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Platforms and incentives for consensus building on complex ICT systems: The development of WiFi

Geerten van de Kaa*, Hans de Bruijn

Faculty of Technology, Policy, and Management, Delft University of Technology, Jaffalaan 5, 2628BX Delft, The Netherlands

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ABSTRACT

This paper studies the organizational hiccups that can occur during the development of technological platforms for complex ICT systems and focuses on an important part of the ICT ecosystem; committees that develop common ICT platforms. Given the diverging interests of the parties involved, it is surprising that consensus is usually reached in these committees. A case study of the development of IEEE 802.11 is conducted which is presented as an emergent phenomenon. IEEE 802.11 is a typical example of a highly successful technological platform that encountered several organizational glitches during its development, but eventually achieved widespread market dominance. This study examines these glitches and proposes strategies to overcome them by using concepts from the governance literature.

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1. Introduction

With the ongoing convergence of industries, complex ICT systems have emerged that consist of established technological components (Van de Kaa, Den Hartog, & De Vries, 2009). These components originate from various product markets. The wireless local area network in homes is an example of a complex ICT system as it includes components from computer manufacturing (e.g., personal computers) and computer peripheral equipment manufacturing (e.g., printers). The stakeholders involved in these product markets all strive for a common platform that can integrate and interconnect the once distinct components. Platforms are defined as "evolving organizations[1] or meta-organizations that: (1) federate and coordinate constitutive agents who can innovate and compete; (2) create value by generating and harnessing economies of scope in supply or/and in demand; and (3) entail a technological architecture that is modular and composed of a core and a periphery" (Gawer, 2014). This paper focuses on a system's interfaces,[2] which as a whole constitute the technological platform (Baldwin & Woodard, 2009). These interfaces can be used to interconnect the constituent components of technological architectures such as complex ICT systems. They enable two and multi-sided markets (Rochet & Tirole, 2003; Rysman, 2009), allowing various actors including platform users, complementors, platform providers, and platform sponsors to connect (Eisenmann, Parker, & van Alstyne, 2009; Suarez & Kirtley, 2012).[3]

* Corresponding author. Tel.: +31 15 2783678.
E-mail address: g.vandekaa@tudelft.nl (G. van de Kaa).

[1] Whereby an organization is defined as a "system of coordinating activities of two or more persons" (Barnard, 1938 as cited by Gawer, 2014).

[2] Which may become compatibility standards or dominant designs if used commonly.

[3] Thus, a platform can refer both to a set of (standardized) interfaces (such as IEEE802.11) and complex ICT systems that are enabled by those interfaces (such as the wireless local area network). The focus is on the former.

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The paper studies the organizational hiccups that occur during the development of technological platforms. The aim is to identify these glitches and to describe and discuss various high level strategies to overcome these inefficiencies, and to explain why actors remain committed or even become more committed to successfully develop the platform despite these difficulties during the platform development process. To achieve this objective, a case study (Yin, 2009) around the development of IEEE 802.11 has been conducted. This platform is a set of (standardized) interfaces that can be used to enable a wireless local area network (WLAN). IEEE 802.11 is a typical example of a highly successful technological platform that experienced several glitches during its development, but eventually achieved widespread market dominance. Secondary data was gathered in the form of previous scientific papers and online news archives such as minutes of committee meetings. Primary data was gathered by conducting several semi-structured interviews with key persons involved in the development of WiFi (including the committee chair).

The network around IEEE 802.11 consisted of committees, subcommittees, and task groups each comprising experts with various interests and sometimes conflicting agendas, thus making the network quite complex. Complexity arises when the dependencies among the elements become important (Miller & Page, 2007). It has been argued that in such complex environments, emergent behaviour may become apparent. Here the term *emergence* is used to denote something arising from the local interaction of agents (Epstein & Axtell, 1996). Bedau and Humphreys (2008) provide a comprehensive discussion of this concept. Under this definition, it may be argued that the development and promotion of IEEE 802.11 can be seen as an emergent phenomenon whereby individuals spontaneously came together in various institutions such as committees and consortia to develop and promote a common platform. This paper explores the extent to which high level strategies may surface in such networks to counteract the chaos that results from organizational hiccups.

The paper contributes to the literature on ICT platforms (Gawer, 2009, 2014; Gawer & Cusumano, 2002; Rochet & Tirole, 2003) by studying platforms from a governance perspective. ICT platforms have been studied from multiple perspectives, for example, from the area of strategy, economics, and engineering design (Gawer, 2014; Gawer & Cusumano, 2013). Scholars that apply perspectives from engineering define platforms as technological architectures that consist of interfaces which may enable innovation, whereas economists argue that the interfaces themselves can be considered as platforms which enable two and multi-sided markets (Gawer, 2014). Scholars in the area of strategy study factors that affect the outcome of platform wars (Blind, 2011; Gallagher, 2012; McIntyre & Subramaniam, 2009; Shapiro & Varian, 1999b; Sheremata, 2004). However, few scholars have examined platforms from a governance perspective. This paper suggests that the understanding of platform development is enriched by applying the lens of governance and change management (Axelrod, 1984; De Bruijn & Ten Heuvelhof, 2008; Lewis, 2011; Pestoff, Brandsen, & Verschuere, 2012). Governance is defined as "coordination and regulation of interdependent actors in the absence of an overarching political authority" (Rosenau & Czempiel, 1992, as cited by Mueller, 2010). Several incentives for consensus building were found; the perspective of future gain, the perspective of enduring gain, strong voting rules, a sense of urgency, and an incentive to compromise. These incentives explain why stakeholders remain committed to a decision making process, despite several organizational hiccups and bruises.

2. Theory

Platforms have been studied from multiple perspectives. Scholars in the area of engineering design envision platforms as technological systems or architectures (e.g., complex ICT systems) and study how such platforms result in innovation (Gawer, 2014). For example, they emphasize that the modular character of platforms enables innovation (Langlois & Robertson, 1992). In this respect, (standardized) interfaces are crucial as they facilitate the modularity of the technological system (Schilling, 2000). Economists study how such interfaces or platforms may be set. Platforms may be set in markets, in hierarchies, in a hybrid combination of markets and hierarchies, and in a network form of organizations.

When platforms are set in markets, they are developed and promoted by single firms or multiple firms that are active in e.g., consortia or alliances. Platform wars may occur in which competing platforms fight for market dominance (Shapiro & Varian, 1999a). Markets in which platform wars are fought are often affected by network effects (Farrell & Saloner, 1985; Katz & Shapiro, 1985), meaning that a platform increases in value once more users adopt the platform. Scholars in the field of technology management have attempted to explain the outcome of platform wars by identifying factors for platform selection given the occurrence of economic market mechanisms such as network effects (Schilling, 1998; Suarez, 2004; Van de Kaa, Van den Ende, De Vries, & Van Heck, 2011). Scholars seem to agree that increasing installed base is crucial for attaining dominance (Hill, 1997; Shapiro & Varian, 1999a). For example, this can be accomplished by pre-empting competitors by entering earlier (Lieberman & Montgomery, 1998) or by marketing communications to influence anticipated or expected installed base (Schilling, 2013).

When platforms are set in hierarchies they are developed in committees where actors discuss the contents of these technological platforms and try to reach consensus about specific aspects. Scholars have focused on the platform development process that takes place within committees. For example, Nickerson and Zur Muhlen (2006) incorporated an ecological perspective and Backhouse, Hsu, and Leiser (2006) examined the phenomenon through an actor network perspective and applied the circuits of power framework to understand the development of platforms. Leiponen (2008) applied the theoretical lens of social network theory to understand platform development for wireless communication.

Platforms can be set through a hybrid combination of markets and hierarchies (Farrell & Saloner, 1988; Funk & Methe, 2001). Platforms may also be set in "network forms of organization" (Powell, 1990) which is comparable to what Mueller (2010) refers to as "networked governance" in that it consists of "looser affiliations of organizations and individuals that rely

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