A METAPHOR FOR PLATFORM DEVELOPMENT PROCESSES.

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Abstract
There is considerable research on platform market competition. However, there is significantly less research on governance of the preceding stage of platform development prior to market launch. This paper proposes that the avalanche game is an appropriate metaphor for this. A typical platform development process is outlined and the correspondence between it and the game is drawn and elaborated. In order to explore the role of incentives in platform development, the original simulation model of the formal avalanche game is extended using literature on the incentives of platform development processes. The exploration of the extended model behaviour provides insights about how platform governance incentives may influence platform development process.

Keywords: platforms, governance, decision making, simulation

INTRODUCTION

This paper focuses on committee based platform development. Basically the process of developing common platforms (or interfaces) is "incentive driven" in that "members will support an initiative […] if they perceive that substantive benefits are to be realized" (Hawkings, 1999). Van de Kaa and De Bruijn (Van de Kaa & De Bruijn, 2015) offer 5 specific incentives for consensus building; 'the perspective of future gain', the perspective of enduring gain', 'strong voting rules', a sense of urgency', and 'an incentive to compromise'. This research will go beyond this study and will analyse whether these incentives can be generalized and can be used to explain order in cases of platform development.

The objective of the paper is to arrive at a simulation model with which decision making in platform committees can be better understood. We propose to use metaphors as a means for thinking about the governance of platform setting processes. Organizational literature points to the role of common cognitive schema and frameworks (Weick, 1979), metaphor and analogy (Nonaka & Takeuchi, 1995), and stories (Brown & Duguid, 1991) as means for bringing together and aligning diverse individual experience and understanding. Metaphors have long been used in organization science (Cohen et al., 1972 ; March, 1962; Morgan, 1997) and are pervasive devices for thinking, understanding and problem solving (Lakoff & Johnson, 1980). They are used to understand some part of reality in terms of something else, usually a common base reference, expressed in terms of A is like B and bring to the fore a certain aspect of what is observed while leaving others in the background. Metaphors cut across different contexts and thus allow imaginative perceptions to combine with literal levels of cognitive activities (Bateson, 1973). Along with analogies and models, metaphors are part of the process of scientific discovery (Tsoukas, 1991) .

We use the avalanche game (Lane, 2008) as a metaphor. We adapt the formal simulation model to the platform governance context. We extent where necessary the metaphor to incorporate the incentives identified in van de Kaa and De Bruijn (2015). Through the simulation model we explore the effect that additional incentives from the literature can have. We offer this metaphor to the practitioner community rather than a large, unintelligible model that will be put to the side. Small models have just as much potential in multi-stakeholder settings (Ghaffarzadegan et al., 2011).

Theory

Platform-based markets have become highly important in several industries, high tech in particular, with the number of platforms and firms whose activities revolve around them growing considerably over the last years (Gawer & Cusumano, 2013; Zhu & Iansiti, 2012). Platforms are essential to the operation of most technological systems, such as ICT systems, because they enable the interconnection of various technological components and subsystems. The most recent, conceptualisation of platforms, spanning engineering design and economics perspectives defines platforms as (Gawer, 2014): "evolving organizations or meta-organizations that (i) federate and coordinate constitutive agents who can innovate and compete, (ii) create value by generating and harnessing economies of scope in supply or/and in demand, and (iii) entail a technological architecture that is modular and composed of a core and a periphery". Research on platforms has mostly focused on platform market competition.

When several platforms are developed and become available, competition among them may ensue. Examples include the classic battle between VHS and Betamax (Cusumano et al., 1992), Microsoft and Sun Microsystems (Garud et al., 2002) and more recently between Blu-ray and HD DVD (Gallagher, 2012). The emergence of a single dominant technology platform is an important phenomenon of markets that are characterised by increasing returns to adoption (Arthur, 1996). Early entry into such markets gives firms an advantage (Lieberman & Montgomery, 1988) which may result in a winner take all outcome. In either case, the increasing importance of platforms calls for deepening the knowledge about the platforms (Gawer, 2009). Various scholars have come up with a wide range of factors that are thought to influence the outcome of platform market competition (Narayanan & Chen, 2012; Suarez, 2004; Van de Kaa et al., 2011). These authors point towards the importance of quickly building up an initial lead in terms of installed base (Shapiro & Varian, 1999). The basic underlying rationale is that in platform based markets, network effects arises whereby the value of a platform increases as more people adopt that platform (Farrell & Saloner, 1985; Katz & Shapiro, 1985). Scholars have come up with various factors that affect the installed base. These range from key complementary assets including financial resources and reputation to strategies such as timing of entry and marketing through e.g. pre-anouncements. Other scholars argue that these factors are related to each other. For example, firms can apply strategic resources to pursue certain strategic in order to increase installed base and the availability of complementary goods. Installed base and complementary goods are positively related and both affect installed base positively (Schilling, 1998; Schilling, 2002). Furthermore, various technological factors such as backwards compatibility and flexibility have been explored. These factors can be applied to explain the outcome of platform wars. For example, Gallagher and Park (2002) have studied various generations of video gaming consoles that fought for market acceptance and found that the consoles that offered backwards compatibility (e.g. PlayStation 1 and 2) were more successful as they could benefit from a previous installed base. Furthermore, in these specific cases, financial resources could be used to apply penetration pricing strategies increasing installed base. Often, consoles are even priced below cost in order to increase installed base. Complementary goods in turn are priced high so that firms can earn profits from these goods.

Another line of research focuses on the actual development of platforms within committees. Various scholars have studied the reasons why firms participate in committees that develop common platforms. Greenstein (1992) argues that firms tend to develop common platforms in committees in order to solve potential coordination problems. Scholars offer various more specific reasons why firms want to participate and have an influence in committees. First, firms' likelihood to join committees that develop platforms is dependent upon the number of patents that are applied for by these firms (Blind & Thumm, 2004) as the patents result in financial resources if the platform would achieve market dominance (Dokko et al., 2012). Although the reasons for firms to participate in committees has been studied, few scholars have focused on the reasons why firms remain committed to the platform. Recently, Van de Kaa and De Bruijn have performed a case study of the development of WiFi and they have come up with 5 incentives for consensus building that explain why firms remain committed towards the platform while the decision making process is at times cumbersome. These incentives include 'the perspective of future gain', the perspective of enduring gain', 'strong voting rules', a sense of urgency', and 'an incentive to compromise' (Van de Kaa & De Bruijn, 2015).

Method

In this paper we view the avalanche game (Lane, 2008) as a metaphor for the platform governance process. Based on Van de Kaa and de Bruijn (2015) we outline the parallels between the platform development concepts and the avalanche game. We adapt the original avalanche game to the platform development process and interpret the simulation results produced in light of the metaphor we use. We propose this metaphor as a means for thinking about the governance of platform setting processes.

The use of metaphors implies a way of thinking and a way of seeing that pervades how we understand our world generally. For example, research in a wide variety of fields has demonstrated that metaphors exert a formative influence on science, on our language and on how we think, as well as on how we express ourselves on a day to day basis. We use metaphors whenever we attempt to understand one element of experience in terms of another. Thus, metaphors proceed through implicit or explicit assertions that A is (or is like) B. The metaphor frames our understanding in a distinctive yet partial way. For example when stating that an organization is like a machine. This is a true statement in the sense that it reliably produces certain results but at the same time the metaphor ignores human aspects. This is the case for all perspectives that deal with the study of organization and management. Keeping this fact in mind then it is possible to put a range of metaphors about organizations and management to use. The advantage in proposing the avalanche game as a metaphor for a platform governance context, is that it is possible to use and modify a formal system dynamics model developed to replicate the physical dynamics of the game (Lane, 2008).

We think that applying a modelling and simulation methodology is appropriate for platform governance because the process of developing platforms has emergent properties and emergent outcomes that are not predictable *ex ante* (Van de Kaa & De Bruijn, 2015). Furthermore, the stakeholder network around platforms can be seen as a complex system and their study requires the application of simulation techniques.

The Metaphor

This section outlines the elements of the metaphor between the avalanche game and the platform developing stage prior to its market launch. The links are then used to make changes where appropriate to the original system dynamics avalanche game.

The avalanche game

The avalanche game is a management task where a group of participants is required to move a physical object towards a particular height, under certain conditions and rules. The object can be a hoop or a pole. It supports discussion about individual behavior and group goals, and about the role of rule breaking in achieving aims. Avalanche introduces participants to such lessons in as little as 10 min. It is a metaphor for exploring the relative importance of co-operative and competitive behavior (Lane, 2008). Such behavior arises in various settings where conflicting strategic objectives coexist in organizations, in the prisoners' dilemma, and in integrated bargaining situations. The game may also be related to situations involving companies in which the resulting behaviors are mediated by market regulations.

Participant tasks

Each participant has two objectives, one is to lower the object, the other is to maintain contact with the object at all times. A group of three to twelve individuals is asked to position themselves around the object, and each supports the object in a horizontal position using one finger. The group then starts to lower the object in sync to a set height close to the ground. Participants move their fingers downwards lowering the object until it reaches its designate height. There is a clear condition to participants: they must lower the object while simultaneously maintaining contact with it. No communication is encouraged during the game. When more participants are involved, the pursuit of these objectives by each player may cause the object to move upwards rather than downwards.

Three outcomes of the game

The task is easily accomplished with few participants. For example, when the object used is a hoop, three participants will manage to produce the desired behavior each time (Figure 1). This is possible, as a hoop requires at least three support points to stay horizontal. Therefore, it is impossible for participants to lose contact while lowering their fingers. However, when the number of participants increases, completing the task is not straightforward. Interaction between each participant attempting to lower the object and keep in contact with it, may produce counter-intuitive behavior from them. Possible end outcomes may be divided into three modes (Figure 1): (desired) prolonged process, stalled process and ascending. In the first, the task is accomplished but it takes much longer. In the second the object may just stay near its initial position height, with some small and apparently random, upward and downward movements. In the ascending mode, the object moves away from its objective.

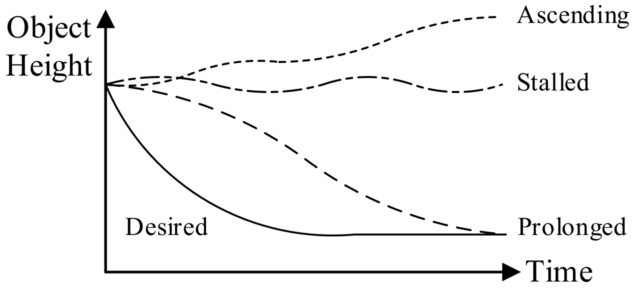

Figure 1 Modes of behavior (adapted from Lane, 2008)

In each of the three cases, the participants may attempt to coordinate the actions of participants and increase the alignment of their actions. These reactions are discouraged from the facilitator. In the event that one of the participants loses contact with the object this has to be declared. This is also monitored by the facilitator. In such a case the task starts again.

Explanation of the dynamics of the game

Lowering the object to the *Desired Object Height* is the common objective for all the participants (Figure 2). The object rests on the fingers of the participants exerting a *Contact Pressure*. There are two conditions that apply to all of them. They must lower the object, and maintain contact. In order to do the first, they have to make a constant *Downward Finger Movement*. For the second, they must maintain a *Contact Pressure*. When one participant reduces his *Finger Height*, ceteris paribus he reduces the *Contact Pressure* on his finger. It can also ceteris paribus reduce *Object Height* which leads to a compensating increase in C*ontact Pressure*. When the two influences operate together their effects are cancelled out and the *Contact Pressure* for each of the participants remains the same. With three participants, all are equally involved in maintaining the *Object Height* due to the geometry of the situation. But with more than three not all of them are required to do so. The difference this makes is that either of the two links may stop to operate at some time. For example, a participant may move his finger down but if the remaining participants are enough to support the object and do not move, then his action will not change the *Object Height*. Instead, he will experience a reduction in *Contact Pressure*, which may cause him to overreact in order to maintain contact, lift his finger and cause neighboring participants to do the same to maintain contact themselves.

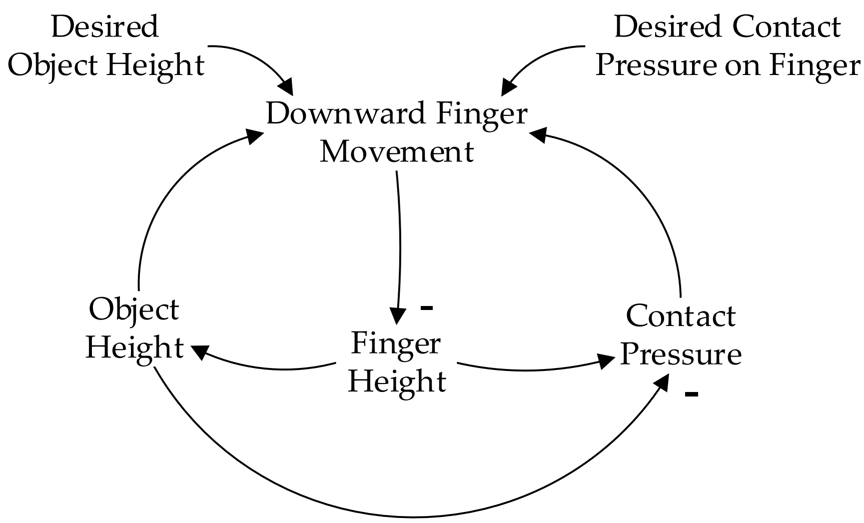

Figure 2 Causal loop diagram for the avalanche game (adapted from Lane, 2008)

Crucial factors

Apart from the number of participants and the particular geometry used in the game a number of additional factors have an effect on the game. These are:

1. The weight of the object. This directly affects the pressure participants experience. It is harder to lose contact with heavier objects.
2. Errors in the positioning of fingers. The natural “wobbling” introduced via the participants having to keep their fingers horizontal.
3. The speed of individual action –finger movement. It is plausible that all participants move their fingers in slightly different speeds.
4. Degree of response to pressure variation. The degree that participants compensate for deviations from the nominal object pressure they experience.
5. Finger sensitivity to pressure. This is a function of the individual physiology of the participants and introduces an additional level of heterogeneity.

Platform development

The starting point for a committee of stakeholders engaging in a platform development process is the point at which firms realize that they need a protocol which is not yet available. They can either decide to develop it themselves or in consortia, or they can try to set up a committee at a formal organization. In the latter case they have to formally ask the board of the formal organization for approval of the establishment of the new committee. If approved, the committee is established and then firm representatives may join and discuss the contents of the protocol. This is done through submitting various technical proposals.

Normally, several meetings are needed to agree upon the specifications of the platform. At each meeting, discussions are held which result in several proposals that may be put to a vote. Groups of stakeholders prepare proposals for the technology according to their interests, and try to gain support for them so that they can influence the contents and direction of platform’s specification. A certain number of voting members are present at each meeting. They can approve, oppose, or abstain proposals that are put forward. A proposal is accepted if it receives more than 50 percent of the votes.

Stakeholders that participate in committees can have various reasons to reach a consensus decision despite the fact that throughout their interests may be diverging. Van de Kaa and De Bruijn (2015) offer five of these incentives. First, in these sessions every individual involved knows that they can benefit in the long-term from the outcome of the decision making process because they have a change of one of their proposals being accepted. As these proposals often include patented technologies they know that they will gain future revenue. Second, once an agreement about a platform is reached, all stakeholders stand to benefit from the fact that they can now realize complex systems that could not be realized earlier because the platform was not available yet. Third, there may also exist strong voting rules which reward active participation and keep the decision making process on a track. Fourth, various competing platforms may be in development in other committees or consortia and actors may feel an urgency to reach a consensus first. Fifth, because of the competing platforms that may be available, actors also gradually develop an incentive to compromise.

Parallels between the avalanche game and platform development

In the avalanche game, the outcome for each participant depends on the actions of all the rest as the movement of the object is determined by its geometry and characteristics. A metaphorical link may be drawn with situations where individuals or organizations are required to set multiple and conflicting strategic objectives (Roberts et al., 1968; Weil, 2007). Thinking about such situations in metaphorical terms may result in creating insights even if they apply only at a metaphorical level (Morecroft et al., 1995).

In the avalanche game players seek to reach a certain target – height together. In platform development processes they seek to develop a platform that is supported by everyone. In both cases something drives the process ahead. In the avalanche game it is the weight of the object the players support. In the platform development process it is the expected benefits that a common platform provides and the urgency to develop the process and come to a compromise in order to avoid competition from other platforms. Players and stakeholders have equal access to the process they participate in but there is natural variation in both cases owing to: (i) the errors in the positioning of the fingers – unsuccessful proposals stakeholders make, (ii) the speed at which players move their fingers – urgency of platform development, (iii) the degree of the response to the pressure players perceive owing to actions of others – the pressure stakeholders perceive to give way to other stakeholder's interests, and (iv) the way actors in both cases over or under-react.

Table 1 Correspondence of crucial factors in the avalanche game and in the platform development process

Avalanche Game	Platform Development
The weight of the object	Potential of competition – market prospects
Errors in the positioning of fingers	Errors in the technical proposals
The speed of individual action –finger movement	Urgency of undertaking the platform development
Degree of response to pressure variation	Degree of response to development pressure
Finger sensitivity to pressure	Degree of over or under reaction to pressure

Model Results

We have made minor modifications to the original avalanche game model to account for the varying weight – urgency to reach a consensus during the platform development process. An additional variable is used to account for the urgency to conclude the development of the platform. The reasons for this may be perceived threat from competing platforms and stakeholder sunk investments in R&D that they are eager to see bear fruit. The *Development*

Urgency variable is linked to *Stakeholder Involvement* and *Effect of Diversity on Platform Development*. Figure 3 shows the complete stock and flow structure of the system dynamics model.

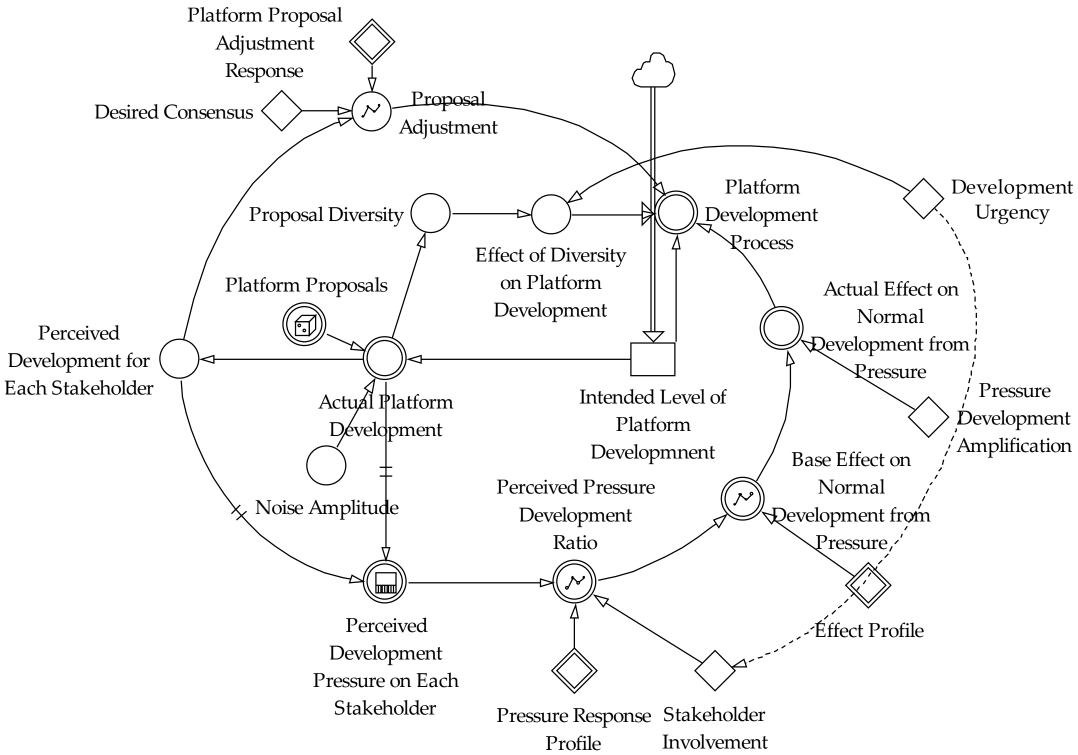

Figure 3 Stock and flow diagram of the modified avalanche game

The model was simulated for 4 years with time steps of ½ days, using Euler integration. Two important factors were varied, the urgency in reaching a consensus on the platform development (4-5.8) and number of stakeholders involved (10-50). Results shown in Figure 4 illustrate some intuitively logical insights. First, a greater number of stakeholders in such processes will tend to produce greater variety of converging and diverging process outcomes. Thus, it will be more likely that the process will not be successful or it will take longer to reach a consensus point. Just as in the original avalanche game, a greater number of players involved will tend to raise rather than lower the object used.

The second insight is that a strong *Development Urgency* will always result in a relatively rapid conclusion in every case. Thus at the limit the number of stakeholders may be less important. However, this extreme case is unlikely in the sense that applying so much pressure to a process amounts to it being run in a Hobbesian manner where the stakeholders are merely present and quickly converge on a common thesis, rather than engaging in a dialectical process about the merits and weaknesses of each platform proposal. The equivalent case in the original avalanche game is giving the players a heavy object to lower made out of dense metal. In this case maintaining contact with the object is more likely purely because of the fact that the players cannot exert enough force to raise the object using their fingers.

In both cases of 10 and 30 stakeholders it is possible that in some runs stakeholder may diverge so slowly or progress may be so slow that the platform development process may appear stagnant and may "run out of steam" eventually. In such cases it is likely that the intended platform will be superseded by developments in the market and eventually be outcompeted if it ever makes it into the market.

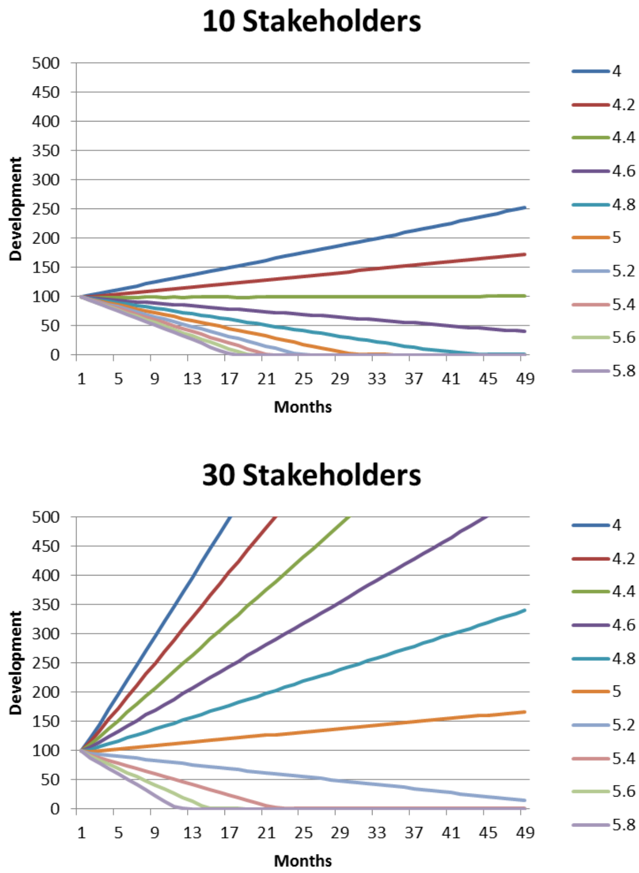

Figure 4 Simulation results with 10 (left) and 30 stakeholders (right)

Discussion and Conclusion

This paper has introduced the avalanche game and considered its value as a metaphor for platform development processes. These processes may vary from being highly unstructured to being formal and can have a range of outcomes. The aim in every case is for the stakeholders involved to arrive at a consensus for the platform that will eventually reach the market, in a meaningful timeframe. This is important as there may be additional competitors attempting to undercut them. The paper adopted the original system dynamics model (Lane, 2008) and adjusted it slightly in order to account for the specifics of the platform development process. In principle these processes can produce three outcomes: (i) reach a conclusion, (ii) proceed without any measurable progress, and (iii) quickly diverge and dissolve. The model results qualitatively resemble these three outcomes and thus we contend that it constitutes a useful metaphor for thinking about platform development processes.

This paper aims to an existing gap in the literature and makes the case for ways in which modelling and simulation can be applied to decision making in platform development. While there is already a wealth of modelling and simulation work for understanding how common platforms are established (Parker & Van Alstyne, 2005; Rochet & Tirole, 2003; Windrum, 2004) these studies focus on platform selection, e.g. the stage at which platforms have been developed and are competing in the market. No research has focused on applying simulation methodology to platform development stage. Furthermore, this line of research outlook has not been taken up in Tiwana et al. (2010) or Narayanan and Chen (2012) who offer future research directions.

Practitioners are sometimes involved in standards committees where the goal is to develop common interfaces. Decision making rules are not always available and it is up to the committee chair to establish such rules (Lemstra et al., 2011). The insights from this study may be used by such chairs in order to better understand decision making processes in committees and, even, to direct the process towards success. The take away from this conceptual exercise is the emphasis on the trade-off between the urgency of dealing with a matter and the number of necessary stakeholders that ideally should be involved. As the old African saying goes "If you want to go quickly, go alone. If you want to go far, go together". What makes things more complicated of course than these stylised results are two things. First, in real world cases of platform development the number of stakeholders varies. More may join the group bringing knowledge, technology or required capabilities. Others may exit as they become disenchanted or look for better opportunities elsewhere. Second, as people tend to discount the future in general (Kahneman, 2011) it is likely that the sense of platform development urgency will also vary during such a process. This is more often than not the case. The equivalent in terms of the avalanche game is of course instructive. All chaos can break loose if more players come in and start to support an object of a given weight. Similarly, chaotic can be a situation where players increasingly perceive their situation as one where rapid progress is required and attempt to lower the object faster. This is likely to lead to instability and even to the object eventually gaining height.

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