# RESOURCE TRANSFORMATION IN PLATFORM ENVELOPMENT

*Research in Progress*

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## Abstract

*Product developing organizations rapidly increase their investments in digital platforms to capture value from external ecosystems. This enforces a shift in attention from up-front development of end-user functions to generic resources, providing design capability in those ecosystems. However, to cultivate a prosperous ecosystem around its platform firms also need to invest in building an initial installed base to kick-start network effects. Since strong network effects tend to foster winner-take-all competition platform entrants have to carefully consider how to avoid fighting to the death for increased installed base. In this research in progress we explore how firms may develop platform strategies through envelopment. As an organization exercises envelopment it seeks to enter an existing platform market by bundling its own platform resources with a target platform. We report on an action research design initiative where a global automaker engages in the transformation of existing organizational and technological resources into new platforms resources when seeking to enter the ecosystem around Google's Android. Drawing on the resource-based view of the firm we engage in an analysis of our preliminary data, indicating that such resource transformation has to be anchored in a careful and structured assessment of how different resources may provide competitive advantage in existing value chains and in the upcoming ecosystem respectively.*

***Keywords****: platform envelopment, resource transformation, platform strategy, digital innovation, action design research.*

## 1 Introduction

Spring 2014 Volvo Car Corporation demonstrated a radically new service concept at the Mobile World Congress in Barcelona. This new service illustrated how a connected car could be exploited as a digital platform, allowing the automaker to tap into existing business transactions, which traditionally are far beyond range. The concept was centered on a specific platform resource: a digital key. In short it demonstrated how a car owner could issue a temporary digital key, provide this key to couriers, and choose the car as a delivery option when ordering goods online.

> *In a ground-breaking technology move for the automotive industry, Volvo Cars demonstrates the world's first delivery of food to the car – a new form of 'roam delivery' service. The service, which will be showcased at the Mobile World Congress in Barcelona, allows consumers to have their shopping delivered straight to their car, no matter where they are. (Press release Feb 20, 2014)*

Volvo Car Corporation's noticed initiative illustrates how product-developing organizations have started to experiment with new platform concepts to capture value from external ecosystems. To successfully set up a platform strategy such organizations have to shift its attention from developing end-user functions to enabling resources that provide design capability for external developers (Ghazawneh and Henfridsson 2013; Prügl and Schreier 2006; Svahn et al. 2015). Although

demonstrated on a specific service – delivery of food to the car – Volvo's digital key is an example of such a generic resource, not up-front designed for a specific purpose. Breaking with conventional assumptions on platforms, it was not viewed as an asset being shared across a range of up-front defined products (Robertson and Ulrich 1998), but as a resource offering generative capacity for unrelated and unaccredited audiences to design new services (Zittrain 2006).

Digital platforms open up for instant reproduction of applications, without virtually any marginal cost (Benkler 2006; Brynjolfsson and Saunders 2010; Shapiro and Varian 2000). As a consequence, associated ecosystems generate substantial functional variety and homogeneity (Anderson 2006; Boudreau 2012). From a platform perspective, this typically triggers strong network effects and high switching costs (Katz and Shapiro 1994; Rochet and Tirole 2003). A digital platform is simply more attractive the larger is the base of consumers using it. This makes a difficult barrier for platform entrants. Therefore, when setting up a strategy to guide the introduction of a new digital platform product developing firms cannot just focus on how to best provide design capability, but they also need to find ways for rapidly building initial installed base to be able to benefit from increasing returns to scale (Eisenmann et al. 2006).

Extant literature predicts that the strong network effects in digital innovation ecosystems foster winner-take-all competition (Evans and Schmalensee 2002) where platform owners may end up fighting to the death (Eisenmann et al. 2006, p. 99). Finding themselves in a situation where a new platform market may cannibalize on existing business cases, most product developing firms are prevented from investing enough resources to create necessary momentum. The literature is relatively sparse on evidence for how firms develop alternatives to such 'all-in' approaches. However, one option for building initial installed base is to simply tap into an existing ecosystem "by bundling its own platform's functionality with that of the target's" (Eisenmann et al. 2011, p. 1271). This strategy is generally referred to as platform envelopment.

While existing research offers an understanding of how platform envelopment may provide competitive advantage in platform markets, it is silent on how firms may leverage its existing resources to realize such a strategy. This research departs from the observation that digital platforms provide resources for unconstrained use in external ecosystems, while a Porterian view on competitive advantage (Porter 1985) assumes that resources should not be easily exploited by external actors. On the contrary, such conventional practice is based on the idea that firms should increase their competitive advantage by striving to make organizational and technological resources imperfectly mobile, non-substitutable and difficult to imitate (Barney 1991).

To engage in platform envelopment product developing firms have to focus on their existing resources. This research in progress paper is an intermediate report on an action design research project where we engage with a global automaker to transform existing organizational and technological resources into platforms resources when seeking to enter the ecosystem around Google's Android. We aim to use the resource-based view of the firm (Barney 1991; Penrose 1959; Wernerfeldt 1984) to explore of how such transformation takes place and how it is exercised to create competitive advantage in a platform market. Our research question is: *How can product developing organizations leverage existing organizational and technological resources to improve platform performance through envelopment?*

# 2 Theory

## 2.1 From Product Platforms to Digital Platforms

Firms invest in platforms to leverage the benefits of scale and scope (Chandler 1990; Krugman 1980; Teece 1993). From a business strategy perspective the dynamics around scale and scope sets the stage for how numbers and variation can be used to create competitive advantage. Ultimately, firms have to consider how platforms may help them to (1) produce more units of the same type and (2) introduce new types of products. In the vast majority of cases firms cannot choose either or, but have to find a

balance between scale and scope in order to meet concurrent cost and differentiation demands from customers (Karlsson and Sköld 2007).

In complex product development firms typically draw on modularity to deliver product variation on the basis of commoditized components and production processes (Baldwin and Clark 2000; Meyer and Lehnerd 1997; Robertson and Ulrich 1998; Sanderson and Uzumeri 1995). A modular product platform offers an organization capability to build product variation by substitution (Garud and Kumaraswamy 1995; Sanchez and Mahoney 1996) and scale advantages through specialization and effective division of product development labor (Langlois and Richard 1992; Parnas 1972; Sturgeon 2002; Von Hippel 1990). However, to deliver such benefits products are functionally decomposed (Ulrich 1995) and frozen well before time of production (Baldwin and Clark 2000; Iansiti 1995). In other words, they reflect an up-front understanding of overall product functionality, which makes a temporally stable template for how products can be varied and how they can evolve over time. Although scope is an increasingly important strategic issue in complex product development (Langlois 2003), the inscription of functionality in modular product platforms (Baldwin and Clark 2000; Henderson and Clark 1990) seems to give scale the upper hand.

However, extant research on digital innovation suggests that the interplay between scale and scope is fundamentally different in the emerging digital economy. More precisely, scale advantages in production essentially disappear when anything that is encoded into a digital format can be reproduced instantly without virtually any marginal cost (Benkler 2006; Brynjolfsson and Saunders 2010; Shapiro and Varian 2000). In this vein, niche products do not just become an interesting complement to volume products, but represent a substantial opportunity to set up genuinely new revenue streams and business models (Anderson 2006; Benkler 2006; Boudreau 2012; Brynjolfsson et al. 2010; Brynjolfsson and Smith 2003). To set up a strategy for digital platforms organizations have to shift attention, from developing end-user functions to enabling resources that provide design capability for external developers (Ghazawneh and Henfridsson 2013, Prügl and Schreier 2006).

The importance of scope in digital innovation has paved the way for layered platforms (Adomavicius et al. 2008; Gao and Iyer 2006; Yoo et al. 2010). Such layered digital platforms do not enforce an allocation of a particular functional structure to physical components. Instead, layers are defined and maintained relatively independent from each other, opening up for designers to pursue largely unconstrained combinatorial innovation by gluing elements from different layers using a set of protocols and standards to create alternative digital products (Gao and Iyer 2006). In this vein, reuse is a central aspect of a layered architecture. However, it is not about the reuse of material things, such as tools or physical components. If we listen carefully to the proponents of pattern-oriented software architecture (Buschmann et al. 2008; Gamma et al. 1995) it is not even about the reuse of software components or code, it is about the reuse of ideas. The shared digital platforms, making a center of gravity in innovation ecosystems, offer both a way to identify the core design problems of a particular application domain and replicable rules and building blocks for their solutions (Steenson 2009).

Even though variation and homogeneity are inherent characteristics of digital innovation, scale is a mandatory key to success. The main reason is that digital innovation is an increasingly distributed activity (Yoo et al. 2008), taking place in networks (Boland et al. 2007; Powell 1990; Tuomi 2002) or ecosystems (Kapoor and Lee 2013; Selander et al. 2013; Wareham et al. 2014). Such environments are powered by strong network effects where successful platforms enjoy increasing returns to scale (Cennamo and Santalo 2013; Eisenmann et al. 2006; Katz and Shapiro 1994; Rochet and Tirole 2003). In this context, a platform is simply more attractive the larger is the base of consumers using it. This is sometimes referred to as a demand-side economy of scale (Katz and Shapiro 1986; Parker and Alstyne 2005).

## 2.2 Network Effects in Digital Platform Strategy

Theory as well as practice suggest that the self-reinforcing feedback loop in such demand-side economies of scale sooner or later leads to winner-take-all battles (Evans and Schmalensee 2002),

where "an aspiring platform provider must consider whether to share its platform with rivals or fight to the death" (Eisenmann et al. 2006, p. 99). Opening up the platform is generally viewed as a necessary step to create such momentum around a digital platform. At the same time it could leave its creator with little control and ultimately without mechanisms for appropriating value (Katz and Shapiro 1986; Schilling 2009; Shapiro and Varian 2000). For many product-developing firms unconditional openness is not an option. Cars, heat pumps, and washing machines remain physical products, delivering tangible value. In this context, firms keep exercising product innovation in a "closed" manner, drawing on linear development practices, process control of value chains, hierarchical organizations, and stable modular designs. At the same time, the functions associated with those products are increasingly enabled by software and digital technology, calling for more open innovation environments. Those firms simply have to find ways to combine different innovation regimes (Godoe 2000; Henfridsson et al. 2014; Svahn and Henfridsson 2012). As they seek to introduce digital platforms this leads to a "dilemma of how much is open enough to attract enough buyers while retaining adequate returns" (West 2003, p. 1259). A key question is whether it is necessary to give up control over the platform or if enough momentum can be created just by granting outsiders access to it (Boudreau 2010).

With the winner-take-all strategy essentially out of range product developing firms often have to explore alternative entry paths, not relying on their own capability to grow massive installed base. Extant research is relatively silent on advice, but one strategy promotes the idea of rapidly expanding its innovation network by tapping into an existing platform market. This is referred to as platform envelopment (Eisenmann et al. 2011). In practice, an organization implements such an envelopment strategy "by bundling its own platform's functionality with that of the target's so as to leverage shared user relationships and common components" (Eisenmann et al. 2011, p. 1271). Platform envelopment is often portrayed as a hostile act, where the objective is to capture shares of a market by blocking an incumbent's access to users. As an incumbent is threatened with an envelopment attack it may face no option but to radically change its business models or simply sell off the business.

# 3 Resource Transformation in Platform Envelopment

In essence, a digital platform is an instrument, affording emergence of an unbounded number of product variations and speciation based on a finite number of digitally enabled platform resources (Gaskin et al. 2010; Yoo 2013). In this research we are trying to improve our understanding of how firms act in order to identify and enable those platform resources. In particular, we study how firms may engage in the transformation of existing organizational and technological resources into platforms resources when setting up an envelopment strategy. In doing so, we depart from the resource-based view of the firm (RBV) and its general assumption that competitive advantage primarily lies in the application of a bundle of valuable tangible or intangible resources at the firm's disposal (Barney 1991; Penrose 1959; Wernerfeldt 1984). When seeking to envelop an existing platform the firm is exposed to competition within the new ecosystem. In order to provide sustained competitive advantage RBV predicts that added resources have to be heterogeneous in nature and not perfectly mobile. To remain valuable they should be designed so that they cannot be easily imitated nor substituted without great effort (Barney 1991, p117). In other words, the added resource base has to be highly distinctive relative to its potential rivals. Successfully implemented this may provide lock-in effects on key user groups, while undermining the ability of rivals to do the same (Cennamo and Santalo 2013). This suggests that platform envelopment and distinct positioning together offer an opportunity to rapidly grow and then preserve an innovation ecosystem. Therefore, we hypothesize that:

> *H1: A platform envelopment strategy requires concurrent investments in distictive positioning.*

Whether operating in a product innovation context or seeking to exploit the opportunities in digital innovation, the firm's ultimate objective in a resource-based approach is to achieve sustained, above-

normal returns, as compared to rivals (Rugman and Verbeke 2002). However, when seeking to transform existing organizational and technological resources to be bundled with an existing digital platform firms need to pay careful attention to what they actually afford. As articulated by Edith Penrose (1959) far before the digital age, "it is never resources themselves that are the 'inputs' in the production process, but only the services that the resources can render" (Penrose 1959, p.22). A given resource may afford certain capabilities within the organization, while a decision to transform it may provide other design capabilities to an external ecosystem. Further, a decision to transform a resource might expose conflicts of interest and contradictions as it offers different types of competitive advantage in the existing market compared to the upcoming platform market. Finally, such a decision may be irreversible since the envelopment risks to permanently destroy competitive advantage in the traditional market place. Therefore, we hypothesize that:

*H2: Resource transformation entails careful negotiations of competitive advantage in existing markets and the upcoming platform market respectively.*

# 4 Research Method

Connectivity is an application area where the automotive industry has invested significant efforts over the last couple of years. However, recent developments in software platforms (e.g., Ghazawneh and Henfridsson 2013), technology and innovation management (e.g., Tiwana et al. 2010), and driver inattention (e.g., Engström and Victor 2009) have called for new knowledge on how to design more open in-car platforms for safe connectivity, including governance frameworks and certification procedures. In our research we have studied Volvo Group, a leading manufacturer of trucks, buses, and construction equipment at the global market. Volvo has initiated several research projects over the last couple of years in order to explore the effects of connectivity and digitalization. As part of one of those projects, initiated early 2013, we set up an action design research study (Sein et al 2011), where we engaged with Volvo to transform existing organizational and technological resources into platform resources when seeking to enter the ecosystem around Google's Android. In addition to researchers and Volvo personnel the team also was represented by the car maker Volvo Car Corporation and a consultant firm, with substantial experience in vehicle connectivity. The project was guided by the objective "to design, develop, and evaluate a safe open-source connectivity platform concept for infotainment services and applications that satisfy state-of-the-art safety standards."

On the one hand, Volvo and other automakers need to develop new platform concepts to deal with digitalization and leverage connectivity. At the same time, such new concepts cannot be implemented without major organizational changes. We decided to set up our study as an action design research project (ADR) to be able to concurrently generate prescriptive knowledge on platform design and address the problem situation encountered in the organizational setting. ADR opened up for iterative research and learning on designing, developing and evaluating a safe connectivity application platform, within a reflective process model. The social interaction within the ADR team unfolded as a cyclical cognitive process, making it possible for us to access the organization's mindset, decisions and practices.

## 4.1 Data Collection

The ADR team was embedded in Volvo's ordinary operations and followed the firm's different moves at a close distance. Data collection started fall 2013 and will continue until summer 2015. The first author of this paper has been deeply engaged in problem solving and collaborative meetings across the whole period. Our main data sources derive from such events. Notes were taken in each project meeting. Up until now 21 meetings and five workshops have been recorded, although not all of them are transcribed at this point. Further, actions and decisions were described and registered in an online project database. Since the beginning of our study 55 individual actions and 150 decisions are registered. To assess and follow up the consequences of the ADR team's work we have also made 32 semi-structured interviews with developers and managers within Volvo Group, independent third-

party developers, and external alpha testers (Table 1). Minute of meetings is another important data source in our study, contributing with condensed project summaries on a weekly basis. All in all, notes from 17 meetings are used in our analysis.

| Categories | Number of interviews | Length | Transcribed |
|---|---|---|---|
| Volvo staff | 8 | 4:06:10 | 4 |
| Third Party Developers | 7 | 3:37:57 | 3 |
| Alpha Testers | 17 | 7:02:17 | 17 |

*Table 1. Overview of interviews.*

# 5 Preliminary Results and Future Work

## 5.1 The first ADR cycle

This ADR project took off from a relatively nuanced and informative problem formulation. In essence, the team should address the contradiction between, on the one hand, enabling the business prosperity of open in-car platforms and, on the other hand, the unconditional need to fulfill safety requirements. In response to this initial problem formulation a project objective was defined, requiring the team to "design, develop, and evaluate a safe connectivity platform concept, i.e., the overall philosophy and design of a set of resources with which to generate derivative infotainment services and applications that satisfy state-of-the-art safety standards". When initially engaging in the building of a new platform concept the team focused its attention on how to provide design capability, which in the hands of external developers would generate safe applications. To create such capability the ADR team experimented with the transformation of several existing organizational and technological resources. A notable example was the work with a so called 'metronome app'. In this experimental move Volvo tried to package its existing knowledge on how safe car drivers switch their attention between the primary (driving) and secondary tasks as a tool to be used in software development. Volvo Group had invested considerable efforts in capability to measure driver distraction in practice. One method was based on a so called occlusion test. Applied in simulators it allowed for interaction to be blocked and thereby enforce certain use pattern that could be evaluated in detail. The team could see that this method would be far too complicated for an open platform and, on top of that, developers would most likely perceive it as enforced by Volvo. A senior expert in human-machine interaction (HMI) suggested an idea for transforming this internal resource into a simple tool for developers. He called it a 'metronome app':

> *A simpler version of this [Occlusion safety test] is to measure total task completion time at the same time as glances are controlled by a metronome set at 1.5s on/off road. This may be easier.*

The metronome app would be a platform resource allowing external developers to continuously test driver distraction of different solutions in very simple manner.

As new candidates for resources providing design capability emerged the ADR team started to consider organizational interventions. How would those resources eventually play out in an external community and how would the internal organization be influenced? Trying to better understand such organizational implications, the team engaged in an evaluation of a wide range of existing platform concepts. All in all, the ADR team studied 22 different platform solutions, such as Genivi, BMW ConnectedDrive, Renault R-Link, and Android. Performing this assessment it soon became obvious that while the different platforms provided similar technological conditions for packaging resources and eventually offering resources to a community, they differed significantly in how easy it would be to use them. As a member of ADR team the first author of this paper interviewed a range of internal experts to identify pros and cons of each platform candidate. A strategy and technology leader, with previous experience from IT consulting, was a strong proponent of Android:

> *One [benefit] is that there is an existing open source SDK so you can get up to speed very quickly. A lot of developers and applications are already implemented in Android. So we need very little 'fresh oil' for running it.*

As a result of the platform evaluation the ADR team shifted its attention towards entry barriers. Without low entry barriers, where developers could easily and rapidly engage in the development of safe automotive applications there would be no community. The team saw that environments where developers have to invest in new tools, knowledge, or other assets would inevitable drive people away from safe automotive development. As reflected in the meeting minutes, this made a strong argument in favor of Android:

> *Android is a mature application platform and open source, which means that it seems like an obvious choice for anyone, looking for an application platform.*

Turning to reflection and learning, the ADR team found it critical to build an initial installed base and eventually they decided to design the new platform on the basis of Android. In other words, the first ADR cycle had indicated that a firm, such as Volvo, might address the need to build installed base by tapping into another platform market. However, to exercise influence through this platform Volvo would have to bundle its own resources with the resources offered by the target platform. Such platform envelopment would then leverage shared user relations and common components. With the decision to adopt Android, the ADR team fine-tuned and extended the problem formulation. The new envelopment strategy forced the ADR team to look beyond just providing design capability. Suddenly, it was obvious that they would have to compete over developers with other actors, including Google. Therefore, the team shifted attention to better understand how resources could be transformed for the purpose of competitive advantage.

## 5.2 The Second ADR Cycle

When entering a second ADR cycle the team zoomed in on how they could extend the Android platform with resources that where distinctly different compared to other resources in the Android ecosystem. How could they attract developers' interest by simply offering them interesting and yet relevant stuff they had never been able to play around with before? Would it be possible to make the non-negotiable constraints of safety an asset, rather than a problem? To get a kick-start of the second cycle the ADR team investigated a possible collaboration with another initiative – the Automotive Grade Android (AGA) project. This project also experimented with an envelopment strategy, but with a software engineering focus on application programing interfaces (API) and software development kits (SDK). As reflected in the meeting notes, the ADR team saw an opportunity in the fact that AGA developed a "Vehicle API giving possibility for App developers to access vehicle data". The team recognized that "this task is in our project scope as well". However, AGA also offered easy access to a whole range of other concrete platform resources, such as a distraction level API and a simulator for development. Seeing the value of this the ADR project decided to join forces with AGA.

When starting to think about the organizational interventions associated with the inclusion of AGA resources, the team identified a need to complement and extend. Volvo's global application SDK coordinator argued that "the choice of going with Automotive Grade Android allowed us to focus more on the safety and driver distracted related user stories". However, it was still unclear how such stories should be constructed to guide the design of the new platform. To shed some light on developer expectations the ADR team recruited 7 external developers for informed discussions. These developers were interviewed on their experiences from existing ecosystems, such as Android, iOS, and Windows mobile. As a salient example of those interviews, the ADR team learned that information about the end-user would be a much-appreciated resource. In the case of a Volvo platform that would mean detailed knowledge about a truck driver's daily tasks and responsibilities. Turning their attention inwards, the team found that this type of resource was viewed as a highly valuable asset, developed through focused business analysis and carefully protected. Packaged in the form of brand personas,

Volvo Group used it to guide product development in its different subsidiaries. As described by the application SDK coordinator "Volvo has spent a lot of time and resources to collect the data and create these personas". It was obvious that any attempt to distribute them as public resources in an open platform would meet considerable resistance.

Although it seemed hard to transform existing knowledge on end-users into platform resources, user stories kept playing an important role in the ADR team. To increase their own understanding of how to best support developers in their work with safe application development they created a range of concrete user stories. Now the notion of user referred to developers as users of the platform. One such user story was summarized:

> *As a developer I want notifications from the vehicle that are of interest from a safety perspective so that I can show different views depending on situation.*

This particular story identified a need for concerted HMI management. A shared platform resource, continuously assessing safety risk levels, would reduce the burden on application developers substantially. Eventually, this user story resulted in a complementary Safety API, providing real-time access to in-car resources, such as preferred interaction modalities. In practice, that opened up for applications exercising run-time selection of appropriate interaction sources, such as video, images, sound, and text.

As a final activity the resulting platform resources were evaluated by alpha testers on the basis of a university programming course. 172 students were working with application development in Android, particularly focused on the resources provided by the ADR team. The students were given the broad assignment to "create innovative and original software applications within the area of safe connectivity". Eventually, the output was presented to a jury, evaluating applications on the basis of well-defined criteria and pairwise comparison, using IBM Focal Point. At the time of writing, the ADR team is engaging in a first assessment of this activity.

Although the detailed analysis of our data is still in progress our preliminary findings deliver some tentative support for our hypotheses. When arriving at the decision to adopt Android the ADR team shifted its focus and invested considerable energy in distinct positioning. In the literature distinctive positioning (Cennamo and Santalo 2013) and platform envelopment (Eisenmann et al. 2011) are presented as two alternative entry paths for building an ecosystem with critical installed base. Drawing on the preliminary evidence from this research we suggest that those two strategies are interdependent, at least in cases where the platform is open and non-proprietary. In this setting, an enveloper may even be welcomed as long as it invests in distinctive positioning. We intend to collect and present more evidence on this topic as we proceed with our research.

When it comes to our second hypothesis we have witnessed a growing interest at Volvo for understanding how competitive advantage may be achieved in an external ecosystem. Further, our study illustrates that such competitive advantage has to be created on different premises, compared to the traditional business environment. The ADR team's activities were experimental and therefore established practices have not yet been explicitly challenged. Still, as demonstrated by the attempt to draw on existing brand personas to support external developers, the resource transformations accomplished rendered resistance from the existing organization. This suggests that an upcoming platform business will come at a price, to be paid by the traditional business. Drawing on our preliminary results, we argue that resource transformation generally entails careful negotiations of competitive advantage in existing markets and the upcoming platform market respectively.

In addition to following up our two hypotheses we also intend to dive deeper into theoretical explanations of how different resource provide competitive advantage. Drawing on the resource-based view of the firm we intend to develop a theoretical model for how to understand resource transformation in platform envelopment and outline how this model can be used to derive practical guidelines for platform design.

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