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Comparative analysis of existing multi-sided digital platform initiatives

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Comparative analysis of existing multi-sided digital platform initiatives

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Abstract

Digital platforms are omnipresent in our society. For example, streaming movies via Netflix, interacting with friends through social media, or using Deliveroo to order your meal. Digital platforms and digital marketplaces caused a big impact on the value creation process within different application domains. Actual digital ecosystems have appeared and the value propositions of traditional players within different domains got challenged by new and more integrated offers. Within this setting, also smaller-scale initiatives try to find their position. Local initiatives such as energy management platforms to link residents with (renewable) energy suppliers, or community platforms to link neighbours and city or village initiatives, especially in “online-only” times are appearing fast.

Although the number of both successful and failed cases is constantly growing, systematic understanding of the reasons behind this, is still lacking. This paper wants to add to this understanding by analysing digital platform initiatives from different points of view. The overall research question tackled in this paper is to determine critical characteristics that can impact the success of the digital, multi-sided platform business model. To achieve this, a conceptual framework that allows to analyse and compare platforms is presented. The framework is then applied on different existing platform solutions, in a broad range of application domains, to identify specific design choices and compare the different platforms. Overall, more general insights in the role of network effects, pricing strategy, and other key features that impact the risk of failure, are obtained. The analyses indicate that positive network effects are predominantly present which is important for the growth of the user base. Pricing schemes indicate that general customers do not want to spend a lot of money to use a platform. Therefore, they usually can use it for free. Advertisers play a crucial role in the revenue stream for a platform but too much ads can irritate the end user. Platforms also tend to use third parties for services which reduces the time to market and lowers the investment risk. Platforms immediately benefit from other technological advantages like scalability. Due to the low homing-costs for users, there is room for competition in each domain but of course platforms try to differentiate their offer from their competitors.

Keywords

Digital Platforms, Multi-Sided Platforms, Network Effects, Pricing, Multi-Homing Cost

I. INTRODUCTION

Platforms are omnipresent in our society, ranging from an ordinary dating club to advanced service providers nowadays. Multi-sided platforms (MSP) focus on the interaction between different groups of participants, called the user sides. If these interactions occur in a mainly online setting, it is called a digital platform. These platforms changed the way we interact with each other through social media platforms, consume media via platforms like Netflix, and use mobility services such as Uber. Digital platforms significantly changed the business ecosystem. Traditional companies get competition from other players. For instance, in the context of self-driving cars, automotive companies are confronted with new players that have another core businesses, such as Google which is specialised in data management. Platforms come in many flavors and are continuously changing to adapt to a changing ecosystem and new or improved technologies. This flexibility and ability to handle complex tasks, combined with the possibilities of rapid scale-up are one of the strong points of a digital multi-sided platform [1].

The number of successful and failed MSPs is constantly growing but the reasons behind it are still unclear. The aim of this research is to add to this understanding. Therefore, different existing digital platform initiatives, in a broad range of application domains, are analysed from different points of view using a new conceptual framework. Overall, we want to see if currently identified factors, that might indicate the success, can be found in across multiple application domains or just in very specific cases. Together with newly found insights, this should help to determine critical characteristics that can impact the success of the digital MSP business model. The remaining of this paper is structured as follows. Section II provides more background information on MSPs, along with a formal definition, reoccurring and important elements, extracted from the literature, are briefly introduced here. To identify these strengths and weaknesses, our proposed framework to analyse different platforms is presented in section III. In section IV, the application domains and corresponding platforms that were analysed using this framework are listed. The results of this analyses and discussion can be found in section V. Finally, section VI contains a short summary of the content and the main takeaways that were discovered.

II. MULTI-SIDED PLATFORMS IN LITERATURE

A. Definition of a multi-sided platform

What exactly is a multi-sided platform? At the moment, there is no generally accepted definition. Many definitions can be found in literature, and although each description differs a little, their focus is mainly the same. Combining a few strengths of these definitions, we define an MSP as follows [2], [3]:

a multi-sided platform is an intermediate, offering technologies, products and services, that creates value by bringing two or more different user sides together and facilitates direct interactions among them in a way that is beneficial for all parties. Without the platform, these interactions would barely exist or be much more complicated.

Overall, the platform can be seen as a network of user sides, each producing products and/or providing services that are interesting for another side in the platform, increasing the overall value of the platform. Based on this definition, a few key elements can be extracted:

- two or more different user sides,
- direct interaction between users, either within or between user sides,
- facilitation of the interactions and thus creation of value for all user sides.

One of the first MSPs was a physical dating club. Men could pass a note to the women present in the club through the waiters. This club had men and women as different user sides, aiming to bring them together. To keep the platform viable, the strategy must be altered to have enough members on each side. Therefore, the women could enter the club for free while men needed to pay. The concept of dating clubs can also be found in many online alternatives such as Tinder for instance. Even in this simple example, where people are brought together there is already some level of complexity in designing a platform to keep it interesting for all user sides [4].

Within the broad range of MSPs, two categories can be distinguished: innovation platforms and transaction platforms. A transaction platform focuses on connecting different user sides. It can bring producers and consumers together or it can connect employers with employees, for instance. In addition to enabling different user sides to interact, the platform can also play an active matchmaking role. An innovation platform, on the other hand, is mostly dependent on new technologies and its possibilities, and allows for new activities that might disturb the existing markets. In this type of platform, the connection between or within user sides is typically longer or frequently recurring. This last type of platforms can also create opportunities that lead to new types of economic agents, for example app developers since the invention of the smartphones [5], [6].

B. Important factors

The market for digital platforms is continuously changing and many platforms come and go, the one more successful than the other. What results in success and what in failure is not straightforward. However, according to previous work in this domain, some important aspects can be detected. In the next paragraphs, some of these aspects that require special attention during the design phase of a platform are discussed.

a) Network Effects: The value of a platform is very dependent on its active user base. The more active users, the more interactions that can take place, leading to a higher value of the platform. The attraction of users, on all user sides, is subject to network effects. A network effect indicates the increase (positive network effect) or decrease (negative network effect) in value of the network if more users are added. A positive network effect results in an increased interest in the platform and thus attracting more users. For example, in an online recruitment platform, more employees attract more employers, while at the same time, more employers attract more employees. When a network effects takes place between different user sides, like in the example given earlier, it is called an indirect or cross-side effect. Users from one segment can also attract more users from the same side. This is a direct or same-side effect. This is seen in many social media platforms. When a lot of friends are using that platform, you tend to register as well as it is a new way to stay connected. A negative effect will decrease the value of the platform. Note that not all effects have an equal impact on the platform. One network effect can be stronger compared to another [7].

b) Winner-takes-it-all and multi-homing costs: The number of active users influences the choices of developers of services and goods. For instance, in the video game industry, a platform with a large user base is more valuable to game developers as it offers a greater potential market for their games compared to platforms with a smaller set of users. The decisions to participate in a platform is influenced by the presence and strength of network effects. From the provider's point of view, it is more beneficial to develop for the dominant platform, given its larger user base. This can lead to the so-called *winner-takes-it-all* outcomes as the platform with the largest number of users tips the market in its favour [8], [9]. However, in many domains, there is currently no monopoly and no indication that the market is evolving in that direction. This is due to the fact that platforms differentiate their offer and thus no two platforms are really identical.

Customers are also able to associate to or use multiple platforms in parallel, which is indicated as multi-homing. Multi-homing costs imply the costs of maintaining presence on multiple platforms at the same time. This can be monetary such as subscription costs, and effort to keep everything up-to-date. Look at social media platforms. In theory a person can be active on every platform as they are free to join and use. However, maintaining each profile takes a lot of effort and is the main reason most people use at most 3 platforms. In some cases, platforms will try to dominate the market by keeping the multi-homing costs high or at least they will try. In other cases, platforms even make the effort to make services compatible between platforms keeping the multi-homing costs low. This can be beneficial to enter a market but makes the platform more vulnerable for innovative competitors. Low multi-homing costs open the door for competition, even with similar value propositions by these platforms and a smaller chance on winner-takes-it-all scenarios [10].

c) Pricing: Another important aspect in the success of a platform is the pricing strategy. Obviously, charging one user side too much will reduce the interest of this user side and, through the network effects mentioned above, also affect the interest of a different user side. Overall, the number of users will drop and the value of the platform will decrease [9], [11]. Nevertheless, developing and keeping a platform operational does not come for free: revenue streams are needed to cover these costs, but too high prices will keep customers away. This price sensitivity makes that in some platforms, one user side can use the platform for free. Examples showed that increasing prices or switching from a free to a paid platform without giving more value to the users has negative effects on the platform's value. In many cases, one side receives services below marginal cost, meaning that they receive a cross-subsidy from the other user side. Having a side that is subsidised also means that there is a side that is paying more to keep the equilibrium, this side is then referred to as the money side. Multi-sided platforms tend to set an asymmetric price structure in which one side pays more than the other [12].

New platforms also struggle with the so called chicken-and-egg problem. Network effects and pricing play a vital role in the growth of a platform. The price will determine if people are willing to use the platform and the network effects will influence the growth. This leaves us with one question: which user side needs to be attracted first to launch the platform? In theory, the platform creates a user side by investing some money in this initial side [13].

d) Other: Whereas network effects and pricing are already quite important, alone they do not lead to success. The platform is dependent on several economic and technological factors that will further determine the success. The value propositions offered to every side of the platform, the ease of use, and the fundamental services of the platform are critical determinants of platform success [14]. Strong platforms emerge early enough to leverage network effects, but they do not need to be first movers. They take advantage of the economics of complementary goods, open the platforms to a wide range of contributors. Further, it has shown that the success of a platform depends on how well it anticipates on current trends and movements in the market. A platform that is flexible and able to adapt will seem to lose less customers [15].

III. FRAMEWORK

In this section, we propose our framework that consists of new and existing templates that allow to identify strengths and weaknesses. The first 3 templates focus on analysing an individual platform where the last one allows to compare different platforms within a single domain. Potentially, this last one can also be used to compare platforms over multiple domains.

A. Multi-Sided Platform template

The first part is called the Multi-Sided Platform (MSP) template. With a simple drawing, see Figure 1, the aim is to determine the interactions between the different user sides and the potential network effects (see II-B0a) on the platform. We focus on relations that impact the value of the platform in a positive or negative way. These take place between different user sides or within a single user side. Multiple same-side or cross-side effects can exist next to each other but as mentioned earlier, their level of impact can be different. In the overall evaluation it is key to make reasonable assumptions on the strength of these network effects. One effect can completely compensate or overrule another effect. The interactions and the intentions of the present user sides allow us to identify another important aspect: the money side, which indicates the user side that contributes most to the economic viability of the platform.

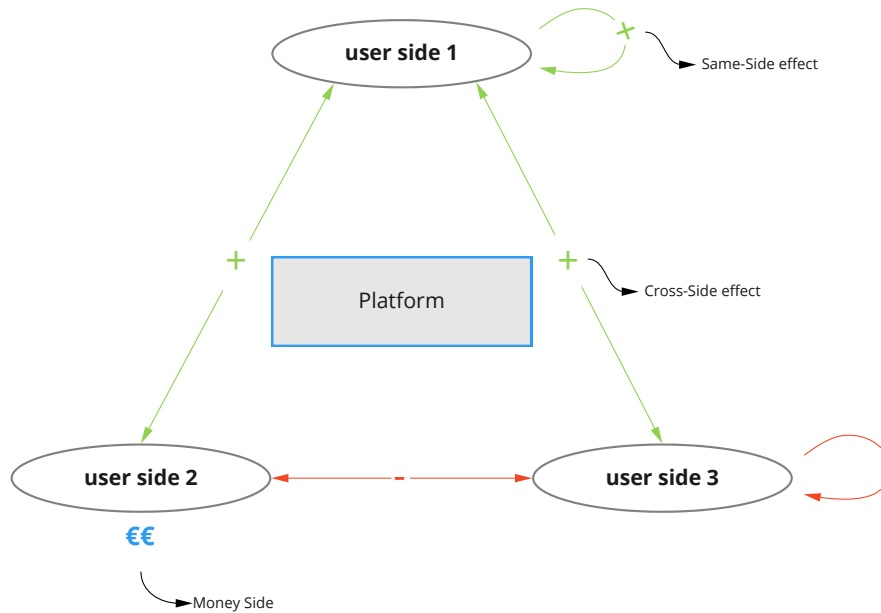


Fig. 1: Overview of the Multi-Sided Platform template. A digital platform has 2 or more user sides that interact with each other. Between user sides, positive or negative cross-side effects can be distinguished and on each user side, same-side effects can be listed. The money side(s) are also indicated as it is important to know who pays for the platform.

B. Technical Platform Setup Template

The second part of our framework is a technical template. The goal of this template is to get an overview of the technical architecture behind the platform to reveal the cost structure. An example can be seen in Figure 2. Modern platforms have a software and hardware component. The design choices made here play a crucial role on the costs and flexibility of the platform. One can opt to invest in own hardware to host the platform and collect the data or to use servers from a third party like Amazon. For each aspect, one should make a well considered choice taking in account the costs (not only the investment but also the development, maintenance and technical issues that might arise), the pros and cons. If for instance, a platform wants to have its own servers, it also needs to make sure that they don't brake down, keep back-ups and anticipate on growth of the platform whereas using a third party as Amazon does this all for you, but possibly for a higher fee or by requesting data sharing. From the point of view of the user sides, the different ways to interact with the platform or each other are listed. A platform that is easily accessible and user friendly will potentially be more successful. Identifying these key elements of the platform will give insights in the cost structure, the strengths and potential threats. For example, if the technical setup is easily scalable or if the user interfaces are adapted to each user side for an optimised experience.

C. Business Model Canvas

The aim is to identify sustainable aspects in the business models that are a key characteristic of success. Therefore, the Osterwalder Business Model Canvas (BMC) forms an important template for analysis as well [16]. The BMC gives insight on many important aspects of a platform design, such as main value proposition, customer segments (linking directly to the user sides of the MSP template) and their relationships to the platform, cost and revenue structure and key activities and partners (e.g. third parties). Figure 3 shows the template with an indication of some interesting elements.

A few components can immediately be filled based on the information gathered in the earlier steps. For instance, the customers segments match the user sides and the key partners should be identified as third parties in the technical template. Based on the general working of the platform and the services it offers, the value propositions can be filled and linked to the corresponding customer segment. The key activities are linked to the value propositions as these can be important to let the platform stand out towards it competitors. To make this relations clear across the canvas, different colours are used. A general colour is used for blocks that have an impact on all parties in the platform. All combined, the costs and revenues should become clear. The BMC template should also reflect if the potential issues, detected in the MSP template, are tackled or are at least somewhat considered. From this canvas, additional threats and pitfalls can be detected.

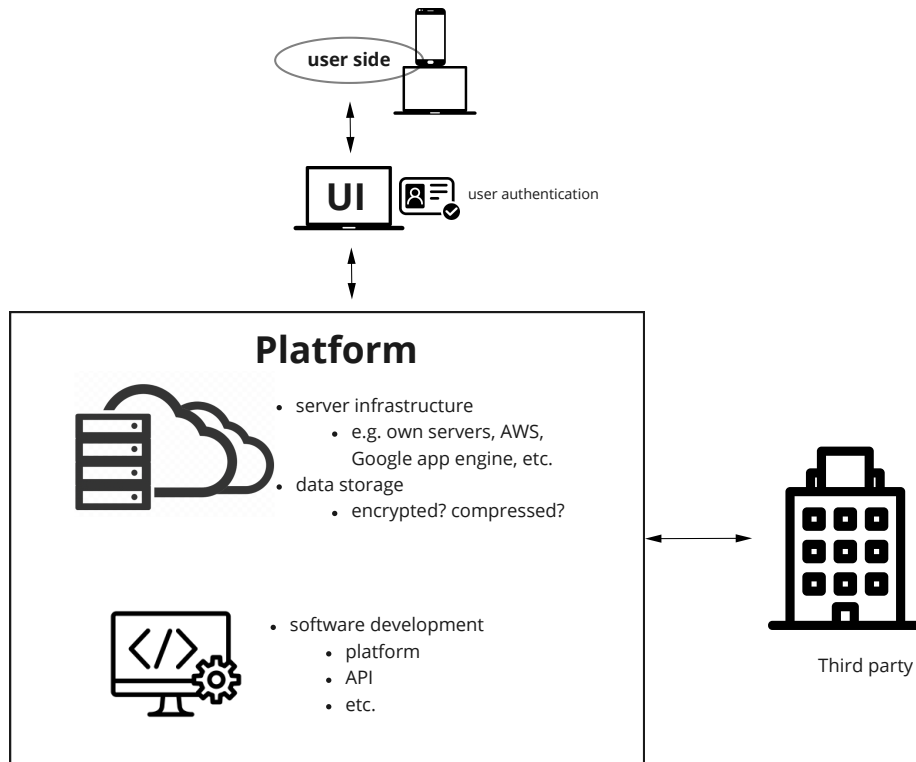


Fig. 2: Overview of the Platform Setup Template. A high level structure of the platform allows to identify different direct and indirect costs. This structure can also help to identify potential issues like scalability or investment risks.

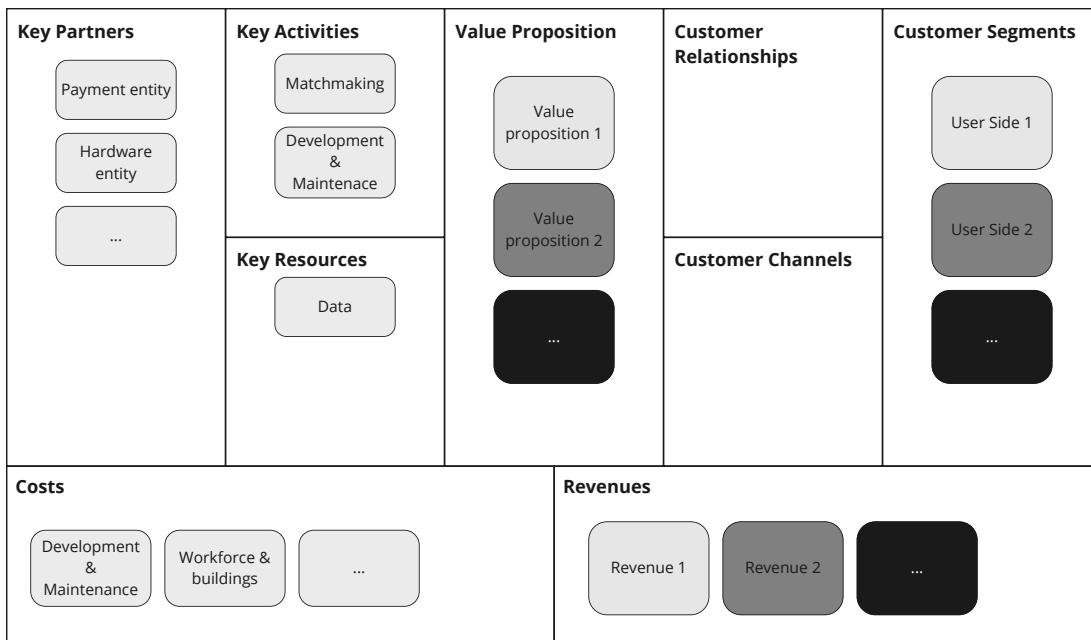


Fig. 3: The highly-used Business Model Canvas (BMC) from Osterwalder. For the previously identified user sides, the value propositions and important customer channels are identified together with the resulting revenue streams. Based on the earlier constructed high-level architecture and general knowledge about the platform the costs and critical tasks from the perspective of the platform can be determined.

D. Comparison Template

Lastly, the different platforms within a single domain should be compared to one another on multiple aspects. Therefore, a last template is added where the platforms can be compared along different axes. The axes have no scale as this would be very hard to explicitly quantify but placing the dots more to the left or right should already allow to distinguish interesting differences. We identified the following aspects that are worth comparing but this list can be extended if needed. These are the type of questions that help us to compare the different kind of platforms and help to find difference that might indicate a platform failure.

- **Multi-Sidedness** - Within a single-sided focus, the platform connects one sector and is completely dependent on same-side effects. In a multi-sided setting, the platform brings 2 or more sectors together. The different platforms need to be arranged based on how many sides they connect, thereby taking into account how representative all sides are (for example, is the role of advertisement overly prominent or just more subtle).
- **Likelihood to be served by a single platform** - This indicates whether this platform is unique with no or limited competition or whether it has a lot of similar competitors. This links to the winner-takes-it-all principle and the multi-homing costs discussed earlier.
- **User access flexibility** – This axis indicates how accessible the platform is, and compares between free and easy registration versus a paid membership and complex registration process. Typically, social media platforms are very easy to access whereas government or banking/payment platforms mostly require a 2-factor authentication. This axis can be linked to the user authentication method identified within the technical overview template.
- **Importance of personal user data** - This axis is used to identify how important personal data is for the existence of the platform: how valuable/necessary is the knowledge of the personal user data to the platform provider? For example, a platform offering personalised content will more strongly rely on user data.
- **Transactional management** - Here, the template indicates how the transactions between two user sides are handled. If transactions are participant-managed, the user sides make their own agreements on the transaction without the involvement of the platform. For example, if one user buys something second-hand, both parties can agree that the payment will happen when the goods are collected and the platform does not intervene. In platform-managed transactions, the platform will receive the money and only release it when the goods are well-received and accepted by the buyer.
- **Trust** - With trust, we mean the reason why users would join a platform. If you join a platform out of personal interest or to be member of a certain community, we refer to personal or community trust. When someone joins the platform because he/she believes in the specific service, and its safety, that person is driven by platform trust.
- **Funding** - Finally, this axis provides an indication of funds generation. A platform is publicly funded if it receives any funds from the government or is subsidised. Money from investors or customers are classified as private. Note that this axis does not relate to the money/subsidy side which is relevant in pricing decisions.

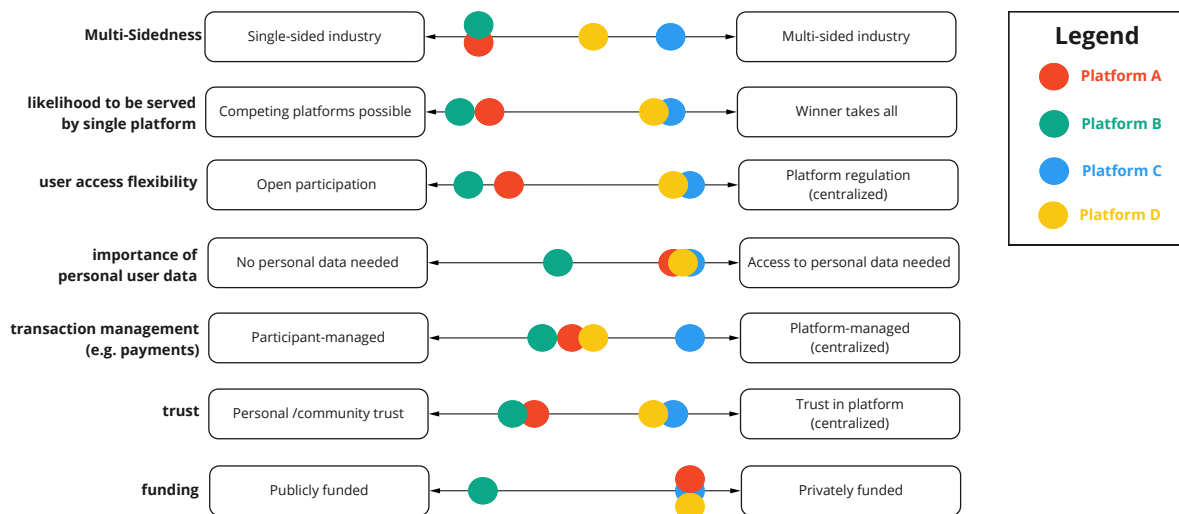


Fig. 4: Overview of Comparison Template.

IV. DOMAINS AND PLATFORMS

To test our framework, 30+ platforms in a broad range of application domains have been studied using the proposed templates. Before the general findings are discussed, the different application domains and platforms are briefly introduced.

A. Online Tutoring

The setup of an online tutoring platform is to match students with specific education needs with skilled educators. This allows the students to learn new skills or to catch up on what they are currently running behind. In an online environment, tutors provide individual or group instructions in a virtual learning environment, which can be a live session or through recorded material. Tutoring can be done one-on-one or in larger groups of students. Following platforms were analysed during our research:

Platform	Description
Bijleshuis	a large tutoring company that operates in Belgium and The Netherlands. It provides online tutoring by screened tutors to help processing learning material, assist in homework or provide study tips. Their goal is to bring students or businesses and tutors together in a qualitative and controlled environment.
Fluotopics	a platform which links tutors to elementary school, high school and college students. Their focus lies on mathematics, statistics, physics, chemistry, and admission exams. The main objective is to make tutoring more affordable and effective.
Het Bijlesbureau	a local tutoring platform that links students of any degree to a professional tutor. Their matchmaking looks for a tutor with the right set of skills following a more personal approach.
Teacheronline	a non-profit tutoring platform that wants to link students of any kind with a tutor. All lessons are done online, solving logistic and planning problems.

B. Online Recruitment

Recruitment refers to the overall process of finding, screening (e.g., through interviews or other tests) and selecting suitable candidates for jobs within an organisation. Besides in-house recruitment, there are also cross-organisational platforms where job seekers can get an overview of available positions, and where headhunters can get an overview of professionals currently on the lookout for a new position. Following platforms were analysed during our research:

Platform	Description
Nestor	an interim office for people over 50 and retirees, specialised in recruitment for companies where motivation and maturity are more important than age.
Nowjobs	a digital platform that connects companies to interim workers, mainly students, in an easy, fast and transparent way. The focus strongly lies on the digitisation of the job market and thereby satisfying the short-term staff shortage in sectors like catering, retail, and events.
Glassdoor	provides insight in jobs and companies by collecting ratings, reviews, and even salary reports in order to increase workplace transparency. All this information is shared with the job seekers before they apply.
ICTjobs	focuses on the IT sector, offering a more narrow descriptions of the different domains within IT in contrast with the bulk of ICT offers on other platforms.

C. Online Shopping

e-Commerce and online shopping provide the opportunity to find whatever you need from the comfort of your couch, and get it delivered to your doorstep within the next day(s). Centralised e-commerce services require a significant investment in software development and operational costs to manage the logistics chain. Therefore, platforms exist that allow smaller shops and businesses to sell their goods to a wide range of customers without expensive investments. Following platforms were analysed during our research:

Platform	Description
Bewustonline.be	a non-profit to support local entrepreneurs by improving the visibility of local online shops. They strive to connect customers to these businesses by promoting these local shops.
Bol.com	a web shop active in Belgium and the Netherlands, offering all kinds of products. They also offer a platform for retailers to sell products through the platform.
Shopify	a multinational e-commerce company that allows anyone with a monthly subscription to set up an online store. It provides different types of products or services to sell online, including physical and digital products, services and consultations, memberships, ticketed experiences, classes, and rentals.
Vinted	an international online peer-to-peer marketplace that enables the purchase, sale and exchange of clothing and home items. The main focus of the company is giving second-hand items a new life.

D. Online Payment

A payment platform allows to ensure a secure transaction of money between the customer and the merchant, especially when a lot of transactions happen online. Different platforms use different kinds of payment, i.e. relying on direct debit transactions, credit card transactions or by using the credit that was pre-loaded on the platform or application. Following platforms were analysed during our research:

Platform	Description
Bonsai	a payment platform that plants a tree for every 10 transaction made via the platform. To gain popularity, there is a loyalty program and collaboration for tickets with third parties are possible.
Payconiq	Payconiq by Bancontact app lets the user pay a merchant or friends by simply generating and scanning QR codes. One simple pin or fingerprint can confirm the transaction.
Alipay	initially a credit guarantee platform. A buyer deposited the charged amount to Alipay and after receiving and accepting the products, the money was forwarded to the merchant. Now, Alipay offers a lot of services such as credit card bills payment, P2P transfer, mobile phone top-up, ticket purchase, food order, vehicle for hire, stocks, and funds investment, insurance selection and so on.
PayPal	one of the common checkout options in online stores nowadays. PayPal attempts to make online purchases safer by providing a form of payment that does not require to disclose credit card or bank account numbers.

E. Meal Delivery

The opportunities created by meal delivery platforms have made the lives of many people a lot easier, and probably saved many restaurants or catering businesses from going bankrupt during the recent pandemic. For many smaller businesses, it is not feasible to develop their own application to allow their customers to order and pay for food, nor do these smaller businesses have the capacity to hire additional staff to take care of the deliveries. Digital meal delivery platforms provide a solution for this, and many initiatives are appearing across the globe. Following platforms were analysed during our research:

Platform	Description
GrabFood	a business unit of Grab, Southeast Asia's largest mobile technology company connecting consumers, drivers and businesses. It offers an app via which you can order food from your favourite restaurant, and it gets delivered hot and fresh.
Deliveroo	a food delivery company, available in a lot of countries. The platform allows to order food and drinks within a certain range of your location. Couriers deliver the freshly prepared meal by bike or scooter.
Share The Meal	a charity platform on which people can make donations to feed the poorest children in the world.
Too Good To Go	a platform that wants to tackle the global food waste problem. This is done by connecting food services, with a food surplus, to consumers. The consumer can purchase the meal with a discount (Delivery not included).

F. Mobility and Traffic Management

The mobility sector is evolving more and more towards a multi-modal travelling, thereby not only including multiple traditional modes of transport in a single trip, but also evolving towards sharing mobility modes. Providing the end users with accurate (live) data is one of the main challenges to make these modes of traffic more popular. A traffic platform can link the different users, mobility providers, local authorities, and data providers. Following platforms were analysed during our research:

Platform	Description
TMaaS	platform bringing together all the options for public transport.
Moovit	platform that allows companies to create their own transportation application. The well known Uber platform is an example of such an app based on the services offered by Moovit.
Reach Now	Mobility-as-a-Service (MaaS) platform, built on a mobile application where multiple means of transportation are integrated: several types of public transport, bikes, and e-scooters together with a cost comparison and trip length for the different options.
Ridecell	an all-inclusive technology that provides the capability to connect people needing a ride with drivers. Ridecell also offers multiple forms of transportation, including short-term car rental, car sharing, ride sharing, fleet operations, or sharing fleets of vehicles.

G. Travel Management

Planning a trip seems very easy as individuals just place a booking at a local travel agent. The local agent, however, needs to arrange everything. Therefore, the tour operators typically rely on local agents, who are in touch with local hotels, special lodges, excursion organisers, etc. Digital B2B solutions exist that connect tour operators to local agents. Apart from that, tour operators sometimes offer fancy traveller apps to their customers bringing together all practical information. Following platforms were analysed during our research:

Platform	Description
Tripadvisor	TripAdvisor brings travellers and providers of hotels, activities, cruises, flights, etc. together. One can book individual arrangements as well as complete holiday packages. The platform has a review system where travellers can rate the different services.
Lato Travel App	The LATO Travel App is a digital travel platform that aims to improve the co-creation travel process between local agents and travel organisers. LATO will allow them to gather all the necessary travel information in one place and get a good overview of the travel quote.
Vamoos	Vamoos is an app for tour operators, it provides all the information the clients will need for their trip. Tour operators can connect to local hotels and villas to create different and personalised offers for their travellers.
Kalina	Kalina Travel is a web-based platform that aims to provide tour operators and corporations with a database of local travel service providers such as hotels, car-rental services, transfer services and also a live flight service, with guaranteed lowest costs available.

H. Community Platforms

A community can be defined as "a group of people living in the same place or having a particular characteristic in common", and people within a community often share a feeling of fellowship with others, as a result of sharing common attitudes, interests, and goals. A community platform builds on these connections between people to stimulate social interaction, and to link citizens, local merchants, and local authorities together. The platform can allow people to share ideas and discuss, to agree on meeting arrangements with like-minded individuals, to advertise about local initiatives and events, etc. Following platforms were analysed during our research:

Platform	Description
Hoplr	Hoplr is a private neighbourhood social network which has two approaches. The first one is focused on citizens: it allows them to get in touch with the local community or neighbourhood to find lost pets, a good plumber, borrowing a ladder, and many more. The second approach is aimed at external parties who can post relevant messages, alerts, and neighbourhood activities on the Hoplr dashboard (without seeing any neighbour's content) to establish neighbourhood communication, neighbourhood inclusion, care, and citizen engagement.
CitizenLab	CitizenLab is a community platform designed to bring cities or towns in contact with their citizens. Their mission consists of two parts: make the voice of the citizens count and make local governments better understand their citizens. The platform helps in consulting citizens for important decisions, increasing transparency in decision-making, and gathering useful insights from its inhabitants.
Hivebrite	Hivebrite is a community platform that helps organisations to build a community. The platform allows clients to easily brand products, customise offers, and engage with their own created community. Hivebrite comes with a lot of built-in features for data management, marketing campaigns, and even recruitment.
Tribe	Tribe is a community platform solution designed for online communities of all sizes and a broad range of targeted audiences. The platform is fully customisable and offers a lot of functionalities.

V. ANALYSIS AND DISCUSSION

The above introduced application domains and corresponding platforms have been analysed using the proposed method and templates. Table I summarises the important findings after analysing the different platforms and domains. We especially focus on the critical points introduced in section II-B, and if these can be identified in the analysed frameworks and application domains.

	+ cross-side effects	- cross-side effects	+ same-side effects	- same side effects	advertisers	scalability	personal data	strong competition	pricing
Online Tutoring	✓			✓ ⁽¹⁾	✓ ⁽²⁾	✓	✓		pay per hour tutoring, platform takes percentage employees freemium
Online Recruitment	✓	✓		✓ ⁽¹⁾	✓	✓ ⁽²⁾	✓	✓	recruiters pay fee per worked hour or to access data
Online Shopping	✓			✓ ⁽¹⁾	✓	✓	✓	✓	fee per order, subscription fee from sellers, fee for promoting article
Online Payment	✓		✓			✓		✓	fee on transaction
Meal Delivery	✓	✓	✓ ⁽³⁾	✓ ⁽¹⁾	✓	✓ ⁽²⁾		✓	commission on each order
Mobility and Traffic Management	✓		✓	✓ ⁽¹⁾		✓ ⁽²⁾	✓	✓	commission on sold products
Travel Management	✓		✓	✓		✓ ⁽²⁾	✓	✓	Travellers free, B2B monthly subscription
Community Platforms	✓		✓			✓	✓	✓ ⁽⁴⁾	members mostly free organiser pays monthly subscription

TABLE I: Overview of the important general findings after analysing the different MSPs over diverse domains.

⁽¹⁾ Occurs when there is internal competition. This competition can lead to higher waiting times or less matches. This will especially occur when there is an imbalance between the provision of one user side and the demand of another user side.

⁽²⁾ From a technical point of view, the platform is perfectly scalable but some steps require human intervention for matchmaking or delivery which can cause a bottleneck.

⁽³⁾ Rating system improves platform trust.

⁽⁴⁾ Multiple platforms exist but they don't come cheap. Local governments can only afford one platform.

Considering the networks effects, the following observations can be seen across multiple domains. Positive cross-side effects are clearly predominantly present in all application domains. Bringing tutors and students, employees and employers, or riders and drivers together always results in a mostly dominant positive cross-side effect. From literature we know that this kind of interactions is important for the growth and success of the platform as each user side will attract more members of the other side. The more interactions between user sides, the more value the platform creates. Therefore, this observation could be expected. The platforms show no dominant negative cross-side effects that are critical for the platforms' existence and growth. There is however one negative cross-side effect that requires special attention, namely the one between the regular platform users and advertisers. In all cases, advertisers experience a growing user base as beneficial where the other user sides might experience too many advertisements as hindering, affecting their experience. Though ads might be a lucrative source of revenues, there seems to be a limit in order to keep the other user sides satisfied. This can especially be seen in the meal delivery and online recruitment domain. Besides promoting restaurants or companies through the regular functions of the platform, explicit advertisements for other products is possible as well.

Another frequently recurring negative effect is seen within a user side due to internal competition or user sides that offer similar goods or services. Each participant wants to optimise the revenue for its products or services offered which is of course dependent on the level of competition within the platform. For example, in the meal delivery sector, similar restaurants need to compete with each other which makes it less attractive for them as this impacts their potential revenue stream. In the case of recruitment, too many employers can make the search for new employees more complicated because the potential employees have a lot more options. Many more can be identified over the different platforms analysed. However, these negative effects only occur when there is an imbalance between members of different user sides. When there is an equilibrium, the needs of both user sides are met. There is enough supply from one side to satisfy the demand of the other side. If for any reason, the platform grows unequally and one side grows significantly more than the other side, an imbalance is reached. For that reason, platform owners must assure that the positive cross-side effects that stimulate the grow are stronger than those potential negative effects, thereby always keeping the platform in equilibrium.

A positive same-side effect is seen when users within a user side can interact with each other, this stimulates the community feeling of this user side. For example, in the online payment domain money transfers between the users from the same side can occur. In the meal delivery domain, a review and rating system of restaurants helps other users within the domain make a choice. A summary of the common network effects can be found in Figure 5. One final remark on network effects is that these are determined from a theoretical point of view. In an ideal world this behaviour is to be expected. However, when launching a platform, the real effects will depend on the status of entered market. The level of competition and the potential presence of a market leader will impact the strength of the predicted effects.

The pricing scheme is the second important factor in the design of a platform. The observed platforms showed that the price for one user side, typically the general customer, is kept as low as possible. In most cases, the usage is even free for this user side. Of course, they still need to pay for the services or products they receive through the platform. All platforms take a commission on these transactions. To keep the costs for the community low, there is a clear trend for many application domains: the introduction of advertisers. The latter are an obvious money side, allowing the platform to subsidise another important user side. This is the asymmetric price structure that we identified as important earlier. Being able to subsidise one or more user side(s) makes it easier to attract more members to this user side which in turn will attract members to another user side. Overall, this helps the platform to exploit the network effects and to solve its chicken-and-egg problem. For example, in the online tutoring domain, tutors are an important user side as without them the tutoring cannot be provided. Therefore, tutors can join and use the platform for free. Students on the other hand will probably be a larger group that really need these services and are willing to pay for this. They are the money side. A part of what they pay the tutor directly goes to the platform.

Looking at different pricing schemes of the observed platforms, it is clear that most platforms get their revenues out of fees per transaction. This means that participants only pay for what they use or achieve. For example, advertisers pay for the number of views and clicks on their ads or employers pay per successfully attracted employee and/or per time their vacancy is clicked, or companies pay a fee per order. This fee is typically a small percentage of the total transaction price. Platforms also collect a lot of user data, often needed for the matchmaking step in the platform. Data is knowledge, knowledge is power and thus it is worth money. Some platforms sell this data to interested companies as additional revenue stream. For example, in the recruitment sector, the collected data can be sold even to other platforms or job offering companies to extend their offer.

The price paid by users of the platform also depends on the costs of the platform itself. The development and maintenance of a platform are frequently recurring costs over all observed domains. Continuous development is important to keep the platform up to date and adapt it to new innovations to keep it interesting. New technologies lead to new opportunities, one riskier than the other. Many platforms seem to reduce the risks by not investing in own server infrastructure but rely on companies such as Google or Amazon. Definitely for new and smaller initiatives this is beneficial, like Teacheronline in the tutoring domain.

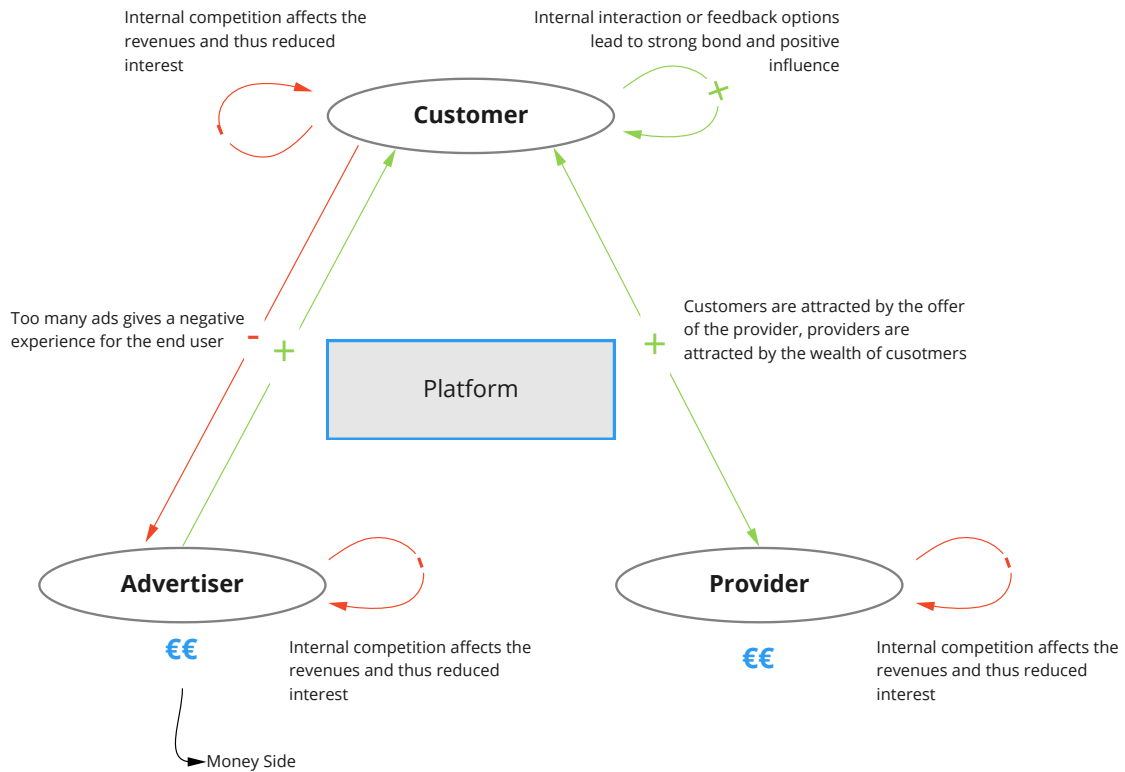


Fig. 5: General look on the common interactions between platforms.

Another advantage is that this drastically reduces the time to market and immediately makes the platform scalable. These third-party companies also offer additional tools, taking away a lot of headaches. The in-house developers can purely focus on the specific functionalities of the platform. Besides spending money on the usual branding, platforms can have additional costs to support their image or create value. For example, in the online payment with Bonsai, they plant a tree per 10 transactions on the platform. In other cases, the platform makes costs to keep a user side on board by for instance, guaranteeing a minimal yield. This for example is seen in meal delivery platforms where the riders of Takeaway have a fixed basis wage independent of the number of orders they deliver, this is in contrast with the approach taken by Deliveroo. In times of lockdown with less orders or unpredictable number of orders, Deliveroo lost riders to Takeaway as they had a better offer in these difficult times.

From the platforms' design choices and strategies, we can learn that most platforms intend to create a large active user base of customers. The platforms are designed to be scalable and easily accessible through simple user interfaces for a broad public. Only in the recruitment domain, there are platforms focusing on a more specific type of users, Nestor for example focuses on people above the age of 50 or ICTjobs focuses specific on programmers. In all other domains, all who wants to use the platform can use it. Throughout our analyses, we did not find any indication of a *winner-takes-it-all* platform. Of course, one platform might be more unique than another, but they all experience some competition. That is where the platforms try to differentiate and offer something extra. A lot of platforms try to solve the same problem, none of them are really identical which is important as differentiation attracts new users. In the online payment domain, there is Payconiq by Bancontact and Bonsai. In general, they allow you to do the exact same thing: pay a friend or in a shop. However, Bonsai, which is more recent, tries to compete by drawing the green image card. Per 10 transactions they plant a tree and there is a loyalty program together with the participating shops to collect some cashback. All this could be reasons for users to join the Bonsai community. If this approach will work for the Bonsai platform is something we will see in the next years. Thinking beyond the domains discussed in this paper, it is hard to find digital platforms that have no competitor at all. There are however some exceptions. This can be seen in the video domain or even the whole world wide web where there exist standardised protocols to simplify the development. Long before the computers, there videos were stored on tape in different formats, meaning that you needed different devices to decode and play the tape. The high costs involved would eventually lead to one dominant player. Therefore,

it is better to define a standard [9]. Another reason that competition is possible is due to the low multi-homing costs: people can easily join and use multiple platforms at the same time. This is visible in every application domain we investigated. In the online shopping domain, it is very easy to create and maintain multiple accounts to order products. Even vendors can be active on multiple platforms at the same time even though the cost is higher for them as all the products must be added to the different shops. This very positive news, as this allows for new innovative platforms to disturb the market and compete with market leaders. One exception here are the community platforms. Although there is competition in this domain, many cities will only use one platform due to a high license price and all the work to keep the data consistent over all platforms. The cities experience a high multi-homing cost where for their citizens, the multi-homing cost is low.

As mentioned earlier, data is becoming more important, not only as revenue stream but also as a basis for the platform to function. Matchmaking platforms in recruitment or tutoring for instance, need a profile to create a match. In online shopping, order history is used for suggestions. The more data that is required, the higher the threshold is for people to register. Although it takes longer to register, you get more quality in return. In the mobility sector for instance, a background check on the drivers is performed, which gives a higher trust and safety feeling. We also see that the introduction of a rating or review system is beneficial for the platform. It gives the users a community feeling but more importantly, more trust in the platform. In the meal delivery domain, it is beneficial to know the experience of other customers if there is some doubt on the quality. Another trend is that platforms take care of the money transfers between user sides, the platform acts as an intermediary. This is a service offered by the platform, making transactions between user sides easier but it also gives the platform control over its revenues. It can immediately subtract its fees and it avoids losses as users cannot go around the platforms to make a cheaper transaction.

After analysing the different platforms, it is clear that the positive cross-side effects are the main driver for the growth of a platform. User sides attract each other and create value for the platform. In cases of an imbalance between the offers from one side and demand on the other side, internal competition arises affecting the experience and potential loss of clients. Overall, the platform keeps the price for one user side as low as possible. The main revenue comes from fees on transactions and advertisements. There is also a clear trend in using services from other companies to reduce the risks and profit from scalable technologies. In this way, the platform can focus on its core business.

When designing or launching a new platform, some general guidelines must be taken into account:

- 1) use customer channels wisely to optimally exploit network effects, for example, use different channels for different user sides and have decent customer support in place,
- 2) make the platform easy to access and easy to use with simple user interfaces,
- 3) try to make the value propositions stand out from competitors, the platform should offer something unique or different from competing platforms,
- 4) pricing scheme should be similar or cheaper compared to direct competitors to attract customers,
- 5) use advertisers to reduce the costs of other user sides but do not overdo it as this can be annoying as well,
- 6) focus on platform' core functionalities and use available third parties to handle the standardised operations.

Although strengths and weaknesses can be identified and taken into account, there are still no guarantees that a platform will be successful. A lot depends on the current market trends and the interest of the broader public to join the new platform. Although there are often low multi-homing costs, the bigger platforms always try to stay ahead of possible innovations to keep their user base intact. The right strategy and moment to enter a market is still unclear and can use some further investigation. What makes that occasionally, a new application succeeds at disturbing the market and gives established values a little panic attack? It is still an open question, but we do already know a few strong points that are definitely required to stand a chance. For the platforms analysed, there are a lot of strong points detected but this did not tell us if the platforms are really profitable in their domain. This is definitely something to explore in the future.

VI. SUMMARY AND CONCLUSION

This paper introduced recurring aspects in the design of multi-sided platforms and the relation to the success of a platform. The role of network effects, the importance of a balanced pricing scheme, the possible benefits of technological solutions, and the influence of the current market are discussed. To identify these strengths and weaknesses in existing platforms, a framework consisting of 4 templates was presented. These templates focus on identifying the different user sides and the related networks effects, costs, and revenues together with the values brought to the user sides by the platforms. With this framework, 32 platforms over 8 different application domains (online tutoring, online recruitment, online shopping, online payment, meal delivery, mobility and traffic management, travel management, and community platforms) were analysed. This showed that positive cross-side effects are omnipresent, stimulating the growth of the user sides. Advertisers play a crucial role

in keeping the prices for the user sides as low as possible and typically one user side is subsidised by another. In all domains, competition is present and all platforms try to differentiate in their offer. Together with low multi-homing costs, this makes that no platform has a real monopoly. The use of third parties offering services as web hosting are very present, reducing the time to market and making the platform scalable whenever needed. At the end, some general guidelines can be defined to consider when launching a new platform. One should use relevant customer channels to reach the targeted user sides to exploit the networks effects, create an easily accessible and usable platforms and try to differentiate the offered value to make the platform more interesting. Competitive pricing schemes and other sources of revenues through advertisers should make the platform affordable.

Although a lot of strengths can be defined, alone they are not enough. The status of the market, technological trends and the moment you enter a market heavily influence the success of a platform. A lot about this exact influence is still unknown. There also exists more applications domains and platforms than we currently analysed. So additional analyses are needed to see if the described observations are also valid in these other domains. Our analyses is primarily qualitative but there is room to make this more quantitative. For example, research on the cost effectiveness of these platforms or the trying to put numbers on the network effects. Further the role of marketing in the launch of a platform should be further investigated.

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