems as the choice of one-sided influences that of the other (Evans, 2003; Katz and Shapiro, 1985; Rochet and Tirole, 2003; Rochet and Tirole, 2006) to define new and emergent behaviors (Dominici and Levanti, 2011).

These platforms operate in a setting of organizational complexity (Mitleton-Kelly, 2003), and they leverage technology to help people, businesses and artificial agents to converge (Yablonsky, 2020) driving the creation of new business models (Schallmo *et al.*, 2017; Yablonsky, 2019).

These platforms enable, and leverage, the various relationship that will help the multisided relationship that may involve business-to-business, business-to-consumer, consumer-to-business and consumer-to-consumer transactions (European Commission, 2016). One of the main reasons favoring these systems success is the significant decrease of transaction costs (Coase, 1960), which facilitates both direct and indirect transactions.

The two groups' interactions create surplus for both the involved parties, i.e. consumers and sellers, (Schiff, 2007). The attractiveness of one side for the other depends on both its size and quality (Bakos and Katsamakas, 2008; Evans, 2003; Wright, 2004). But the relevant relationships are not only those between the two subsystems (passengers and drivers) but

even inside each subsystem as, for the two-sided platforms, users on one side not only care about how much the users on the other level participate but also they care about participation and usage of fellow users on the same side (Belleflamme and Peitz, 2018; Wang and Yang, 2019).

Two-sided platforms generally create added value by matching of two social and economic autonomous systems, the supply side with the demand side (Evans *et al.*, 2011; Mäntymäki *et al.*, 2019), and their success is related to their capability to attract a large number of users on the two sides providing them with new services that helped both sides in co-creating value and in getting new opportunities (Hwang *et al.*, 2018; Belleflamme and Peitz, 2018). Furthermore, these platforms could create more surplus for the parties by offering important value-added service (Dou *et al.*, 2016; Kuo *et al.*, 2009; Zhang *et al.*, 2015). According to a complex theory perspective (Massingham *et al.*, 2020).

As mentioned above, both services and users play a key role for platforms in achieving higher results and faster growth in the market (Hagiu and Wright, 2015). Superior intermediation services represent a surplus (Caillaud and Jullien, 2003), and more users entering the network increase the value for the individual users (Rochet and Tirole, 2003). Both sides leverage digital platforms to capture the economic value from their interdependence (Evans and Schmalensee, 2007).

The literature on two-sided platforms is rich in studies and mainly focused on antitrust policies (Katz and Sallet, 2018; Katz, 2019) and on business models or pricing issues (Armstrong, 2006; Belleflamme and Peitz, 2018; Hagiu and Hałaburda, 2014; Schiff, 2007; Tan and Wright, 2018; Täuscher and Laudien, 2018). However, new frontiers of research in this field disclose several and significant opportunities for these markets and the related platforms. Among them, the spread of digital technologies is an essential element to foster business growth, and in particular big data represent a significant resource (Trabucchi *et al.*, 2017, 2018).

2.2 Networks and services

According to the service science in the digital economy, digital services are seen as dynamic configurations of people, technology and shared information that create and deliver value between social and economic actors (Maglio and Spohrer, 2008; Vargo *et al.*, 2020).

In this scenario, the concept of the "network level" has become more relevant than the single relationships and even than the role of each single node. Accordingly, to comprehend the evolution of these systems, focus on interactions between nodes is needed rather than looking at the individual nodes and to the specific relationships linking them.

According to this view, the network can be considered as a complex system, composed of autonomous systems, in which everything influences everything (Gummesson, 2008), and business processes are necessarily characterized by dialogue and continued interactions between its parts based on a structural coupling condition both inside the two-sided platform systems and with other agents outside its boundaries (Varela *et al.*, 1974; Ranjbari *et al.*, 2019).

Therefore, considering the network theory (Danõa *et al.*, 2020), value is created in a many-to-many logic of reticular interactions and is affected by every activity performed by social and economic actors belonging to the network by their motivations and by their competitive behavior.

In this context, each actor contributes to service/product (co)creation and emergent mutual values (Vargo and Lusch, 2008; Lusch *et al.*, 2007; Basile *et al.*, 2019; Algharabat *et al.*, 2020).

This view stresses the following points:

- the whole of actors in interaction is different from the sum of parts;
- the many-to-many trend, characterized by numerous and heterogeneous interactions, underpins system complex(ity) condition; and

- constant relations between social and economic actors, strengthened by new technology, stimulate mutual behavioral and organizational adaptability.

In this way, the authors argue that digital platforms contribute to social and economic creation and fulfillment of nonlinear relational dynamics that characterize a complex system (Massingham *et al.*, 2020).

The systemic approach focuses on the system as a dynamic whole, taking into account the nonlinear interactions between its parts, to obtain a holistic perspective on the paths of action occurring in a given context and how they help shape it (Stacey, 2007; Devereux *et al.*, 2020).

On these bases, we can consider these initiatives as a CAS emerging from bottom-up relations stimulated by marketing and communication activities and aimed to learning, process variation, tuning and improvement (Kauffman, 1993; Basile *et al.*, 2016; Basile *et al.*, 2018; Jafari Songhori and Nasiry, 2020).

2.3 Chicken and egg paradox

The current literature presents several contributions that explore the so-called "chicken and egg dilemma" (also called "paradox") (Caillaud and Jullien, 2003; Coad *et al.*, 2017; Eisenmann, 2008; Kim and Tse, 2011; Olczyk and Kordalska, 2018; Ren *et al.*, 2018). The well-known chicken and egg dilemma refers to issues that arise owing to how get the two sides "on board" (Rochet and Tirole, 2006; Stummer *et al.*, 2018).

This problem, according to the complexity theory, is strengthened by nonlinear behavior of parts that influences the impossibility to predict platform evolutions (Sivunen and Putnam, 2020).

In this case, the questions posed herein are which class of users can be seen as the chicken, or the egg, and which comes first, as one of the two sides must be attracted first to the platform to attract the other one. In the digital marketplace, these issues are significant constraints, and they represent the first few challenges of two-sided platforms (Evans, 2003; Murtaza *et al.*, 2004; Rochet and Tirole, 2003; Trabucchi, 2020).

Solving the above cited dilemma is fundamental for platforms success as it represents the first step in the formation of the interaction between the two sets of users, and this will create value for both subsystems (passengers and drivers) (Trabucchi, 2020), and it may be able to develop a system-wide change (Wanner *et al.*, 2019).

In their initial phases, two-sided platforms face difficulties in acquiring users – that will use the digital platform – on both sides. The two sides' willingness to join the intermediation offered by the platform depends on each other (Caillaud and Jullien, 2003). Network externalities, and in particular indirect network effects, increase difficulties related to the dilemma. In fact, these externalities affect the decision-making process of users to enter a platform. The decision of one side users is related to the capability of platforms to acquire users of the opposite side; in fact, the limited number of connections between the two parties represents a strong limitation and leads to a lower customer retention.

Solving the chicken and egg dilemma is crucial and strategically important for two-sided platforms to get both buyers and sellers on board and establish linkages between the two sides of the market. Users base their decision to join a specific platform on their perception, i.e. if they perceive a high value of the platform or not (Bruun *et al.*, 2002; Rask and Kragh, 2004).

Regarding that, complexity theory provides an integrative and dynamic framework to understand the interaction patterns in networks of interdependent agents who interact and are bound by their common needs or objectives. In this view, the system is "emergent" when

the individual agents interact in ways that transcends themselves and becomes something more (becoming greater than the sum of its parts) (Walby, 2007; Galkina and Atkova, 2020).

Over the years, a number of scholars tried to identify some practices to reduce complexity and overcome the obstacle. The theme is topical, and actually there is an ongoing call for more research that contributes to unpack the puzzle of chicken and egg dilemma.

In this scenario, the behaviors of the agents and their motivations have a primary role for the players in the online marketplaces to shape their participation (Pondy and Mitroff, 1979; Goldstein, 2011; Galkina and Atkova, 2020; Vrontis *et al.*, 2020). The current literature presents several prior papers that are specifically focused on these players' strategies to show both the best practices or failure cases (Bruun *et al.*, 2002; Belleflamme and Tuolemonde, 2004; Eisenmann *et al.*, 2006). Some scholars explored specific industries or contexts (Bruun *et al.*, 2002; Evan, 2003; Krammer *et al.*, 2001; Rask and Kragh, 2004), whereas others examined pricing strategies or intermediation services that help platforms to improve the structural coupling between users-systems (e.g. Caillaud and Jullien, 2003). Both business models (Muzellec *et al.*, 2015) and the types of users (Stummer *et al.*, 2018) are relevant parameters in solving the chicken and egg dilemma.

As Rochet and Tirole (2003) suggested, the main goal of two-sided platforms is to secure at least one side to attract the other. This is a preliminary and fundamental aspect because initially the platforms encounter difficulties in sustaining themselves. Thus, it is important that platforms show adaptive dynamics characterized by potential users-systems behavior to attract other users.

Given the low entry barriers and the reduced transactions costs, platform capabilities should be to focus on quality services to stimulate relations between users and improve their competitiveness. In this context, reputation systems are important parameters for users (Resnick and Zeckhauser, 2002).

2.4 Taxi-hailing industry

In the current global scenario, there are many examples of markets where two or more groups of participants interact via digital platforms. The taxi-hailing sector is one of these significant examples.

The rapid expansion of the sharing economy and the massive spread of internet-based mobile technology provide unprecedented competition in the taxi industry (Cramer and Krueger, 2016). The scenario changed drastically, in particular for taxi drivers (Johnston, 2017; Oei and Ring, 2017), and several two-sided platforms (such as Didi, Lyft and Uber) entered the taxi market by leveraging mobile apps. These digital platforms connect taxi drivers and passengers by incorporating taxi-calling services into some instant messaging apps (e.g. Wechat) (Dou *et al.*, 2016). These digital platforms connect previously unmatched demand-side and supply-side participants through new innovative forms of value creation. Network effects help explaining the boom of these platforms and their success. The high number of users, i.e. drivers, increases the likelihood that taxi seekers (such as tourists) will find a high-quality service. Furthermore, these platforms help increase the social utility and present reduced transaction costs (both prices and costs) compared to traditional established taxi operators.

As suggested by Meelen and Frenken (2016), some differences emerge between the players in this sector. On one side, there are the platforms to order a taxi such as Uber, Lyft or Didi; on the other side, there are those platforms to share a ride, such as BlaBlaCar or Gogobus, and the other services created to hitchhike or carpool. Frenken and Schor (2017, p. 5) argued that "in the case of a taxi service, the consumer creates new capacity by

ordering a taxi on demand to drive the passenger from A to B." Instead, in the case of hitchhiking/carpooling, drivers had planned to go from A to B anyway, and passengers occupy an unused seat.

In this evolving scenario, both governments and authorities must constantly implement new regulations for the online taxi-hailing services as opposed to their direct competitors in the traditional taxi services (Jiang and Zhang, 2019).

Despite ongoing discussions, research on digital platforms in the taxi-hailing sector is still in its infancy, and scholarly knowledge remains limited and fragmented.

In this field of research, the literature about Uber case is predominant (Dudley *et al.*, 2017; Meelen and Frenken, 2016; Isaac, 2014; Cramer and Krueger, 2016; Skok and Baker, 2018; Urbinati *et al.*, 2018). The debate on the belonging of the Uber platform to the sharing economy is still of interest and current (Bardhi and Eckhardt, 2012; Belk, 2014; Böcker and Meelen, 2017; Botmsan and Rogers, 2010; Frenken and Schor, 2017; Meelen and Frenken, 2016).

Uber has represented a disruptive innovation that had a strong impact on the taxi industry (Cramer and Krueger, 2016; Isaac, 2014; Urbinati *et al.*, 2018). Rogers (2015) investigated social costs and benefits of Uber, whereas other scholars examined Uber's practices (Hall and Krueger, 2017; Horan, 2017; Ronblat *et al.*, 2017). Among the studies on Uber, Böcker and Meelen (2017) suggested that there are significant differences between the platform services (e.g. Uber X, Uber Black, Uber Pool, etc.), so each should be studied with different protocols.

Despite the findings of prior studies in the sharing economy and multisided platform literature, the body of research in the taxi-hailing industry has overlooked insights from the chicken and egg dilemma.

3. Research design

To study the chicken and egg paradox and how the related complexity can be reduced (Sivunen and Putnam, 2020), we have decided to adopt the single case study (Yin, 1989). This approach has been defined as appropriate for the first steps in theory building (Eisenhardt, 1989); moreover, it has been found as the correct approach to use when there is a general lack of prior literature and research about a specific phenomenon as highlighted in Section 2 (Mills *et al.*, 2010).

According to Yin (1989), in an exploratory case study, such as ours, it is important to identify a case that could be tightly linked to the research propositions. In our case, we selected the case of MyTaxy/FreeNow (or using the new name it has started using since 2019 "FreeNow"), a platform that was founded in 2009 and that was the first to intermediate taxi drivers and normal customers; today it has caught the attention of important traditional automotive industry players, and in fact Daimler is investing in and managing the platform (Basili and Rossi, 2019; Remane *et al.*, 2017).

According to a study by CERTeT (2018), e-hailing has strongly impacted the Italian urban mobility, and there has been a direct effect, the so-called "MyTaxi effect" (Corcom, 2018), of the platform we are studying in the Italian context. The CERTeT's study (2018) analyzed the impact of this new phenomenon between October 2016 and September 2017 in three main cities (i.e. Milan, Rome and Turin) and showed significant numbers in the following several aspects:

- reduction of average waiting times between trips;
- increased use of the e-hailing platforms compared to other call/booking methods;

- highest bookings (drivers received 51% of the booking) and payments (on average, 66% of payments) via apps;
- increase in the numbers of rides for taxi drivers (at least 3/5 more per day); and
- improvement of the propensity of foreign passengers to communicate with the taxi driver.

Moreover, according to the 2018 company financial disclosure in the past year, the platform's revenues kept growing. In the past year, while still operating only in five big Italian cities (Rome, Milan, Turin and the two new locations of Naples and Palermo), the platform was able to double its revenues and intermediate quite 2 million rides. This growth mostly depends on a sentence/decision of the Autorità Garante della Concorrenza e del Mercato (Italian antitrust) that has freed taxi drivers to use more than a single platform (traditional or digital) to get the rides.

These data show that this platform can be considered as a good example of best practice, and so it is interesting to explore and describe the main strategies its management has designed and implemented to reduce the complexity embedded in the chicken and egg paradox and to leverage effectively the interconnection between the two subsystems (both passengers and taxi drivers) to create a stronger set of value creation processes that enhance the possibility of platform diffusion (Evans *et al.*, 2011; Belleflamme and Peitz, 2018; Mäntymäki *et al.*, 2019; Wang and Yang, 2019) and increasing its chances of an emergent behavior (Walby, 2007; Galkina and Atkova, 2020).

As suggested by Yin (1989), we have looked in several, different sources of evidence. We started looking into the online documentation both on the MyTaxi/FreeNow Italian corporate website and on the various online organizations related to the taxy-hailing industry to have a first secondary data-driven idea of the various actions that the company had implemented to enter the Italian market and the external conditions influencing the system in its evolution (Bertschinger *et al.*, 2006). In this phase, we have looked for information regarding the strategies and the incentives for drivers and passengers alike to be informed on the platform actions. Then we looked in travel blogs over the internet (keywords used: *MyTaxi Napoli Recensione* – My Taxi Naples Review; *MyTaxi Servizio* – MyTaxi Naples Service; *My Taxi App*) looking for information on the passenger side strategies (e.g. the vouchers or the refer-a-friend campaign).

The data collected during the first phase were used in the second phase to build the interviews guide that we used in the second phase: the interviews to several drivers.

In this second phase, we interviewed several taxi drivers in Italy (four in Rome, June 20–21, 2019, and 16 in Naples in the months of June and July), in Portugal (three in Lisbon, June 26–30, 2019) and in Ireland (four in Dublin, August 2–4, 2019) (all the drivers were male). The drivers were selected randomly, as two of us called the MyTaxi/FreeNow for a ride and interviewed the driver answering the call (all the drivers agreed to be interviewed after we assured them that the interview was an anonymous one). In these interviews, we first presented the drivers with the data from our desk research, and then we asked them to define the main reasons that had driven them to start using the new platform, and we asked them about their main experiences in dealing with the platform, with the other taxi-hailing networks, and on the effectiveness of the various MyTaxy/FreeNow initiatives. After each interview the two interviewers compared their notes to identify the main themes and the relevant answers that they had written down.

In the third step of the research, we looked at the other side of the platform (the passenger-system). To gather data, we looked at the MyTaxi/FreeNow Italia's social media pages on Facebook and at the user reviews in the Google Play Store looking for hints of the user satisfaction and of the drivers behind using the app.

4. MyTaxi/FreeNow case

The MyTaxy/FreeNow platform has been described as "an app-based platform for traditional taxis, which offers all major innovations of Uber: booking and tracking of drivers, cashless payment etc." (Gyódi, 2017, p. 3).

As highlighted by one of the app reviews: "Works great. Reliable and if you are familiar with Uber or Lyft from the States, this app is perfect for you!" Moreover, during the years the app has added other features as the turn-by-turn navigation to increase its drivers' trustworthiness.

The service was deployed in the big cities as in these locations it is easier to reach the critical mass needed to make the platform profitable. Moreover, when this kind of platform is used in small location, as highlighted by several Google play reviews, it may become unreliable as there are too few taxi drivers to be attractive for the user (e.g. a user wrote about the app that "It worked great in Rome! Saved me a lot of time finding a taxi wherever I was during my visit there," whereas another wrote that "Awesome app Works great in big cities in Germany but no so well in smaller ones [. . .] I do however think it's not the apps fault [. . .]").

MyTaxy/FreeNow app business model is linked to the number of rides it is used for. The app is free for the customer, while the driver has to pay a fee, in the measure of 5% of the full ride price. This fee is lower than similar ones asked by the traditional players (sometimes as high as 9%). During 2019, the fee was raised to 7% driving several taxi drivers to leave the platform; one of the drivers we have confronted with told us that "as I can freely leave the platform, I'll stay and see if they'll rise it again, then I'll leave this platform" highlighting that at least some of the drivers do not feel locked in with the platform.

To address the chicken and egg paradox and to stress nonlinearity in rising relations between a side and the platform, MyTaxi/FreeNow management applied several strategies working at the same time on both sides of the platforms. The interactions of these strategies have been represented in the following causal loop (nonlinear) diagram (Figure 1).

The closed loop diagram shows that the platform has implemented some strategy working only on one side (drivers or customers) while most of the strategies do strengthen each other through several positive links.

When MyTaxy/FreeNow enters for the first time in a new city, to stimulate the system emergence, it adopts two different strategies to create the structural coupling between its two user-bases. On one side, customers are offered 30 days of "50% discount" ("1st month discount" in the diagram) for all their rides paid through the app. According to one of the interviewed taxi drivers in Rome, being among the first to adopt the app is really useful as "many customers start using the app only to get this discount on our fare, so they are more willing to call us (the taxi drivers) using the app."

At the same time, the platform strategies have been defined to encourage drivers to become active in supporting the diffusion of the app both with passengers and with the other drivers. Drivers can prompt other drivers to enroll in the MyTaxy/FreeNow program leveraging a "gasoline coupon" that can give both the old and the new driver a voucher of €250 to spend in gasoline (leveraging the partnership the app has with Q8) if they are able to generate 90 MyTaxy/FreeNow rides in four weeks. According to one of our interviewed drivers,

> [. . .] the gasoline discount has been really important for me as I, as a cab driver, can use the car for even more than 150 kms each day, so these discounts are as good as money.

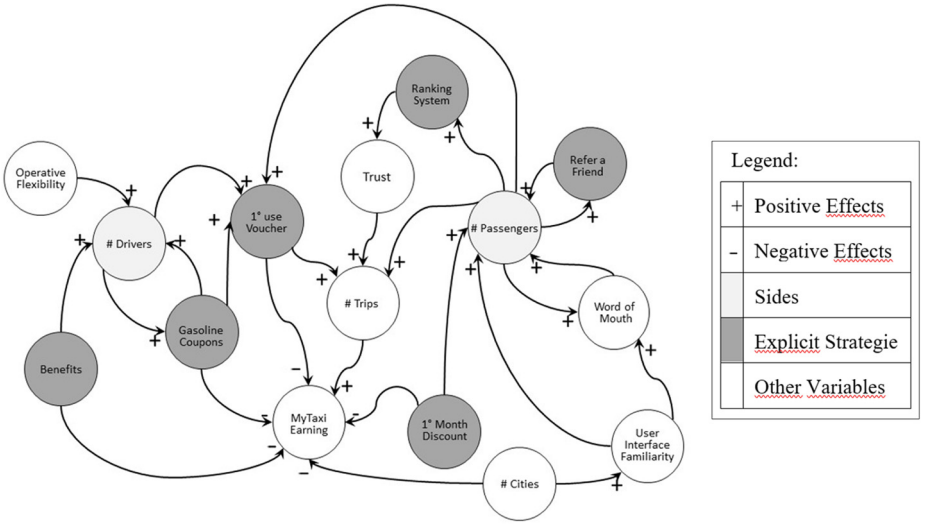

Figure 1.
The MyTaxi/ FreeNow platform closed loop diagram

The same holds for the promo (first use voucher in the diagram) drivers can give to passengers to get a discount of €10 in their first ride with the app that entitles the driver with a €10 gasoline voucher.

In one of the interviews in Dublin, the driver told us that "often (he) promoted the app to new clients as (he) got double advantages, as (he gets) both the money and the voucher, out of new users"; at the same time, another driver, in Naples, hold that:

> [. . .] the discount is particularly useful in the fixed price rides, as those from the airport to the city, as it is a good competitive advantage on my colleagues out of the platform.

This strategy is even more effective as clients can use the app to pay the ride even if they have booked it with a traditional platform helping the driver in being a viable distribution channel of the app's first use coupon.

On the other side, existing users (passengers) can give new users a coupon code ("Refer a Friend" in the diagram) to use at registration that will give them a small voucher (usually €5) that help new customers to use in their first trip. When the voucher is redeemed the first user gets a credit for the same amount.

At the same time, these strategies would not be useful if the platform was not able to provide significant advantages to both sides. Passengers can use the app to track the driver both while it is arriving at their spot and during the ride; they can use it during their travels without having to trust drivers in foreign countries.

One of the drivers we interviewed in Rome told us that the change of the platform name from MyTaxy/FreeNow to FreeNow was decided to adopt a common name all over Europe to become more attractive with tourists and travellers. According to the driver, these are the most frequent users in the Italian capital as they start using the digital platform as they often do not trust Italian taxi drivers, and they feel more secure using the app even as the app has real-time turn-by-turn navigation, so customers are able to see if the driver is following the right path. A similar view that justified the adaptive systems behavior has been found in the reviews of the app in the Google Play Store where several users have highlighted the role of trust in using the app ("Transparency and trust. This helps me

eliminate my paranoia when riding taxis" or "It's a brilliant app that's very easy to use and uses trusted drivers a lot").

The app leverages the need of trust in the drivers to create a healthy competition between the drivers. The passengers can evaluate the driver participating in a "ranking system"; moreover, they can mark a driver as a "preferred one" so that the app algorithm will select the driver, if available in the area, for their next trips. This is another example of positive closed loop as having the chance to be "preferred" encourages the drivers to be fair toward the passengers creating a better climate for using the app. The effect of this positive loop is enhanced as passenger can use the tool of negative reviews to sanction rude, or untrustworthy, drivers and, as highlighted by one driver in Naples, "when (the driver's) ratings get too low you start to get less and less selected so you risk of not being able to use the app at all."

Being part of the MyTaxy/FreeNow network is really useful for the driver ("Benefits" in the diagram) as the platform can be freely accessed, it does not require the drivers to pay a monthly fee as many of the traditional players do or a minimum number of trips while it is useful to reduce the time gap between the different trips. In particular, one of the interviewed drivers told us that:

> I can use this app without leaving my drivers' cooperative, I use it to increase the number of trips I have each day, moreover I can choose where to park in order to be nearer to the places where I think the passengers are in a given moment of time and this helps me to jump the queue in the parking slots.

Another has told us that:

> [. . .] with the MyTaxy/FreeNow app, I've been able to leave my previous platform, saving the monthly fee they asked me to pay, and to focus on tourists that are the richest part of the market as they ask for the longest trips.

5. Discussion and conclusion

In this paper, we showed that considering a digital platform as a CAS help to shed light in two classic topics of two-sided platforms: the chicken and egg paradox and how to solve it. The present paper focuses on both these intriguing aspects by investigating a significant case study, i.e. MyTaxy/FreeNow – a taxi e-hailing company. This study is among the first few to examine MyTaxy/FreeNow and to conduct an analysis of the platform strategies.

We consider the case a significant one as the company has not only got good results but also it has got a strong impact in the taxi-hailing Italian industry as a whole. Moreover, the company has shown that its strategies are viable and effective as it has been able to enter six cities in Italy and more than 100 in Europe.

The company has exploited a merger and acquisition program to enter some locations, but most of the times it has leveraged a tried-and-true set of strategies to target the drivers-system and the passengers-system at the same time. They used these strategies to stimulate system emergence and to actively address the chicken and egg paradox (Caillaud and Jullien, 2003; Rochet and Tirole, 2003; 2006; Sivunen and Putnam, 2020).

The data, as highlighted in the closed loop diagram, we have drawn in this paper highlight that to overcome the paradox a company should be able to implement three different set of strategies.

The first set of strategies are those able to create the structural coupling conditions that are represented by both to create value for the single user on each of the side of the platform and to stimulate co-creative processes. In our case, this has been done giving benefits to the

taxi drivers (area flexibility, tourist market, no fees, reduced gap between trips, going home trips) and other advantages to the passengers as well (a user-friendly interface, an easy-to-use app that works in a similar way to other hailing app; the possibility to use the same app in various cities; an online prebooking service).

Then, the company has implemented strategies to transform each user in an ambassador for its peers. MyTaxy/FreeNow has done this with the "Refer a Friend" voucher program (passengers) and with the gasoline coupons (drivers).

Finally, the company has implemented some strategy to make each side an ambassador to enroll more users from the other side. For example, the gasoline coupons require new drivers to use the platform for 90 trips in a four-week period, but the drivers can incentivize passenger to use the app as they can give them a promotional code to make them pay through the app; on the other side, the promotional campaign of the 50% discount in the first month becomes a strong incentive for the passenger to prefer MyTaxy/FreeNow drivers influencing the drivers to enroll as soon as possible.

At the same time, the platform has implemented several strategies to protect each side from being exploited from the other side. The drivers are protected with a "no-show" policy that bill a small amount to passengers that fail to keep the appointment, while the passengers have the review and ranking system that can protect them from being exploited by the drivers.

But our analysis has shown that these strategies are expensive ones as the company is effectively "buying users" on both sides, so it is a high-risk strategy so it cannot be easily generalized as the complexity of the diagram shows that is really difficult to define a "one-size-fits-all" model (Chisholm and Jung, 2015).

The insights derived from this case can have useful and interesting implications for both practitioners and scholars. Our study can suggest the three main area practitioners, as the platform managers, should focus on when the company has to enter a new market and how they need not only to address the need of each specific side, but they have to factor in the interdependence of the two sides in order to favor the development of emergent behaviors (Goldstein, 2011; Galkina and Atkova, 2020; Massingham *et al.*, 2020).

At the same time, the case has several, interesting, social implications. Above all the data gathered both from the drivers and the passengers highlight that these platforms are able to provide services that both subsystems do care for. The real-time turn-by-turn navigation, for example, is a useful way to increase the legitimacy of the taxi drivers with positive effects for the passengers too as they feel more comfortable with the traditional hail systems. Accordingly, the case shows that the main innovation of the car-sharing economy can be effectively used in the more traditional taxi e-hailing industry to make these services more modern and more trusted by the foreign customers as well.

Platforms such as the MyTaxi/FreeNow can have a relevant social role in those contexts where the link between social and economic systems is based on specific needs, for example, in the health or sanitary transportation; regarding that, the authors think that these platforms may become a viable solution for those territories (marginal or metropolitan suburbs) characterized by being far from hospitals, even if they host many elderly people. The ability of these platforms to coordinate the drivers-system with the needs of the passengers-system may reduce the response time of these services and may create a potential new market for these services for smaller and private organizations.

The present study advances the extant system thinking knowledge in several respects. First, it contributes to the nascent literature that investigates two-sided platforms in the taxi-hailing sector. Second, this case contributes to the debate on the key role of platform strategies to structural coupling creation useful to support the CASs emergence and

relations fulfillment. Third, MyTaxy/FreeNow should represent a best practice, and the analyses of the solutions to solve the chicken and egg dilemma will provide insights for further research and, hopefully, the evidence here presented could enrich the discussion on this topical argument.

Our research has three main limitations. Above all it does not directly involve any customer as we have chosen to use only the app reviews in the Google Play Store as a way to check the topics the reviewers pointed out (both positive and negative ones); then our research has no real measure of the success of the presented strategies in the long run as the app entry in Italy is still going on. Last but not least, the case does not try to understand the relative value of the strategies as could be done with a survey-based research design.

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Corresponding author
Mario Tani can be contacted at: mario.tani@unina.it