Simple rules in the development of multi-sided platforms

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ABSTRACT:

This paper explores the use of simple rules and combines this concept with the art of building and leading a platform. This paper defines simple rules based on the works by Sull & Eisenhardt (2015). We will identify the four key features of simple rules as well as six different types of simple rules. This paper will explain the main advantages of simple rules and how these can be useful for the development and leadership of multi-sided platforms. We will also explain the concept of business platforms and distinguish between multi-sided platforms as a market and business platforms as a modular technical architecture. We define key characteristics of multi-sided platforms and the market that is built around them. Then we will collect simple rules from a set of papers and reports and sort those that are useful in the development of multi-sided platforms, categorizing them by type of simple rule, type of platform and platform development stage. The ultimate goal of this paper is to explain how simple rules can be selected and used to develop and lead multi-sided platforms. The goal within this paper is to provide a database of simple rules that can be used for this purpose and can be selected by category.

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Keywords

Platform, simple rules, multi-sided platform, platform market, platform development

1. INTRODUCTION

This paper seeks to combine the concept of the multi-sided platform development with the use of simple rules as proposed by Sull and Eisenhardt in their book*, Simple rules: How to thrive in a complex world. (2015*). The goal is to help managers to develop and lead multi-sided platforms more easily and more successfully by collecting and organizing simple rules from various works of literature that can be helpful in different stages of development for different platform types. First, the exact purpose and features of simple rules will be explored in chapter 5 of this paper, but by definition simple rules are: *"Simple rules, as we use the term, refers to a handful of guidelines tailored to the user and the task at hand, which balance concrete guidance with the freedom to exercise judgement."* (Sull & Eisenhardt, 2015, nr. 7) In short, the purpose of these rules can be described as: *"Simple rules are shortcut strategies that save time and effort by focusing our attention and simplifying the way we process information".* (Sull & Eisenhardt, 2015, nr. 5) Second, the term business platform will be described in detail in chapter 6 of this paper, including the various types platforms, their roles and the stages of development that we can identify in existing literature. For now, we will summarize that there are two distinct meanings of the word platform according to Gawer (2014). Platforms can be either a technological architecture build using modular components or an intermediary that connects multiple distinct sides in a market. (Gawer, 2014) The second definition is what we describe as a multi-sided market or multi-sided platform. Third, simple rules will be gathered from a set of 20 papers that deal with various types of business platforms and 13 reports that were made by master students of the University of Twente, who in turn collected simple rules from other works of platform literature. The author will extract simple rules from these papers and reports that can be applied to the development and leadership of business platforms, by studying the papers and comparing their recommendations and results to the definitions of simple rules laid down by Sull and Eisenhardt. (2015) The same work was also performed by a second student, J. Hu, and the final results were combined into one set of rules to minimize the personal biases of either researcher. Both the papers used by the author and the papers used by all 20 different groups of master students are referenced in separate reference lists at the end of the paper. The rules that we extract from the papers will then be tested according to the definition of simple rules and their applicability to platform design or leadership as described in chapter 5 of this paper and rewritten to fit the definition of simple rule or discarded if necessary. Once again this was done by both researchers separately and then combined into one set of data to minimize the chance of errors by a single researcher. Finally, the resulting simple rules were classified using three categories selected by the researchers: Type of simple rule, Type of platform (that the rule applies to) and Stage of platform development (that the rule applies to). This categorization will allow the builder of a multi-sided platform to identify what rules are relevant to the exact situation of their platform and select those rules that will help them conquer the issues faced by their platform specifically.

2. PROBLEM STATEMENT

Building a business platform might prove to be a challenging process. Platforms face many different challenges throughout their various stages of development and sometimes occupy a highly dynamic position in their market. As such a manager will have to make a lot of extremely complicated strategic decisions in a short amount of time, while needing to process a lot of possibly imperative information. (Kim & Yoo, 2019) In order to simplify these complicated decisions, we propose the use of simple rules, which can help the user make quick, but effective decisions and help the user process large amounts of information. (Sull & Eisenhardt, 2015). Finding the right simple rule for the right situation however can be time-consuming, since no comprehensive list of simple rules that are useful for platform development can be found. One additional challenge is that, by their very definition, simple rules must be specific to a predefined situation to be effective. (Sull & Eisenhardt, 2015) The simple rules must therefore be matched to the specific circumstances of a platform throughout its development in order to be effective.

3. GOAL

In the introduction, this paper summarized the phenomenon of both simple rules and multi-sided platforms, which will be further explained in the next chapters. As described in the problem statement above, we know that building and leading a platform can be a difficult process, that requires the manager of such a platform to make quick decisions and to process a lot of information. (Kim & Yoo, 2019) We also know that the use of simple rules might help the manager do this more effectively. (Sull & Eisenhardt, 2015). However, literature combining the two concepts in a practical way could not be found by the researcher. Therefore, we want to understand what simple rules are available in current literature on business platforms and how we can apply these rules to the development and leadership of multi-sided platforms. This paper answers this question by defining key characteristics of simple rules and multi-sided platforms and collecting simple rules from existing literature that are applicable to multi-sided platforms. The goal of this study is to help multi-sided platform managers to create and lead their platforms better by supplying the correct simple rules for their situation. The goal within this study is to identify the simple rules found in assigned literature and classify them by platform type, stage of development and type of simple rule to provide a collection of simple rules that allows the user to sort and select effective rules based on the current situation of their platform.

4. RESEARCH QUESTION

What are simple rules and multi-sided platforms and what simple rules from existing literature can help in the development and leadership of multi-sided platforms?

4.1 Sub questions

1. What are simple rules?
    - 1.1 What are the key characteristics of simple rules?
    - 1.2 What is the purpose of simple rules?
    - 1.3 What types of simple rules can be distinguished?
    - 1.4 How can simple rules be made?
    - 1.5 How can we summarize simple rules?
    - 1.6 What simple rule are useful for platforms?
2. What are business platforms?
    - 2.1 What is a multi-sided platform?
    - 2.2 What is the difference between one-sided, two-sided and multi-sided platforms?
    - 2.3 How does the market around platforms work?
    - 2.4 What stages of platform development can be identified?
    - 2.5 What roles do platforms fulfil?
3. What simple rules can be detected in the business platforming literature?

3.1 What literature has been assigned to the authors?

3.2 What simple rules can be identified from this literature?

3.3 What methods are used to classify the identified simple rules?

4. What simple rules from existing literature can help in the development and leadership of multi-sided platforms?

5. SIMPLE RULES

5.1 Key characteristics of simple rules

Simple rules are everywhere: they are part of our own lives without us knowing, they are part of the laws of nature without being written and they are used every day without conscious thought. But despite this omnipresence and a wide variety of examples, simple rules all share a set of common features that make them what they are. In order to describe simple rules we will first go back to the description found in the introduction: *"Simple rules, as we use the term, refers to a handful of guidelines tailored to the user and the task at hand, which balance concrete guidance with the freedom to exercise judgement."* (Sull & Eisenhardt, 2015, nr. 7) From this description Sull & Eisenhardt (2015) define four features that are present in this definition of simple rules:

Simple rules should be limited to a handful.
Simple rules should be tailored to the user.
Simple rules should be tailored to one activity.
Simple rules need to offer concrete guidance but should allow for interpretation.

We can find these features again in this list of simple rules that was used to guide U.S. Forest Service firemen in dealing with out-of-control fires (Sull & Eisenhardt, 2015, nr. 77):

1. Start an escape fire in the path of the advancing fire if possible.
2. Go to where the fuel is thinner.
3. Turn toward the fire and try to work through it.
4. Don't let the fire choose the spot where it hits you.

The reasons for choosing these four features is to form specific and short rules, so they are easy remember and communicate, allowing them to be applied uniformly by multiple users It is for this same reason that only a limited handful of simple rules can be used at a time. If too many rules exist at once, they are unlikely to all be remembered by the user and can therefore no longer be applied as easily. Of course, every user is different in his ability to remember and apply these rules. Therefore, there is no fixed number that simple rules are limited to. Instead every user is meant to decide for himself what constitutes a "handful" and how many simple rules can effectively be used at the same time. Because simple rules are meant to help the user accomplish their most important goals as efficiently as possible, they will need to offer concrete guidance to the user, allowing him to actually address the issue in an effective way. On the other hand, because situations might differ slightly, the simple rules also need to be open for interpretation to allow for a certain amount of flexibility. Finally, in order to be concrete and effective in addressing the bottleneck, simple rules need to be tailored to the user and his specific activity. This prevents them from becoming too vague or generic and losing their ability to offer concrete guidance.

5.2 Purpose of simple rules

Eisenhardt (2015) defines the purpose of simple rules as: *"Simple rules are shortcut strategies that save time and effort by focusing our attention and simplifying the way we process information".* Simple rules have three main benefits (Sull & Eisenhardt, 2015):

Simple rules produce better decisions (nr. 32): "*Simple rules work because they focus on key aspects of a decision while ignoring peripheral considerations."* (Sull & Eisenhardt, 2015, nr. 32) Simple rules simplify decision-making processes by focusing the user's attention on factors that are relevant to the decision and removing those that are not. This allows the user to make effective decisions when operating with limited information or within limited time frames, and minimizes the effort that is required compared to more complicated approaches.

Simple rules promote collective behaviour(nr.38)**:** Simple rules are easy to remember, apply and communicate for members of a group because of their simplicity. This means that entire organizations can apply uniformity in their decision-making process, without constant top-down leadership, resulting in synchronized activities at all levels of the organization.

Simple rules help seize opportunities: Simple rules are flexible enough to adapt to different situations but still provide useful guidance, allowing the organization to pursue opportunities in a consistent manner without the need for slower, more elaborate decision-making processes.

5.3 Types of simple rules

Sull & Eisenhardt (2015) propose six types of simple rules.

Boundary rules: Boundary rules help the user determine what choice to make when presented with several competing alternatives. Boundary rules aid in the process of choosing, by providing simple characteristics that allow the user to easily identify good alternatives, and eliminate bad ones, in situations where time or information is limited. For example, one study in Newfoundland, Canada found that burglars often used a single rule to find suitable houses to break into: "Avoid houses with a car outside". (Sull & Eisenhardt, 2015, nr.51) Another example would be DARPA in the U.S.A., which would only fund projects that both "Further the quest for fundamental scientific understanding" and "Have practical application". (Sull & Eisenhardt, 2015, nr. 52)

Stopping rules: Stopping rules describe when to stop with an action, project, product or collaboration by identifying key characteristics that indicate that the venture will likely fail and translating these into simple metrics that have to be met for the venture to continue. One example of a stopping rule could be "If a partner does not use our product for three months, terminate the relationship". They differ from boundary rules by determining which project to stop, rather than which project to start.

Prioritizing rules: Prioritizing rules are used to rank alternatives to determine which option should be pursued first and which should be pursued later. Prioritizing rules allow a company to prioritize their actions according to importance and possible benefits by providing simple criteria. Examples of prioritizing rules were used by the Brazilian railway company, America Latina Logistica. Their rules to determine which projects had the priority for investment were: 1. The project has to remove a bottleneck to growing revenues, 2. The project has to provide immediate benefits, 3. The project has to minimize up-front expenditures and 4. The project has to reuse existing resources.(Sull & Eisenhardt, 2015, nr. 58-59) The difference with boundary rules is that prioritization rules are used to rank when to pursue opportunities rather than choose which opportunities to pursue.

How-to rules: How-to rules give short and clear guidelines to the user in the form specific actions that the user has to do. They are meant to help achieve a specific goal. Their main advantage is that they give the user clear guidance without needing a long or detailed explanation and while remaining adaptable. This allows the user to react to both predicted and unforeseen situations in a timely and organized manner. The rules used by the Forest Service firemen mentioned before are examples of How-to rules.

Timing rules: Timing rules describe when the optimal time is to

act. Timing rules describe what the exact moments in time are to start with specific actions, to ensure that the timeline of a project is optimized, and actions are strictly taken when most advantageous. An example mentioned is the film studio Pixar which formulated the simple rules "Release one movie per year" and "Release this movie at Thanksgiving" (Sull & Eisenhard, 2015, nr. 91).

Coordination rules: Coordination rules describe how one actor should behave within an organization of multiple actors, without needing to interact with each other directly. This allows the various individual actors to coordinate their actions and act in a collective manner without the need for constant leadership. A very famous example of a coordination rule is when Napoleon, according to legend, told his men to "march toward the sound of gunfire" (Sull & Eisenhard, 2015, nr. 87), allowing his lower officers to act in a coordinated manner without being able to communicate with each other.

5.4 How to make simple rules

When crafting simple rules, Sull and Eisenhardt (2015), give three simple steps:

Determine what will move the needles.
Find out the bottleneck.
Craft simple rules.

The goal of these steps is to produce simple rules that are actually useful for their intended purpose rather than just mindlessly developed writing. The first two steps have less to do with exactly what simple rules to use, and more about where the simple rules should be used. For a simple rule to be effective it needs to make an actual difference in the results for the user. The first step, move the needles, means identifying what goals the user wants to achieve and where simple rules can actually provide a meaningful improvement towards these goals. Of course, this step is completely different for every user, but it means that a simple rule should only be used when they can help gain a significant improvement to the current situation. The second step, find out the bottleneck, determines where the issues are that multiple rules are actually meant to address. In the end simple rules are meant to address a single problem that is holding back the user from improving his results, so identifying that problem is and where it is caused are crucial in designing a simple rule. Finally, the third step is actually crafting the simple rule. A simple rule can be about nearly any subject and there is a very wide variety of simple rules in almost every part of society. Some can be built on purpose, some are developed instinctively, but all should follow the three characteristics of simple rules stated above. When attempting to craft simple rules, there are several sources that the user can draw knowledge from to develop simple rules including natural selection, personal experience, scientific evidence, experience of others and negotiation with others.

5.5 Summary of Simple rules

In summary, simple rules can be about nearly anything. They exist within the laws of nature all the way to the protocols of business enterprises. They are meant to provide a short-cut in our approach to certain complex problems, with very simple solutions. Despite their wide variety simple rules share 4 basic characteristics:

Simple rules are simple
Simple rules are unique to the subject.
Simple rules are specific to the situation
Simple rules relate to specific predefined activities

On top of this, many common features can be found as stated in the previous sections. Simple rules can be very basic and personal such as: Always eat breakfast. They can also be used for an entire organization: Never work with a partner that does not have 3D printing technology. While simple rules do not always give the single best approach in every situation, their value lies in their ability to address complex problems with simple solutions. Simple rules are easy to remember, easy to communicate and easy to apply, giving an entire organization a quick and uniform solution to specific activities, with enough leeway to allow for individual interpretation, making them a very powerful tool indeed.

5.6 Simple rules useful for platforms

In order to determine which rules are suitable for platform development, the author came up with two criteria that have to be met by a simple rule to be considered useful in developing a platform in addition to the requirements laid down by Sull & Eisenhardt (2015) that were described in the previous sections. These criteria were designed to ensure that any simple rule could be readily used for platform development or leadership by the reader of this paper.

1. The simple rule should be specifically about the subject of business platforms.
2. The simple rule needs to be understandable without reading the associated paper(s).

The purpose of these criteria is to ensure that the rules found by the author did not just fit the definition of simple rules as formulated by Sull and Eisenhardt (2015), but also remained simple and usable when applied to a platform by a new user who was not the original developer of the rule. This means of course that rules that are designed for a subject other than business platforms are not suitable for our purpose of designing or leading a platform. Even if they might be useful for other business types, they are not considered usable for this paper. Also, if the future user needs to read an entire paper to understand a rule, it can no longer be considered simple to the new user, even if it was for the designer. We decided that the inherent complexity and time required to read a piece of business literature and understand the simple rule defeats the purpose of the simple rule in the first place. By definition simple rules need to be easy to understand, remember, communicate and apply, otherwise they lose their basic utility.

6. BUSINESS PLATFORM

To explain what a business platform is, we should first explain that the term platform has been used to describe multiple phenomena in business literature. According to Gawer (2014) there are two main streams of literature that feature the term platform in a business context. One stream characterizes the platform as a multi-sided platform or multi-sided market that acts as an intermediary for the purposes of transaction (Abdelkafi et all, 2019, Baldwin & Woodard, 2009, Rochet & Tirole, 2003) or innovation. (Kim & Yoo, 2019, Doganova & Eyquem-Renault, 2009). This type of platform will be explained in a separate section below. The other stream examines the term from an engineering perspective, defining the term platform as a technological architecture that creates a family of products through the systematic re-use of components that are shared among multiple products, also called modular components. This allows for economies of scope in the development and production of new or existing products. (Gawer, 2014; Gawer & Cusamo 2014, Baldwin & Woodard, 2009) The re-usability of discrete existing components also means that technological platforms are often used to foster innovation by providing a stable core of pre-existing technological systems around which to develop the new products. (Boudreau, 2010, Gawer & Cusamo, 2014, Kim & Yoo, 2019.) From an engineering perspective, platforms can be internal or external: Internal platforms are generally used by a single firm to create a family of products sharing modular components with each other for

greater efficiency and decreased costs. (Gawer & Cusamo, 2014; Gawer, 2014, Baldwin & Woodard, 2009) External or Industry platforms on the other hand are open to other firms, allowing them to create complementary new products based on the technology shared by the platform owner. (Gawer &Cusamo, 2014; Boudreau, 2010; Gawer, 2011) Supply chain platforms are a somewhat unique case where a technological platform is shared by one set of multiple firms but still closed from use by external parties, as such it is characterized as a subtype of internal platform. (Gawer, 2014)

6.1 Multi-sided platforms

In its most basic definition, multi-sided platform is a business model where companies act as intermediaries by enabling a connection between two or more sides who could otherwise not connect. (Damsgaard & Staykova, 2015; Gawer, 2014). These platforms connect multiple independent groups for direct interaction supported by various rules and functionalities that make the interactions easier or more efficient. (Hagiu & Wright, 2015) Multi-sided platforms have often been referred to as a form of market or a multi-sided market given that one of their main functions is to mediate transactions between different sides or groups of users. (Baldwin and Woodward, 2019; Gawer, 2014; Rochet and Tirole, 2003) One other common function is to foster innovation by connecting the supply and demand side of innovative products with each other to allow the exchange of information or technology. (Kim & Yoo, 2019, Doganova & Eyquem-Renault, 2009). This allows businesses to "open" their development process to other parties and combine their knowledge to increase innovation. Or as Kim and Yoo (2019) state: *"If the focus on R&D activities inside a company was "closed innovation", and outsourcing is shifting capabilities in one direction, open innovation will allow technology or ideas to cross the boundaries of the company and lead to innovation"* (Kim & Yoo, 2019, nr. 2) However, as we will explain later, there are many more multi-sided platforms that fulfil. According to Hagiu & Wright (2015) multi-sided platforms all share two features: They enable direct interactions between two or more distinct sides and each side is affiliated with the platform. Direct interaction means that the users on two or more distinct sides retain control over the key terms of the interaction, as opposed to the intermediary taking control of those terms. Affiliation means that the users on each side make platform-specific investments that are necessary in order for them to directly interact with each other. Examples of platform affiliation are a fixed access fee to participate on the platform, expenditure of resources to build the platform or opportunity costs that arise when using the platform. (Hagiu & Wright, 2015) One other defining feature of multi-sided platforms according to other authors is the presence of network effects. (Abdelkafi, Raasch, Roth & Srinivasan, 2019; Armstrong 2006; Rochet & Tirole, 2003) Network effects occur when one user of the platform derives benefit from a greater number of users of that platform. Network effects can take two forms, indirect network effects and direct network effects, and these effects grow as the number of users on the platform grows. (Abdelkafi et all, 2019; Armstrong, 2016; Gawer, 2014) Direct or same-side network effects happen when the value of a platform increases for the user as more users join the platform on the same side, i.e. a communication platform allowing one user to interact with more other users. (Gawer, 2014; Rochet & Tirole, 2003) Indirect or cross-network effects happen when the platform's value increases by increasing the number of users of a different group the platform, i.e. the number of customers on the platform increases it value to possible sellers or advertisers. (Gawer, 2014; Hagiu & Wright, 2015) It should be noted that while indirect network effects are often considered a defining feature of multi-sided platforms, they actually share this feature with external (industry) platforms as noted by Gawer (2011) and Gawer and Cusamo (2014)

6.2 One-sided, two-sided and multi-sided platforms

According to Damsgaard and Staykova (2015), one-sided platforms facilitate the connection between the users who form one distinctive group of consumers on the platform, only exhibit same-side network effects and have interchangeable roles. They provide examples of one-sided platforms with the earlier versions of Facebook and Pingit, which purely connected a group of users with each other without demanding any value from these sides. This created the situation where the platform was only subsidizing its users and not generating revenue. However, after attracting a sufficient number of users, it was possible for both one-sided platforms to change into two-sided or multi-sided platforms by adding other groups of users that derive value from a connection to the existing user base. As such the goal of a one-sided platform is not to generate value, but to attract large numbers of users by offering free services and then adding a different side, turning into a two-sided platform that can actually propose a viable business model. This means that one-sided platforms are more of a temporary occurrence than a truly viable business model in its own right. (Damsgaard & Staykova, 2015; Daxhammer, Luckert, Doerr & Bauernhansl, 2019) A two-sided platform is created when there are (predictably) two sides on the platform, a subsidy side and a revenue side. In this case, the platform provider will principally generate value from the revenue side, which it will attract with a large installed base on the subsidy side. This happens for example when social media platforms start to add advertisers to their platform to collect add revenue and in return provide them with access to their user base. (Damsgaard & Staykova, 2015; Daxhammer et al, 2019) Finally a multi-sided platform has (once again predictably), multiple sides, but where on a two-sided platform the platform only generates revenue from a single side, now it is possible to have multiple revenue sides that do not directly interact. (Damsgaard & Staykova, 2015) As such, the difference between one-sided, two-sided and multi-sided platforms is not just how many sides they have, but also from which sides they generate their revenue and whether these sides are directly connected or not.

6.3 Platform markets

As we explained before, when the customer base of a multi-sided platform increases, so do its network effects, allowing the largest platform to become ever more successful. This feature of network effects is often considered the defining feature of platform markets. (Abdelkafi et al, 2019, Gawer, 2014) According to Zhu and Lansiti (2012), indirect network effects in particular are characteristic of platform-based markets and sometimes the strong presence of these effects can prevent a new entrant in the market from gaining and retaining market share compared to the incumbent platform. Abdelkafi, Tangour and Vienken (2019) also call indirect network effects one of the two main characteristics of platform markets, alongside asymmetric pricing structures, where platforms apply different pricing structures to different user groups, partly with the goal of increasing indirect network effects even more. This dominance of larger platforms from large scale network effects means that it is common for platform markets to feature "Winner take all" approach, allowing one or a few platforms to monopolize a layer of the market, while making the entrance of competitors very hard. (Eisenmann, Parker & Van Alstyne, 2011; Gawer, 2014) These dominant platforms often have the ability to steer the direction of their entire business ecosystem and erect barriers to prevent new entrants into the market. This ability to control an ecosystem has led to the term "platform leader" being used to

describe dominant platforms in their respective business system. (Gawer, 2011) On the other hand, Anderson Jr. et al (2014) postulate that while some markets are indeed dominated by monopoly platforms, others are divided into duopolies, with two or more platforms competing in the same market. These are then divided into price setting and price taking duopoly platforms. Price setting duopolies allow competing platform sponsors to determine their own prices, while price taking duopolies work with a fixed platform price, leaving platform performance as the sole metric for capturing platform demand. According to Eisenmann, Parker & Van Alstyne (2011) platform markets usually feature only one or a few dominant platforms at their core, dividing the rest into three categories:
Weak substitutes, These platforms provide a service or product that, while functionally similar with the dominant platform, do not directly compete because they serve different needs.
Complements: Businesses that provide parts to the dominant platform that are not part of its technological architecture, but instead have a high variety and low reusability. There can be a wide variety of complements for each platform. (Baldwin & Woodard, 2009)
Unrelated Platforms; These lack any functional overlap with the dominant platform but may use part of the same components.
Baldwin & Woodard (2009) go on to suggest a hub and spoke model which can be used, where the core is formed by a single platform surrounded by complements (or complementors) that have various relations to the core platform. They do suggest that this model becomes inadequate once complementors start forming their own alliances and relations because these are harder to depict in such a model. Baldwin & Woodard (2009) as well as Eisenmann, Parker and Van Alstyne (2011) also support the idea of a layered market, where most platforms are simultaneously platform providers and a component supplier to another platform, creating a series of layers of platforms that interconnect as supply side users and component suppliers. Each layer will be dominated by one or a few platforms. Baldwin and Woordard (2009) do criticize that this model tends to generalize platforms with comparable but distinct products into one single layer.

6.4 Platform development stages

For classifying multi-sided platforms based on stage of development, we propose the classification used in the paper "Platform growth model: The four stages of growth model" (2019) by J. Kim and J. Yoo. This research is a multiple case study, studying 21 different companies using 30 interviewees, focus groups and over 90 sources of previous literature on multi-sided platforms. The authors of this paper suggest that multi-sided platforms are not consistent entities that simply exist within a market, but instead develop over time through four discrete stages. Their goal is to study these discrete stages and the main challenges the platforms face within them. The four stages of platform development are defined as:
Entry: To start a successful platform, the creator needs to find the right market and service to start their business with. The main challenges at this stage are choosing a service that the platform can successfully provide and gaining entry into market that the platform can successfully compete in.
Growth: Once the platform has entered that market it will need to grow into a viable business. To become a viable business the platform must create a two-sided market by subsidizing the right side and collecting a user base that is large enough to attract a second side. The platform can then gain revenue by charging the second side for access to its user base.
Expansion: In order to survive in the platform market, a multi-sided platform needs to gain a stable position, with a user base that is large enough to prevent the collapse of the platform, this is called critical mass. The platform will need to reach critical mass by encouraging network effects to help its installed base grow.
Maturity: Once the platform has entered the market and gained a stable position, the focus shifts to maintaining this position. At this stage the platform secures its place in the market by managing quality and revenue structure.

6.5 Platform roles

Evans (2003) describes the roles platform of as occurring in three main functions:
Market-makers connect multiple distinct groups so they can have transactions with each other and enables these transactions through digital or physical means. Examples include traditional exchanges and online marketplaces, but also dating services.
Audience-Makers include advertising supported media and online portals that connect advertisers with audiences and derive their money from this process. According to Goettler (1999), as cited by Evans (2003), these services will be valued more by their audience if they provide more useful information.
Demand coordinators are the final category, which essentially includes all other multi-sided platforms. These sell goods or services across multiple groups to generate indirect network effects. Examples include platforms selling software or payment systems.
Evans, Hagiu & Schmalensee (2005) expands to concept to four types:
Matchmakers are broadly similar to the previous market makers, connecting different groups that seek a partner for a transaction.
Audience-makers are still present and still have the same role. The previous demand-coordinators have now been broken up into Transaction-based businesses and Shared-input platforms.
Transaction-based businesses generate value from facilitating transactions between multiple parties, like the payment systems mentioned before or credit cards.
Shared-input platforms seek to match groups and resources on one side to achieve a common goal and create value for at least one other side. Examples include the previously mentioned software developers but also hardware developments.
Later Evans & Schmalensee (2007) simplify and further expand the four-type approach to a clearer and better-defined typology, dividing platforms into: Exchanges, Advertiser-supported media, transaction systems and software platforms.
Exchanges are once again similar to market-makers and matchmakers described previously. They describe any platform that matches different groups for the goal of conducting a transaction, charging one or both sides. Usually the sides consist of a buyer and a seller, but the terms are used very loosely, so dating services, publishers and even travel services are included in this category.
Advertiser-supported media are the theoretical successor of audience-makers and allow advertisers to reach a wide audience, while the audience is attracted with content created or purchased by the platform. Usually only the advertising side is charged, but it is possible to charge both sides.
Transaction systems provide payment systems that help facilitate transactions more easily and securely for both seller and buyer sides of the market. The main example in this case is the various credit card services that currently exist, creating value by leveraging transaction fees from one or both sides of the transaction. Cash money is technically also a transaction system, although one that does not seek to generate profit.
Software-platforms are the last platform defined and operate services for the development of online applications and selling them to users that need to operate on the same platform. In general, developers get free access to software platforms, while

revenue is obtained from the users of the application. The biggest exception to this is video game console manufacturers, who license their software to developers while attracting console users with relatively low prices.
For use in our classification of multi-sided platforms into distinct categories, we based our categories on the last paper, Evans & Schmalensee, (2007), which is not only the final evolution in the platform typology developed by Evans, but also provides the least abstract and most extensive description of all platform types, while establishing clear borders between the different categories. It is also worth noting that Rochet & Tirole (2003) divided platforms by product, leading to an ecosystem where platforms fall into four distinct types very similar to the previous typologies: Software development platforms**, Portals and Media platforms, Payment systems** and **Other roles**, mostly supporting online marketplaces.

7. SIMPLE RULES IN PLATFORMING LITERATURE

The goal of this study is to help multi-sided platform managers to create and lead their platforms better by supplying the correct simple rules for their situation. The goal within this study is to identify the simple rules found in assigned literature and classify them by platform type, stage of development and type of simple rule to provide a collection of simple rules that allows the user to sort and select effective rules based on the current situation of their platform. The author will collect simple rules available in existing literature on business platforms and define how these can be applied to the development and leadership of multi-sided platforms in a practical way, based on the key characteristics of simple rules and multi-sided platforms that were identified from literature.

7.1 Business platforming literature

With the exact purpose and features of simple rules described and multi-sided platform defined, the simple rules itself have been gathered from a set of 20 papers that deal with various types of business platforms and 13 reports that were made by master students of the University of Twente, who in turn collected simple rules from other works of platform literature. Note that since some groups of master students worked together in analysing platform literature, it is possible for some rules to be listed twice. Both the papers used by the author and the papers used by all different groups of master students can be found in the attached list of references. The 20 papers were written by various authors who have conducted research on various aspects of platform theory, leadership and development ranging from case studies to theoretical models and include rather notable authors such as Cusamo, Evans and Gawer, who form a large part of the references in this paper as well. In addition, simple rules were gathered from 13 reports made by master students of the University of Twente. The reports were generated by the master students using the same method as the author. They compiled and read various other papers on the topic of business platforms and gathered lists of simple rules based on the definitions of Sull & Eisenhardt (2015)

7.2 Identifying simple rules from business platforming literature

First, the characteristics and benefits of simple rules have been identified. The key characteristics of simple rules, according to Sull and Eisenhardt (2015), are that simple rules are limited to a handful, should be tailored to the user, should be tailored to one activity and need to offer concrete guidance but also allow for interpretation. They can be summarized as *"Simple rules, as we use the term, refers to a handful of guidelines tailored to the user and the task at hand, which balance concrete guidance with the freedom to exercise judgement."* (Sull & Eisenhardt, 2015, nr. 7)
The benefits of simple rules, according to Sull and Eisenhardt (2015), are that these produce better decisions with limited time or information, promote collective behaviour without the need for direct communication and help seize opportunities in a structured manner. In short simple rules are flexible enough to adapt to different situations but still provide useful guidance, allowing the individual or the organization to make decisions in a consistent manner without the need for slower more elaborate decision-making processes. The author has extracted rules from these papers that can be applied to the development and leadership of business platforms by studying the papers and comparing their recommendations to the definition of simple rules laid down by Sull and Eisenhardt (2015). Collecting simple rules was done separately by both the author of this paper and another researcher, J. Hu, and the resulting lists of rules were then discussed and combined into one set of data preserve the quality of our interpretation of the rules and remove personal bias. The rules collected were discarded if they did not qualify as simple rules and rewritten if they qualified as simple rules albeit they did not contain the proper wording.

7.3 Classification methods of extracted simple rules

The concept business platform, including the various types and roles of platforms, has been explored based on existing literature describing the theoretical concepts and practical implications of platform businesses. There are two schools of thought describing this concept according to Gawer (2014). One has been described as a multi-sided platform or multi-sided market that acts as an intermediary for the purpose of transaction or innovation. The other definition comes from an engineering perspective, describing the term platform as a technological architecture that creates a family of products through the systematic re-use of components that are shared among multiple products making them modular. For this paper, this definition of multi-sided platform is used, basically described as a business model where companies act as intermediaries by enabling a connection between two or more sides who could otherwise not connect, generating revenues from multiple sides, hence the term multi-sided. During this research multi-sided platform have been divided into four categories as described by Evan and Schmalensee (2005); exchange platforms, advertiser supported media platforms, transaction systems platforms and software platforms. We also divided multi-sided platforms into four development stages according to Kim & Yoo (2019): Entry, growth, expansion and maturity. For the classification of the simple rules by type, the author has used the six types identified by Sull and Eisenhardt (2015); boundary rules, how-to rules, timing rules, stopping rules, prioritizing rules and coordination rules. In order to determine which rules were suitable for platform development, the author devised two criteria that had to be met by a simple rule to be considered useful in developing a platform, in addition to the requirements laid down by Sull and Eisenhardt (2015), namely that the simple rule should be specifically about the subject of business platforms and that the simple rule needed to be understandable without reading the associated paper(s). Once again, the remaining simple rules were discarded or rewritten by both researchers separately based on the above criteria and then discussed and combined into one set of data to maximize the quality of the interpretations and remove personal bias. A table of the agreed upon simple rules collected by the author(s) can be found in appendix 2 and a table of the agreed upon simple rules collected by the master students can be found in appendix 3. The resulting simple rules were categorized according to three sets of distinguishing features identified by the researchers from the literature: Type of simple rule, Type of

platform (that the rule applies to) and Stage of platform development (that the rule applies to). The types of simple rules used were proposed by Sull and Eisenhardt (2015), namely boundary rules, how-to rules, timing rules, stopping rules, prioritizing rules and coordination rules. The types of platforms distinguished between by the author, exchange platforms, advertiser supported media platforms, transaction systems platforms and software platforms, were based on Evans and Schmalensee (2007) which builds on Evans (2003) and Evans, Hagiu and Schmalensee (2005). The platform development stages were distinguished based on the classification by Kim and Yoo (2019). The four stages of platform development used in this study are entry, growth, expansion and maturity. In appendix 1 tables of categories of the resulting simple rules can be found, distinguished by development stages in appendix 1.1, distinguished by type of simple rule in appendix 1.2 and distinguished by platform type in appendix 1.3. This categorization will allow the builder of a multi-sided platform to identify what rules are relevant to the exact situation of their platform and select those rules that will help them conquer the issues faced by their platform specifically.

7.4 Applications of simple rules by development stage

After combining the analysis of the types of simple rules with the development stages of platforms they address, we can make several observations. For the entry stage of platform development, we defined the main challenges as finding the right product or service and entering the right market that the platform can grow in. To help reach this goal we found three types of simple rules: Boundary rules, Timing rules and How-to rules. Boundary rules such as: *Aim to release a product/service in high-value categories without previous hits. (Rietveld et al., 2019).* An example of another boundary rule from literature is: *Do not enter a market where a lot of independent platforms exist (Coolman et al., 2020)*. In the entry stage of development these boundary rules can help the platform owner to decide which market to enter and which markets to avoid. In this case both rules are also designed to help the user avoid oversaturated markets where competition is too high for new entrants to grow. In the entry stage of development, we found timing rules such as: *Release a product/service in a period of low amount of new releases (Rietveld et al., 2019).*, which can help the user decide when to enter the market. Finally, how-to rules can help the user achieve define objectives that help a platform develop more successfully in the entry stage of development. Examples include: *New entrants should use technology that is compatible with existing actors. (Hedman & Henningsson, 2015.* and *Set an ex-ante framework for the development of a platform over time. (Tura, Kutvonen & Ritala, 2018)*. For the growth stage of platform development, we defined the main challenges as attracting and subsidizing the right sides in order to create a multi-sided market. In this case we found prioritizing, coordination and how-to rules to help users do this. Prioritizing rules help the user rank different alternatives based on their importance for reaching success. One example of this type of rule for platforms is: *The focus must be on addressing the early adopters and not on the late adopters. (Rietveld & Eggers, 2018).* Coordination rules help different actors within the platform to synchronize their actions without the need for communication by providing simple instructions. For software platform managers specifically, this means for example: *Managers should apply introductory pricing at the beginning of the product cycle and expand software variety in a later stage. (Sriram et all., 2015)*. Finally, for this stage how-to rules are again present to help the platform owner quickly gain users and grow their platform. An example of a how-to rule in the growth stage of platform development is: *Ensure that the side that is more price-sensitive is subsidized. (Eisenmann et al. 2006)*. Next is the expansion stage where the primary goal we defined is for the platform to grow to critical mass. Again, we find boundary rules, prioritizing rules, coordination rules and how-to rules. In our analysis stage we also found stopping rules for this stage of development which are meant to help the platform owner discontinue his activity when the likelihood of failure becomes too high. For example: *Determine a deadline for the moment your platform has to reach a critical mass of customers (N>Nmin) (Coolman et al., 2020)*. In the expansion stage of development boundary rules can help the user find the right partners and ventures, while coordination rules can help to shift the activities to those that are most beneficial to grow the platform. One example of each is: *Work together with companies with a high market share (Coolman et al., 2020.* and *When the service has become well accepted, shift the resources to focus primarily on acquiring new buyers and sellers (Report Group 7).* Finally, in the maturity stage of development a company has reached the size that is necessary for long term survival in their market and can now focus on maintaining its position or expanding it further. Rules we found for this stage include prioritizing, coordination and how-to rules. These rules can help defend the position of the platform. An example of a how-to rule in this case is: *Platform owners should learn from their sister organizations' experiences when responding to competition. (Seaman & Zhu, 2017).* For prioritizing rules, we find*: As a publisher/platform, focus on reach over depth (Athey et al., 2018).* This rule is also specified for a single type of platform that we classified as advertiser-supported media, whereas most rules that were found were not specified for a single platform type. Finally, for coordination rules we found: *A developer should not set the price in advance for a product or service that is accessed via a platform (Gans, 2012).*

8. CONCLUSIONS ON THE USE OF SIMPLE RULES FROM EXISTING PLATFORM LITERATURE

The first conclusion in this paper is that multi-sided platform managers that seek to formulate simple rules in order to create and lead their platform more efficiently, need to fully understand their meaning and characteristics. From both the reports and the papers that were used by the authors, many of the original simple rules were either not simple rules at all, or formulated incorrectly, requiring the authors to do several rewrites on the simple rules identified and remove many of these original rules entirely. From the simple rules that were identified and categorized we can draw a number of conclusions. The vast majority of simple rules that were identified belonged to the same category, being How-to rules. Only a very limited number of specific simple rules found were formulated as timing rules, stopping rules, prioritizing rules or coordination rules. The vast majority of simple rules that were identified are not specified for a specific platform type, but mostly general or universal rules. Only a limited number of simple rules found were formulated for exchanges, software platforms and advertiser-supported media platforms. None were found specific for transaction system platforms. However, we did indeed find simple rules specified for specific development stages. This means that for all identified platform-types in all

identified stages of development, how-to rules have been identified and categorized. How-to rules provide managers with a limited number of specific steps necessary to achieve a goal, to do things better by simplifying the decision-making process allowing these managers to make effective decisions based on limited information or within limited time frames. As for the practical implications of this research, his paper provides a large database of simple rules, that have specifically been selected as useful and powerful for use in platform development. It is recommended that managers of developing platforms recognize the development stage of this platform and select a handful of these rules for a single activity and tailor these to their needs to help their platform to develop more efficiently and simplify the decision processes associated with platform development. It is crucially important that these rules fit the specific circumstances of the platform and are confined to a handful to avoid destroying the advantage of simplicity and specificity in these rules. From a theoretical point of view this, paper sought to define and combine the ideas of simple rules and multi-sided platforms in an attempt to predict how the former may be used to help develop the latter. In the future it could be useful to research the actual use of simple rules in platform development to investigate the practical effects of the combination of the two concepts.

9. LIMITATIONS

As for limitations in this research there are several. For one the concept of simple rules is fairly new and except for Sull and Eisenhardt (2015), very few researchers have actually sought to define the concept further. Because the concept is still developing and few papers can be found on the subject, the authors were offered a limited view of this concept. Another limitation is this papers reliance on secondary sources, particularly the reports supplied by other students, who may well have had a limited view of the concept of simple rules as well. The result is that many rules needed to be partially rewritten or deleted, and although great care was taken to preserve the original meaning of the rule, there is the possibility that small nuances were lost in this rewrite or rules were unfairly removed. One other limitation is the papers reliance on a fairly fragile numbering system to categorize rules, which could possibly lead to misidentification of subsequent rules.

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Appendix 1 Categories of simple rules

1.1 Development stage

	Group D	Group 2	Group 3	Group 4	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 14	Group 15
Entry stage		1, 11, 12, 14	8	9, 13, 14	5	1	5, 7		7			5	
Growth stage		16	3, 5, 9	17	4	3		3, 4	6	4	10,	4	4
Expansion stage	1, 2, 3, 4, 7, 8	7, 8, 13	10, 14, 15	8, 16	1, 2, 3, 9	4	3, 4		3, 4, 5		2, 12, 14	1, 3	3
Maturity stage	5	2, 3, 4, 6, 9, 10	4, 6, 7, 11, 12, 16, 17, 19, 20	1, 4, 5, 6, 10, 11, 12, 15, 19	7	2	1, 2	5	8	1, 2, 3	1, 4, 5, 6, 7, 8, 9, 11, 15, 16, 17, 18	6, 7, 8, 9, 10	1 2, 5, 6, 7
General rules	6, 9	5, 15	1, 2, 13, 18	2, 3, 7, 18	6, 8		6	1, 2	1, 2		3, 13	2	

1.2 Type of simple rule

	Group D	Group 2	Group 3	Group 4	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 14	Group 15
Boundary rules					1, 5		5		4, 7				
How-to rules	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12 ,13, 14, 15, 16, 17, 18, 19	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	3, 4, 6, 7, 8, 9	1, 2, 3	1, 2, 3, 4, 6	1, 2, 3, 4, 5	1, 2, 3, 6	1, 2, 3, 4	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18	1, 2, 3, 5, 6, 7, 8, 9, 10	1, 2, 3, 5, 6, 7
Timing rules							7						
Stopping rules					2				5				
Prioritizing rules		13	9	4									
Coordination rules			20			4			8		10	4	4

1.3 Platform types

	Group D	Group 2	Group 3	Group 4	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 14	Group 15

Exchange			16							15, 16, 17	10	
Advertiser-supported media			6	4								5
Transaction system												
Software platform	2, 3		15		7, 8, 9				2, 8		10, 13		
General/ universal rules	1, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	1, 2, 3, 4, 5, 6	1, 2, 3, 4	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 5	1, 3, 4, 5, 6, 7	1, 2, 3, 4	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 18	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 6, 7

1.4 Combined Tables

Rules (Dev. stage)	Group D	Group 2	Group 3	Group 4	Group 6	Group 7	Group 8
Boundary (Entry)					5 G		5 G
Boundary (Expansion)					1 G		
How-to (Entry)		1 G 11 G 12 G 14 G	8 G	13 G 14 G 9 G	1 G		

How-to (Growth)		16 G	3 G 5 G	17 G	4 G	3 G	
How-to (Expansion)	1 G **2 S** **3 S** 4 G 7 G 8 G	7 G 8 G	10 G 14 G **15 S**	8 G 16 G	3 G **9 S**		3 G 4 G
How-to (Maturity)	5 G	2 G 3 G 4 G 6 G 9 G 10 G	4 G **6 A** 7 G 11 G 12 G **16 E** 17 G 19 G	1 G 5 G 6 G 10 G 11 G 12 G 15 G 19 G	**7 S**	2 G	1 G 2 G
How-to (General)	6 G 9 G	5 G 15 G	1 G 2 G 13 G 18 G	2 G 3 G 7 G 18 G	6 G **8 S**		6 G
Timing (Entry)							7 G
Stopping (Expansion)					2 G		
Prioritizing (Expansion)		13 G					
Prioritizing (Growth)			9 G				
Prioritizing (Maturity)				**4 A**			
Coordination (Expansion)						4 G	
Coordination (Maturity)			20 G				

Rules (Dev. stage)	Group 9	Group 10	Group 11	Group 12	Group 14	Group 15	Author rules
Boundary (Entry)		7 G					
Boundary (Expansion)		4 G					
Boundary (General)							2 G

How-to (Entry)					5 G		25 G, 26 G, 44 G, 45 G
How-to (Growth)	3 G 4 G	6 G	4 G				17 G, 27 G, **39 S,** 46 G
How-to (Expansion)		3 G		2 G 12 G 14 G	1 G 3 G	3 G	5 G, 7 G, 9 G, 11 G, 18 G, **29 E**, 34 G, 35 G, **38 S**
How-to (Maturity)	5 G		1 G 2 G 3 G	1 G 4 G 5 G 6 G 7 G 8 G 9 G 11 G **15 E** **16 E** **17 E** 18 G	6 G 7 G 8 G 9 G **10 E**	1 G 2 G **5 A** 6 G 7 G	1 G, 4 G, 13 G, 19 G, **23 S,** 24 G, 28 G, **32 S,** 36 G, 37 G, 41 G, 42 G
How-to (General)	1 G 2 G	1 G **2 S**		3 G **13 S**	2 G		3 G, 6 G, 8 G, **10 S**, 12 G, 14 G, 15 G, 16 G, **20 S, 21 S, 22 S,** 30 G, 31 G, 33 G, 40 G, 43 G,
Stopping (Expansion)		5 G					
Coordination (Growth)				**10 S**	4 G	4 G	
Coordination (Maturity)		**8 S**					

Appendix 2 Simple rules for platforms by author(s)

Paper nr.	Literature	Simple Rules
1	**Anderson, E. G., Jr., Parker, G. G., & Tan, B. (2014)**	1. A platform monopolist should never stop increasing content availability. 2. A duopoly platform should always avoid price competition. 3. Consider added value of platform performance to be low in content-driven markets and high in performance-driven markets 4. In a platform monopoly, firms should analyse feedback from the developer side to avoid product development errors

2	**Benlian, A., Hilkert, D., & Hess, T. (2015)**	5. Developing platforms need to decide their level of openness before searching for complementors. 6. A platform needs to use the variables accessibility and transparency to manage their openness.
3	**Boudreau, K. (2010)**	7. Platforms that want to increase innovation should share hardware with complementors. 8. Platforms should never give up platform control to increase innovation.
4	**Boudreau, K. J. (2012)**	9. Platforms should increase their number of complementary producers if they seek a greater variety of products
6	**Breidbach, C. F., & Brodie, R. J. (2017)**	10. In service platforms actor engagement should be the focus of the platform.
7	**Cenamor, J., Usero, B. n., & Fernández, Z. (2013).**	11. Platforms looking for more adoption should increase the number of complementary products. 12. Multi-sided platforms should avoid relying on traditional market knowledge.
8	**Eaton, B., Elaluf-Calderwood, S., Sorensen, C., & Yoo, Y. (2015).**	13. Platforms need to prioritize the use of boundary resources when establishing control over their service system 14. A platform should actively decide what boundary resources to offer to complementors, before releasing them. 15. A platform must predict how offered boundary resources might be used by complementors before releasing them. 16. A platform should obtain ownership and control of existing customer data.
10	**Fu, W., Wang, Q., & Zhao, X. (2017).**	17. At the emergence stage, platforms should focus on building infrastructure and directly stimulating network effects directly. 18. At the expansion stage platforms should focus on building relationships among different participants and indirectly generating network effects via value co creation 19. At the maturity stage platforms should focus on building the right environment, while still stimulating network effects via value co-creation.
11	**Ghazawneh, A., & Henfridsson, O. (2015).**	20. In a censored digital application platform, application developers should be treated as important resources for growing the platform ecosystem 21. In a focused digital application platform, platform owners should focus on development of specialized applications and increase their catalogue 22. In an open digital application platform, diversity should be prioritized 23. In an open digital application platform, external resources should be made available to application developers
12	**Hedman, J., & Henningsson, S. (2015).**	24. Existing actors should collaborate to manage technology to hinder new actors to enter in order to protect their market position 25. New entrants should focus on technological capital to compete in new markets. 26. New entrants should use technology that is compatible with existing actors. 27. New entrants should establish collaborative partnerships with existing actors.

13	**Karhu, K., Gustafsson, R., & Lyytinen, K. (2018).**	28. Platforms need to prepare to defend their boundary resources through the use of other boundary resources or legal action.
14	**Koh, T. K., & Fichman, M. (2014).**	29. Buyers should leverage existing relationships with suppliers when competition increases on exchanges. 30. Use separate strategies for single-homing users and multi-homing users. 31. Long strong relationships should be encouraged between buyers and suppliers to increase commitment to the platform
15	**Kude, T., Heinzl, A., & Dibbern, J. (2012).**	32. In the enterprise software industry, spokes should never stop innovating their product/service, to reduce the risk of becoming obsolete. 33. Hubs should be aware which capabilities spokes are aiming for in order to manage partnerships in a better way. 34. In case of a low level of layer overlap, a hub should attract spokes by increasing Technological capital. 35. In case of a high level of layer overlap, a hub should attract spokes by offering access to broad markets, providing them with Commercial capital.
16	**Seamans, R., & Zhu, F. (2017).**	36. Platform owners should learn from their sister organizations' experiences when responding to competition 37. Platform should choose between differentiation and cost-cutting strategies to survive against competition.
17	**Song, J., Baker, J., Wang, Y., Choi, H. Y., & Bhattacherjee, A. (2018).**	38. IT platforms should focus on building a critical mass of users and aggressively market information about their user base to potential developers 39. IT Platforms should be technologically compatible with their adopter to increase adoption
18	**Tee, R., & Gawer, A. (2009).**	40. If there is a sub-optimal fit, platforms need to be adapted to better fit with the existing industry architecture. 41. Boundary resources should be used to control the specifications of complementary products 42. Platforms need to create incentives for complementors to encourage suitable complementary products.
20	**Tura, N., Kutvonen, A., & Ritala, P. (2018).**	43. Value creation should be defined from the stakeholders' perspective. 44.Use ex-ante design to get the commitment, attention and inputs of multiple stakeholders that are involved with the platform. 45. Set an ex-ante framework for the development of a platform over time. 46. Actor roles within a platform should be identified and filled in early on the platform design

Appendix 3 Simple rules for platforms from reports

Group D

	Rules	Context
Company / Platform Owner	1. Form strong partnerships, especially with trustworthy providers of complementary products. (Den Hartigh et all., 2016) (Nambisan et all, 2018) 2. Form partnerships with different types of partners, e.g. hardware developers and software developers. (Den Hartigh et all., 2016)	2. To build up network diversity. 5. To Insulate/restore Cross-side Network Effects when updating platforms

	3. Share reference designs with independent developers and product innovators. (Boudreau, 2010) (Ozalp et all., 2018) 4. Involve multiple stakeholders in the execution and formulation of enterprise activities. (Randall et all., 2013) 5. Make sure that updates to a platform do not happen too frequently and bring substantial benefits on each update. (Song et all., 2018)	
Product / Platform	6. Only use good quality materials to develop the product/platform. (Den Hartigh et all., 2016) (Ozalp et all., 2018) 7. Form strong partnerships with the most important complementors. (Den Hartigh et all., 2016) (Ozalp et all., 2018) 8. Allow consumers to influence product/platform creation. (Randall et all., 2013) 9. Make sure the application review time is as short as possible. (Song et all., 2018)	6 To maintain product/platform quality. 7 To ensure complements' availability. 8 To facilitate co-creation. 9 To encourage application development.

Group 2 (Lacking references)

	Rules	Context
Sustainability of the platform	1. Make the platform sustainable when possible. 2. Use positioning as a sustainable platform, when the platform identifies as being sustainable. **Don't** 3. Don't keep harvesting after a successful product/service but, try to improve or innovate the product. 4. Don't position the platform as sustainable where this is not the case. 5. Don't treat passengers and drivers unequally.	1 To improve economics and social performance.
Communication in the platform	6. Ensure that the participants of the platform can communicate and collaborate regularly. **Don't** 7. Do not surprise participants when adopting a new approach for platform, but gently introduce them to the new approach.	
Internationalization of the platform	**Don't** 8. Do not try to operate across borders using a trial and error method.	8 But first, do thorough research into the market.
Structure of the platform	9. Create value with your customer, rather than from the customer. 10. Try to break up a large company in separate departments, that are specialized in one product or service. 11. Take advantage of complementors to create a platform that matches to the local ecosystem configuration.	
Ways to a successful platform	12. When launching a platform, launch small. 13. Focus on critical mass and quality ahead of money.	

	Don't 14. Do not launch a big platform in the first phase. 15. Don't measure just financial metrics. 16. Don't give producers more attention than consumers.	

Group 3

	Rules	Context
Sponsor's promotion	1. The objective of all parts of an ecosystem should be to maximize the value of the platform. (Rietveld et al., 2019) **Don't** 2. Managers should not lower their reputation by providing products with a lower quality, then is normal on the platform. (Den Hartigh et al., 2016)	2 Because the reputation of their platform has an influence on the result of the promotion.
Pricing	3. Ensure that the side that is more price-sensitive is subsidized. (Eisenmann et al., 2006) 4. Demand quality from the supplier to deliver quality to the customer. (Eisenmann et al., 2006) 5. Connect a select group of customers or suppliers to the platform, potentially through contracts. (Eisenmann et al., 2006) 6. Allow external parties to display advertisements via the platform. (Eisenmann et al., 2006) 7. Add extra features and complements for consumers who are willing to pay for them. (Eisenmann et al., 2006) 8. Launch a variety of options with the latest technologies in the first stage of the platform's lifecycle. (Rietveld & Eggers, 2018) 9. The focus must be on addressing the early adopters and not on the late adopters. (Rietveld & Eggers, 2018). 10. Employ crowdsourcing to enable external parties to produce complements for the platform. (Bergvall-Kåreborn & Howcroft, 2013). **Don't** 11. Do not engage in transactions with competing platforms. (Eisenmann et al., 2006).	6 In order to finance the platform.
Technical	12. Standardize the platforms production processes. (Kapoor & Agarwal, 2017). 13. Commit to a certain universal level of quality on the platform as a guideline. (Den Hartigh et al., 2016). 14. The technical design of products should allow complements of other developers. (Ozalp et al., 2018). 15. Sharing knowledge among developers should be encouraged. (Ozalp et al., 2018).	12 To make the platform accessible to the entrance of developers and complementors, this makes it easier to start on the platform and extends the offer on the platform 13 To ensure customer trust. 17 Even though this could lead to cannibalization of its own product.

	Don't 16. Don't allow products of a low quality on the platform, to enable cheaper production. (Den Hartigh et al., 2016) Also do not do this to be cheaper than other platforms. (Ozalp et al., 2018) 17. Do not focus on increasing the value of the platform's own product but focus on the total value creation of the ecosystem. (Parker et al., 2016)	
Innovation	18. The focus of managers should be on reflecting how available resources can be used optimally. (Hevner & Malgonde, 2019) 19. Managers should request feedback from their consumers. (Kapoor & Agarwal, 2017)	18 Managers should apply a more effectual approach. 19 The feedback and ideas platform providers receive from their end users are valuable to keep improving the platform.
Competition	20. It is important to decide how to respond to envelopment before it happens. (Eisenmann et al., 2006)	20 This could be through adjusting the business model, cooperating with other platforms or suing the competitors. Envelopment could lead to exiting the market, which is the worst-case scenario.

Group 4

	Rule	Context
10	1. New products need to have comparable reliability compared to products of the past. (Bresnahan & Greenstein, 1991) 2. Advertise on a single platform. (Athey et al., 2018) 3. Choose a platform that is a good match for your advertising budget. (Athey et al., 2018) 4. As a publisher/platform, focus on reach over depth. (Athey et al., 2018) 5. Pool information about consumers with partners to increase ad value on your platform. (Athey et al., 2018) 6. Encourage other platforms, such as public ones, to go ad-free. (Athey et al., 2018) **Don't** 7. Don't advertise on multiple platforms that share portions of their audience (Essentially all platforms). (Athey et al., 2018)	1. Otherwise, the customers lose trust in the company. 3 Where you can saturate it to the point that every user sees your ads the desired number of times. 4 To maximize the value of your advertisements.
11	8. When entering a platform market which has crossover with your current platform's users, bundle the competitor's functionality into your current product. (Eisenmann et al., 2011) 9. Focus on appealing to early adopters specifically. (Dranove & Gandal, 2003) 10. Use the internet to monitor reactions to your product. (Dranove & Gandal, 2003)	8 To dissuade envelopment attacks. 10 so you can try to influence these reactions.

	Don't 11. Don't give the option of buying your product and your competitor's product separately, if possible. (Eisenmann et al.,2011) 12. Don't start an envelopment attack when your target has the ability to respond in kind. (Eisenmann et al., 2011) 13. Entrants shouldn't risk strengthening the incumbent's technology by using cross-compatible technology. (Dranove & Gandal, 2003)	
12	14. When entering the market, DO focus on creating positive customer expectations. (Mantena & Saha, 2012) 15. Try to achieve co-opetition with a platform that has an inferior technology when you are the dominant platform. (Mantena & Saha, 2012) 16. Lower the price for customers on the platform side with weaker network effects and raise the price for customers on the platform side with stronger network effects. (Mantena & Saha, 2012) 17. When creating a platform, DO allow integration of non-paying users. (Sussan & Acs, 2017) **Don't** 18. Don't share your network (directly or indirectly) with platforms that have closely matched technology when you are the dominant platform. (Mantena & Saha, 2012) 19. Don't focus on improving technology when in co-opetition when it is an inferior platform. (Mantena & Saha, 2012)	15 In the form of direct network sharing.

Group 6 (Lacking references)

	Rule	context
Critical Mass	1. Work together with companies with a high market share. 2. Determine a deadline for the moment your platform has to reach a critical mass of customers. 3. Focus on attaining critical mass. (Evans & Schmalensee, 2010). 4. Use word of mouth and advertising to inform the target population when launching a new business. **Don't** 5. Do not enter a market where a lot of independent platforms exist.	1 Significantly increases the potential of reaching the critical mass before the deadline. 3 Necessary to survive and become viable, even without fixed costs or economies of scale. 4 The target population is almost never well-informed at the launch of a new business of products.
Governance	6. Always perform quality assurance on major third-party content. 7. As a platform owner, make sure that developers are forced to share the code, so they lose the IP-rights.	7 Developers will not do this based on game theory as they can maximize their profit by not sharing the code.

	Don't 8. Do not make decisions based on the current installed bases of the consoles.	
Performance	9. Determine the time a developer has IP-rights,	9 A longer period in which the developer has IP-rights increases the developer value and keeps the platform value as the reusability of the code constant. The longer the IP-rights period, the lower the pace in which the platform will develop itself.

Group 7 (Lacking references)

	Rules	Context
Perceived platform value	1. Ensure the platform is a complement to the existing industry. 2. Managers of platforms should inform users about prices charged to developers if the platform is a monopoly but not if it is competing with others.	1. In order to create value.
Platform growth	3. Determine which side of the platform to subsidize and if that has a positive effect on the platform. 4. When the service has become well accepted, shift the resources to focus primarily on acquiring new buyers and sellers.	

Group 8

	Rules	Context
Managerial rules for platform providers	1. Encourage discussions and criticism on the platform. (Mačiulienė et al., 2016) 2. Protect information reliability, user privacy, user data, and security of online payments on an online platform. (Mačiulienė et al., 2016)	2 To Improve the trustworthiness of the online platform.
Managerial rules for complementors	3. Form strong relationships with high-status partners. (Srinivasan and Venkatrama, 2018) 4. Aim for low overlap in products with competitors. (Srinivasan and Venkatrama, 2018) 5. Aim to release a product/service in high-value categories without previous hits. (Rietveld et al., 2019) 6. Always maintain a high-quality product/service. (Rietveld et al., 2019) 7. Release a product/service in a period of low amount of new releases. (Rietveld et al., 2019)	3 To attract resources from investors. 5 In order to be promoted by the platform. 6 In order to be promoted by the platform. 7 In order to be promoted by the platform.

Group 9

	rule	Context
Platform owner	1. Consider technology as much an operant resource as human beings. (Ramaswamy and Ozcan, 2018) **Don't** 2. Don't implement a dual strategy. (Cennamo and Santalo, 2013)	2 Exclusivity or AMC

	3. Don't value users solely based on their volume/potential turnover. (Xie, Wu, Xiao, hu, 2016)	
Service provider	4. Let external service providers join the platform without extra fees. (De Oliveira and Cortimiglia, 2017) 5. Enable connection to the platform via multiple devices. (Haile and Altmann, 2014)	4 Other than their own costs for building their app.

Group 10

	rule	Context
Governance	1. Do always perform quality assurance on major third-party content. (Coolman et al., 2020) **Don't** 2. Do not make decisions based on the current installed bases of the consoles. (Coolman et al., 2020)	
Critical mass	3. Focus on attaining critical mass. (Coolman, Dijkstra, Abdalla, Remmelink, & Wonders, 2020; Evans & Schmalensee, 2010) 4. Work together with companies with a high market share. (Coolman et al., 2020) 5. Determine a deadline for the moment your platform has to reach a critical mass of customers. (N>Nmin) (Coolman et al., 2020) 6. Use word of mouth and advertising to inform the target population of the launch of a platform. (Coolman et al., 2020) **Don't** 7. Do not enter a market where a lot of independent platforms exist. (Coolman et al., 2020)	3 Necessary to survive and become viable, even without fixed costs or economies of scale. 4 Significantly increases the potential of reaching the critical mass before the deadline. 5 To prevent a downward spiral of the platform. 6 Before that they do not know the platform.
Price Strategy	8. A developer should not set the price in advance for a product or service that is accessed via a platform. (Gans, 2012)	8 The crucial reason is that the price of access to the product or service will be less valuable because a non-trivial unravelling issue constrains this.

Group 11

	Rule	Context
Platform-Platform interaction	1. Platforms should increasingly differentiate themselves from the rival platforms. (Li et al. 2010, p. 248) 2. The owners of a joint platform must ensure the existence of a platform leader within the joint platform. (De Reuver et al., 2014)	2 In order to (1) coordinate the activities of participating members, and (2) manage the relations with complementors and facilitate complementary innovation.
Platform-Contributors interaction	3. Two-sided platforms should have different pricing strategies depending on buyer and seller expectations. (Hagiu and Spulber, 2013, p. 934)	

	4. Prevent the chicken and egg problem by providing first party content. (Sriram et al., 2015)	

Group 12

	Rule	Context
Perspective & Approach	1. Capturing value should be part of every exercise in strategy, business model design, and innovation. (Teece, 2018) 2. Managers should use information transparency, to establish investors' confidence in the market. (Xu & Zhang, 2013) 3. Managers should avoid the perspective of having a "generic active consumer". (Helberger et all, 2018)	
Partnership & Network	4. Managers should define public values of the platform and translate this into instruction for stakeholders. (Helberger et all, 2018) 5. Managers should follow a vertical integration strategy when introducing first-party applications. (Li & Agarwal., 2017) 6. Managers should formulate platform values as demands (Heylighen, 2017) 7. In case of a competitive scenario, managers should not add "connectors" to share intellectual property (Gawer & Cusumano, 2014)	4 To stimulate stakeholders to work together and fulfil responsibility. 6 So people or organizations come up with offers that satisfy these demands. 7 Because this may be detrimental if rivals end up doing the same. (Mantovani & Ruiz-Aliseda, 2016)
Platform / Ecosystem Value	8. Managers should never stop innovating on the core of the platform (Gawer & Cusumano, 2014) 9. Managers should seek complementary patents on new features, processes and/or designs. (Teece, 2018) 10. Managers should apply introductory pricing at the beginning of the product cycle and expand software variety in a later stage. (Sriram et all., 2015) 11. Managers should ensure that the platform offers a lot of variety within products and product categories. (Jiang et all., 2011) 12. Managers should decide on a platform strategy: either specialization or multi-homing. (Cennamo et all., 2018) 13. Managers should not use cross-platform development technology such as middleware tools. (Cennamo et all., 2018)	8 And ensure that the platform continues to provide an essential and irreplaceable function to the overall system. 9 To manage appropriability. 11 To stay relevant and attract visitors 12 Either specializing first on one platform to maximize their chances of reaching higher innovation performance, or choosing a simultaneous multihoming approach, sacrificing maximum quality on a platform to reduce variance of the complement's quality across platforms. 13 Since this does not help avoid platform specific investments in co-specialization.
Finance-related	14. Managers should be careful of hidden platform specific cost when multihoming. (Cennamo et all., 2018)	14 Because hidden platform-specific costs of complementary multihoming could differ across platforms.

	15. Managers should set the fee high enough to separate the high-demand seller from the low-demand seller. (Jiang et all., 2011) 16. Contractually capture the option to sell independent seller's products. (Jiang et all., 2011) 17. Collect in consumer reviews to reveal the seller's service level. (Jiang et all., 2011) 18. Avoid focusing on concentration of products or services. (Sriram et all., 2015)	15 Because, when the independent seller enters the platform the price and service level must be set. 17 So that the platform can monitor the service level and if needed, adding the product to its own platform offer in order to generate more profit. 18 Because it doesn't lead to higher prices (no relationship between price and marginal costs), since prices are determined by costs and demand functions the concentration has no effect.

Group 14

	Rule	Context
General	1. Set up mutual development teams with the help of crowdfunding. (Nucciarelli et al., 2017) 2. Managers should never stop evolving the platform. (Ramaswamy & Ozcan, 2018, p. 28)	1 Via interactions between developers and customers in order to gain more knowledge about the market. Moreover, a good connection helps knowledge sharing and market testing. 2 So, an organizing actor should never lose interaction with the other engaging actors.
Partners	3. Create relational ties with the key decision makers in new partnering organizations. (Perks, Helen, Kowalkowski, Witell, and Gustafsson, 2017) 4. Managers need to stimulate organizational support for the emergent platform within an early stage. (Perks, Helen, Kowalkowski, Witell, and Gustafsson, 2017) 5. Involve multiple stakeholders when designing the platform. (Proskuryakova, Meissner, & Rudnik, 2017, p. 221)	5 With a variety of backgrounds, ambitions, expectations, experiences, and competences.
Rules	6. Organizations should refrain from focusing on both the platform's technical architecture and what has been done in the past. (Perks, Helen, Kowalkowski, Witell, and Gustafsson, 2017)	
Value proposition	7. Managers should use customer knowledge and feedback for new product development. (Ramaswamy & Ozcan, 2018). 8. Use structured product development methods for the design of new services. (Hofman & Meijerink, 2015)	7 Because this could enhance the effectiveness of the new product development process and increase potential of the success market.
Innovation	9. Keep investing in technology and strive to become the dominant technology. (Schilling, 2011)	10 For a competitive advantage over branded product platforms. The latter are still relatively

	10. Enable One-stop shopping on online retail platforms. (Reinartz et al. 2019)	restricted in fulfilling consumer needs across categories.

Group 15

	rules	Context
Core interaction	1. Managers should set up joint development teams with the help of crowdfunding. (Nucciarelli et al., 2017)	1 In order to gain more knowledge about the market. Also, a good connection helps knowledge sharing.
Partners	2. "Managers should invest in strong relational ties with key decision makers in new partnering organizations" (Perks, Helen, Kowalkowski, Witell, and Gustafsson, 2017). 3. "Managers need to nurture organizational support for the emergent value platform from an early stage" (Perks, Helen, Kowalkowski, Witell, and Gustafsson, 2017). 4. "Managers should train successful athletes, players or staff from the clubs in behavior towards the media or allow for TV appearance." (Budzinski, Oliver, and Satzer, 2011)	4 To attract or develop media-friendly protagonists.
Rules	5. "Lead firms should refrain from focusing chiefly on the platform's technical architecture and what has been done in the past" (Perks, Helen, Kowalkowski, Witell, and Gustafsson, 2017).	
Value proposition	6. "Managers should use customer knowledge and feedback for new product development." (Ramaswamy & Ozcan, 2018, p. 29)	6. Because this could greatly enhance the effectiveness of the new product development process and increase success market.
Miscellaneous	7. Enable one-stop shopping on online retail platforms. (Reinartz et al. 2019)	7. For a competitive advantage over branded product platforms, which are still relatively restricted in fulfilling consumer needs across categories.