Platform Leaders in the Japanese Automotive Industry

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Abstract

Managers may ask themselves how to establish their firms as platform leader in an industry, they will however find few models or guidelines to their interrogations. This paper brings together the recent literature to identify internal and external factors responsible for a platform success on a managerial perspective. To question, investigate and validate these factors, we choose the Japanese automotive industry as field of study. After having operated for more than four decades on the same model, Japanese OEMs are now confronted to the disruption of their markets by new actors such as Google, Apple and Amazon. These players are leveraging their know-hows as platform leaders to literally threat incumbent OEMs on their own markets by developing mobility ecosystems. With the emergence of autonomous and connected vehicles, could Japanese OEMs become platform leaders in a mobility ecosystem?

First, we define internal factors as the capacities of 1) delivering a product platform with a critical mass of user guaranteed by both its value propositions and hybrid strategies, 2) managing the platform and the ecosystem through a vision and 3) orchestrating associated organizational changes to insure the platform coherence and circumvent internal tensions. We identify external factors as a set of organizational human assets arrangements, legal frameworks and government roles regarding mobility ecosystems.

Second, we summarize the confrontation between field observations and the theoretical framework by conducting qualitative interviews.

Third, these studies put forward the hardware commoditization which steers middle-class Japanese OEMs to drastically transform their models. However, no clear visions or directions are given by Japanese OEMs regarding their positions in mobility ecosystems. We highly recommend to managers to define their strategies within these ecosystems before being overwhelmed. This although may not be simple as we detect signs of over-conservatism in Japanese OEMs. By neglecting this issues, automakers may be subject to the Kodak effect by being unable to take strategic business decisions for the sake of their current business. Although vision is needed to help managers to define their positions in ecosystems and prevent over-conservatism, the Japanese management does not favor the elaboration of disruptive visions thus slowing down their capacities to react to new competitors.

Finally, the unclear position in mobility ecosystems, the over-conservatism posture and the impact of Japanese management to formulate disruptive visions expose middle-class OEMs in Japan to not be in capacity to establish themselves as platform leaders for the time being. Comparative studies with new competitors in the automotive industry is however needed to fully comprehend the impacts of these results on the Japanese automotive industry.

Contents

To Japan and its inhabitants that inspire my everyday life.

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0 Introduction

The Japanese automotive industry is one of the most fascinating and prominent industries in the world. Its production system that has shaken the Ford system since the late 1970s was extensively and thoroughly studied. However the automobile marketplace has never been as saturated as today, which an annual growth rate down to only 3.1% from 2014 to 2019 in global light vehicle sales compared to 4.7% from 2008 to 2013 (Fulthorpe, 2015). This is also the case for the Japanese automotive industry with a drop of 11.7% in passenger cars from 2014 to 2016 (JAMA, 2017).

Moreover, big players in ICT such as Google and Amazon are currently threatening to disrupt the automotive market by offering new mobility solutions especially through connected and autonomous vehicles. These new players are mostly platform leaders in their industry and have the know-how to quickly build up a new ecosystem. Therefore, it is not surprising that such companies attempt to develop their own ecosystem within the automotive industry. As an example, the Open Automotive Alliance is promoting the Android platform to cars since 2015. The mobile industry evolution has etched in everyone's mind the potential of these platforms especially with marketplace such as the Apple Store or Google Play. In response to such threat, most OEMs are developing their own ecosystem and platform as platform leader. Any failure to do so may expose these automakers to lose control over their own business model.
The auto manufacturing and related industries represent 8.3% of the total workforce in Japan (i.e. 5.34 million of employees) and is one of the core industry with 17.5% of the total value of Japan's manufacturing shipments (JAMA, 2017). The success of this industry is therefore a social and economic concerns for Japan.

Nonetheless, the capacity of the Japanese automotive industry to successfully compete against new ecosystem should not be taken for granted. This may be especially the case for

Japanese automakers which are now operating on the same model for four decades. With the emergence of autonomous and connected vehicles, could Japanese OEMs become platform leaders in a mobility ecosystem?

The hypothesis that the capacity to become platform leader in an ecosystem can be modeled by both internal and external factors to the firm is the basis of this paper. It is also considered that Japanese OEMs are targeting the position of platform leader to protect the control over their business model and their position of leader in the automotive industry.
This thesis aims to provide a comprehensive model to understand and analyze the emergence of an industry platform. Indeed, economic literature still have not tackled this topic as it often assumes that platform already exists (Annabelle Gawer, 2014). An understanding of Japanese OEM's position and maturity toward industry platform is also a huge ambition of this paper.

First, we develop the definition of the term "platform leader" and "mobility ecosystem" which could be misleading. Second, we construct a theoretical framework by identifying both internal and external factors influencing the success of an industry platform. The literature will give us first insights in regard to the capacity of Japanese OEMs to become platform leader. Third, the established model is our basis to conduct qualitative interview with expert in the automotive field. Hopefully, the synthesis of the literature and the field observations will result in a pertinent analysis. Finally, we identify potential practices to enhance Japanese OEM's potential to establish itself as platform leader in a mobility ecosystem.

1
Literature Review

1.1 Platform and Mobility Ecosystem

To begin with, some clarification in the terms used is needed. This section includes a state-of-the-art analysis of the literature and the main perspectives concerning the platform and mobility ecosystems.
As this thesis is constrained by time, we are taking as starting point a work from TUM[1] with an excellent literature review based on the guidelines by Webster and Waston (Omer Uludag & Matthes, 2016; Jane Webster, 2002).

1.1.1 Platform and ecosystem definition

In this section we are using the definition of platform terms Table 1.1. This is giving a good overview of the leading scholars as well as the most relevant terms concerning platform and ecosystem in the literature. To have a comprehensive and a global vision on the current research concerning the platform concept and the mobility ecosystem, we are giving in this section a short description of the different research streams.

Baldwin and Woodard's perspective (Carliss Y. Baldwin, 2008)

Baldwin and Woodard attempt to define the term "platform" and identify three major concepts: product development, technology strategy and industrial economy.

Product development: This stream of research is related to product platform where the platform is the basis for different products by modifying features. A first definition is given

[1] Technische Universität München

Articles and Authors	Terms defined					
	Platform	Platform Ecosystem	Seconday Developer	Customer	Platform Architecture	Platform Governance
Baek et al.	X		X	X		
Bakos and Katsamakas	X					
Baldwin and Woodard	X				X	
Basole and Karla	X					
Boudreau	X					
Boudreau and Hagiu	X					
Ceccagnoli et al.	X	X				
Cusumano	X	X	X			
Cusumano and Gawer					X	
Eisenmann et al.	X					X
Eisenmann et al.	X		X	X		X
Evans	X			X		
Evans and Schmalensee	X					
Gawer	X					
Gawer and Cusumano	X		X			
Greenstein	X					
Hidding et al.	X					
Jansen and Cusumano	X					X
Le Masson et al.	X					
Manner et al.						X
Parker and van Alstyne	X					
Rochet and Tirole	X					
Scholten and Scholten	X					
Suarez and Cusumano	X					
Tatsumoto et al.	X					
Tiwana	X		X		X	X
Tiwana et al.	X				X	X

Table 1.1: Definitions of Platform Terms in Literature (Omer Uludag & Matthes, 2016)

by Wheelwright and Clark who state that product platforms ”meet the needs of a core group of customers but [are designed] for easy modification into derivatives through the addition, substitution, or removal of features” (S. C. Wheelwright, 1992). This is for instance observed in the automotive industry, an ECU [2] is developed as a platform and then product projects modify this platform according to the customer’s needs. Meyer and Lehnerd nuance by defining a product platform as ”a set of subsystems and interfaces that form a common structure from which a stream of derivative products can be efficiently developed and produced” (Marc H. Meyer, 1997). The development and production efficiently can lead to the combination of ”scale economics and product differentiation at the same time” (Ahmad Ghazawneh, 2012).

Technology strategy: This concept focuses on platforms that are at the centre of an industry. A platform is thus a ”valuable point of control (and rent extraction)”, common examples are Microsoft, Intel or Cisco (Carliss Y. Baldwin, 2008).

Industrial economist: Industrial economist have also used the term ”platform” to define products, services, firms or institutions that serve as intermediates between two or several groups of agents, making them ”multi-sided” (Jean-Charles Rochet, 2003). This especially emphasizes on the concept of network effect or cross-group network effect defined by Hagiu and Wright as follow: ”a cross-group network effect arises if the benefit to users in at least one group (side A) depends on the number of other users in the other group (side B). An indirect network effect arises if there are cross-group network effects in both directions (from A to B and from B to A)” (Andrei Hagiu, 2011). This effect can also be negative, as for example the more users on a roadway, the less useful it becomes for each of them (Omer Uludag & Matthes, 2016).

Gawer’s perspective (Gawer, 2014)

In contrast to Baldwin and Woodard, Gawer classifies the literature into two major streams: engineering design and economics. Arguing of these streams limitations, Gawer bridge the difference between both with an unified view defining platforms as ”evolving organizations 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 modular technological architecture composed of a core and a periphery”. These platforms could be categorized in three types: internal platforms, supply-chain platforms and industry platforms (Gawer, 2014).

[2] An Engine Control Unit is an electronic card that controls a series of control mechanisms in a car

Manikas and al's perspective (Konstantinos Manikas, 2013)

Another wave of research defines a software ecosystem as follow: "we define a software ecosystem as the interaction of a set of actors on top of a common technological platform that results in a number of software solutions or services. Each actor is motivated by a set of interests or business models and connected to the rest of the actors and the ecosystem as a whole with symbiotic relationships, while, the technological platform is structured in a way that allows the involvement and contribution of the different actors" (Konstantinos Manikas, 2013). This definition is one of the most detailed found in the literature and clearly focuses on the software industry with companies or open-source organizations such as Google, SAP or Linux.

Gawer and Cusumano's perspective (Annabelle Gawer, 2014)

This definition classifies platforms into 2 categories: internal and external platforms. An internal platform is defined as "a set of assets organized in a common structure from which a company can efficiently develop and produce a stream of derivative products". It encompasses the "product platform" defined by Baldwin and Woodard and the special case of a supply chain platform. In the supply chain platform "a set of firms follow specific guidelines to supply intermediate products or components to the platform owner or the final product assembler" in order to reduce costs and improve efficiency. An external platform emphasizes on the existence of complementors and the network effect. It is defined "as products, services, or technologies that act as a foundation upon which external innovators, organized as an innovative business ecosystem, can develop their own complementary products, technologies, or services". This platform is manageable contrary to a dominant design and leads to the terms "platform leaders" which is a firm or group of firms that coordinate agents in the complex system industry (Annabelle Gawer, 2014).

Chosen perspective

In regards to this paper, we choose both the Gawer and Cusumano's and Manikas and al's perspectives. The concept of internal and external platforms is especially relevant in the automotive industry, where a clear contrast exists between the supply-chain and external platforms. Moreover, the terms "manageability" and "platform leader" are relevant to our research and will be subject to an extended development is this paper. The software ecosystem is for us a means to define what a mobility ecosystem is. This allows us to base our definition of an ecosystem on the exhaustive and scientific literature review of Manikas and Hassen.

The 1.1 gives an overview of the platforms concept and their overlapping areas.

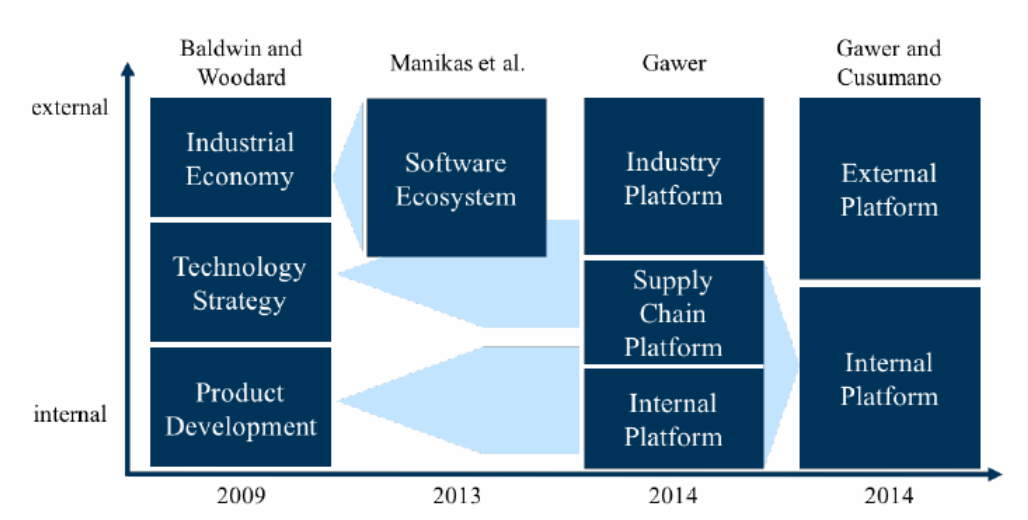


Figure 1.1: Comparison of Different Platform Classification Schemes and their Overlapping areas (Omer Uludag & Matthes, 2016)

1.1.2 Platform leader definition

After a brief review of the major streams on the platform and ecosystem literature, we are now focusing on the definition of a platform leader. To be able to analyse the Japanese OEMs position, we characterize what is a platform leader in both an internal and an external platform. The starting point for these definitions is the work of Gawer and Cusumano (Annabelle Gawer, 2014). This basis is extended and detailed within the specific institutional characteristics of Japan as well as examples from the automotive industry.

Internal platform

Internal platform is not a new concept and as early as 1854, Brow described the ”rigorous program to standardize locomotive parts. Now standard components could be used across a number of Baldwinstandard engines or even in custom designs” of the U.S. locomotive manufacturer. As stated earlier, a ”product platform” is developed to meet customer needs by merely modifying, adding or subtracting different features. The benefits of such platform are well identified by scholars: fixed costs saving, product development efficiency by the reusing of common parts and design modularity. One of the main objectives when developing a platform product is to provide a large product variety and answer diverse customer requirements while maintaining economies of scale in the manufacturing process (Annabelle Gawer, 2014).

Platform products are today largely present in the automotive industry. The shift between the Ford Production System (FPS) and the Toyota Production System (TPS) can be interpreted as

a shift from a ”linear product” to a ”platform product”. It is however interesting to note that in this case the platform product is not the product itself, but the production system. Indeed, the just-in-time production system can be viewed as a means to meet diverse customer needs by simply modifying, adding or subtracting quantity in the production line thanks to the Kaban (Ohno, 1988).

Furthermore, internal platform tends to promote only incremental innovation because of the systematic or planned reuse of modular components (Annabelle Gawer, 2014). This is especially true for Japanese OEMs where the culture tends to favor incremental changes rather than disruptive ones (Aoki, 2001).

Definition 1.1.2.1. *A platform leader in a supply-chain platform, by simply modifying, adding or subtracting a component:*

- *Creates a large product variety and/or address diverse customer needs*
- *Improves efficiency and/or reduce cost*
- *Is inclined to incremental innovation*

The supply-chain platform is defined as a special case of an internal platform, where ”a set of firms follow specific guidelines to supply intermediate products or components to the platform owner or the final product assembler”. This platform allows to find innovative and less expensive components or technologies, but give firms less control over these components and technologies (Annabelle Gawer, 2014). This is the case in the automotive industry where OEMs are platform owners and suppliers are Tier 1, Tier 2 and Tier 3 as represented in Figure 1.2 (Michael Romer, 2016).

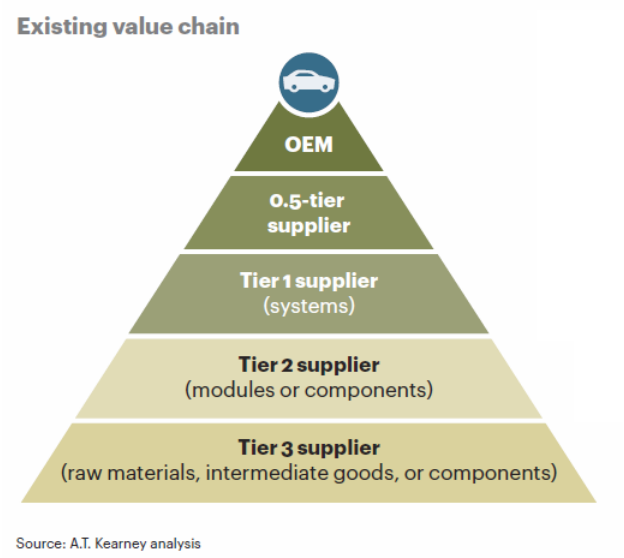


Figure 1.2: Automotive industry supply-chain (Michael Romer, 2016)

Japanese Keiretsu can also be seen as a form of internal platform in an supply-chain framework. An analysis on the information communication arrangement of these organizations gives insightful guidance to the definition of a platform leader. OEMs in a Keiretsu process systemic information of the environment, such as customer needs or market trends. They then communicate these information to suppliers through contextual information sharing, and so does the Tier 1 for the Tier 2. Thus the flow of the information between each supplier is done by a hierarchical decomposition. Moreover, Tiers 1 are in competition with each other and thus internally encapsulate the information so competitors do not get access to it. The information encapsulation is also a means to increase the incentive of suppliers to provide high efforts in the components conception. (Aoki, 2001). Thus, OEMs in a Keiretsu can be viewed as platform leaders because they strongly manage the direction of the platform, which interfaces are standardized and at which degree these interfaces are open to suppliers.

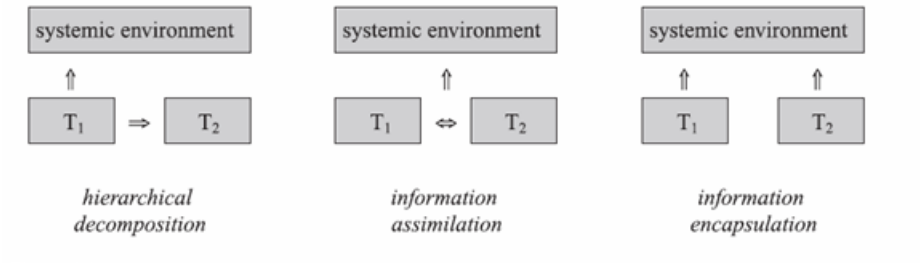


Figure 1.3: Different types of information communication (Aoki, 2001)

Definition 1.1.2.2. *A Japanese platform leader in a supply-chain platform (Keiretsu) plays an essential role in the communication of systemic information in the platform through contextual information sharing.*

External platform

To remember Gawer and Cusumano's definition, an external or industry platform is "products, services, or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects" (Annabelle Gawer, 2014).

An external platform is similar to an internal one as both include a common component upon which diverse product and needs are developed and answered. However, an external platform differs from an internal platform because this foundation is "open" to outside firms. This openness resonates with research on open innovation (Chesbrough, 2003; von Hippel, 2005). Nevertheless, the complex trade-offs between "open" and "closed" is difficult to be reached. A platform leader must not expose too much of its intellectual property in the public space, but at the same time must cooperate with external firm to incentivize them into participating in the platform (Annabelle Gawer, 2014).

The ”dominant design” concept is close to the industry platform concept. A dominant design sets standards for what form and features a user may expect from a product in the future. An external platform is however manageable in contrary to the dominant design that emerges from the industry evolution. This manageability allows organizations to purposefully bring multiple parties in the industry, especially users and complementors (Annabelle Gawer, 2014).

An industry platform is also often associated with an innovative ecosystem. Complementors to a platform add value to it by creating and designing new technologies and products around the platform core component. Instead of being a designer or assembler, we are starting with a core component which is a part of a modular architecture. The final result is either unknown or incomplete before its final realization. This is why an external platform is fundamentally an innovative ecosystem, as the result includes inevitably some innovation in regard to the core component (Annabelle Gawer, 2014).

The competition question arise from the concept of external platform. The position of industrial leadership is often discussed and lost when industry platforms emerge. This is because of the balance of power between assemblers and component makers is alternated which gives new opportunities to suppliers. In the automotive industry, Tier 1 such as Valeo, Bosch or Autoliv are thus in a good position. The potential network effect acts as an entry barrier because the growth in adoption blocks other competitors to enter in the market.

The competition extends from a firm to an ecosystem, where the most likely winner is not the most elegant design or the dominant design originator but the one that (Annabelle Gawer, 2014; Michael Romer, 2016):

- performs a function that is essential to a broader technological system
- solves a business problem for many firms and users in the industry

The governance of platform ecosystem must also be carefully analyzed. Indeed, to sustain the members incentives to invest and product complementary innovations, the industry platform leader may for example reinforce the members business models or implement non-price mechanisms. These methods are not usually practiced by industrial managers and thus deeply transform the current governance of incumbent firm which include OEMs.

The coherence of a platform is difficult to maintain as one should carefully avoid to enter as a competitor in a complementors market to keep the complementors incentives to innovate. This is even more difficult as these decisions are taken by different business units in the organization. Thus the top management awareness of the link between these decisions and a process to coordinate them between organizational silos are needed to manage the platform’s coherence. In order to ensure this coherence, a firm or a small group of firm can act as platform leader for the entire industry.

Definition 1.1.2.3. *An industry platform leader (one firm or a limited group of firms) provides a core component on which complementors innovate to develop new products or services. A platform is manageable and thus can be purposefully designed to attract multiple parties. The platform's governance and coherence must be carefully managed to sustain the complementors incentive to innovate.*

A platform leader could also be a Third-Party Information Mediation defined as a "quasi-organizational architecture in which task units (T2's) encapsulating operational information assimilate a modicum of systemic information through a third-party intermediary (T1)" (Aoki, 2001). The technological environment of these firms is in most cases highly correlated and their innovation efforts are substitutable. In this case, their information processing needs to be encapsulated to stimulate the innovation and the efforts provided by each firm. Moreover, Aoki has also stated that "in order for an evolutionary selection of modular, component products to form an innovative technological system, only common standards for interfaces, as well as a common protocol for data transmission, among them, needs to be provided" (Aoki, 2001).

An example of a Third-Party Information Mediation is the Silicon Valley. On one hand, venture capitalists are mediating systemic information among entrepreneurial firms about the evolving standard and the end-product system. Their role are less important than a manager and are more apart from the firm than in a classical hierarchical organization. However, they are playing a unique governance role in this system. On the other hand, entrepreneurial firms are all in competition for the best innovation. Their incentives are kept ongoing thanks to a strong potential gain rising at each round till a final IPO[3] (Aoki, 2001).

We are clearly seeing some similarities with an industry platform leader which is providing a core component to form an innovative technological system. Furthermore, complementors (resp. entrepreneurial firms) are competing between each other by encapsulating information and are cooperating with the platform leader to get systemic information (resp. venture capitalist). Contrary to an entrepreneur, the incentive of complementors are sustained by a range of mechanisms such as access to a specific market (Apple Store) or to new opportunities by innovating upon the core component (Google Map).

Definition 1.1.2.4. *The organizational architecture of an industry platform is a Third-Party Information Mediation. Each complementor is encapsulating operational information and assimilates systemic information from the industry platform leader.*

[3] Initial public offering

Mobility ecosystems

To begin with, we take as a starting point the definition of a software ecosystem from Manikas *et al.*. In order to adapt this definition for a mobility ecosystem, we are changing two terms. First, the ”technological platform” term is extended to the ”industry platform” term. Although an industry platform is often based on a technological component, it cannot but be reduced only to this aspect, thus the term ”technological platform” is reducing too much what an industry platform is. Secondly, the term ”software” is replaced by the term ”mobility” as this change do not affect the essence of the definition. Although this definition adaptation is not scientifically rigorous and may need further investigations, the result is consistent with our previous definition of an industry platform.

Definition 1.1.2.5. *A mobility ecosystem is the interaction of a set of actors on top of a common industry platform that results in a number of mobility solutions or services. Each actor is motivated by a set of interests or business models and connected to the rest of the actors and the ecosystem as a whole with symbiotic relationships, while, the industry platform is structured in a way that allows the involvement and contribution of the different actors (Konstantinos Manikas, 2013).*

To have a better understanding of what a mobility ecosystem is, we are now focusing on what are its actors and their relationships. Instead of having a pyramid value chain as in the supply-chain platform, the mobility ecosystem is more a hub-and-spoke arrangement. The end product is still the center of attention however it is surrounded by an indispensable and interconnected ecosystem: OEMs, Tier-x suppliers, device manufactures, telecom companies, on-line players and IT suppliers (Figure 1.4) (Michael Romer, 2016).

Figure 1.4: Hub-and-spoke (Michael Romer, 2016)

Moreover, the value of an average vehicle is shifting from 90% hardware and 10% software to 40% hardware, 40% software and 20% content (Michael Romer, 2016; Adam Jonas, 2014). Thus the mobility ecosystem is even closer to a software ecosystem and gives us more confidence to the above definition. The software and content providers are expected to have higher margins and candidates to lead this sector are technology companies with application and operating system expertise. These companies already rely on an industry platform such as Apple, Google and Microsoft and are as strong as a top OEM such as Toyota. Although OEMs are still dominating automotive hardware, commoditization and the high decrease in value share put considerably their profit at stake. Therefore this environment raises questions about the capacity of OEMs to lead this ecosystem and to not become a mere hardware supplier (Michael Romer, 2016; Adam Jonas, 2014).

Hypothesis 1.1.2.1. *The average vehicle value is shifting from 90% hardware and 10% software to 40% hardware, 40% software and 20% content.*

Among OEMs five categories stand out: luxury OEMs, middle-class OEMs, low-cost OEMs, Tier 1 suppliers and wild cards. Luxury OEMs and Tier 1 suppliers are in better positions to reach new growth opportunities. On one hand, luxury OEMs could capture the first-mover advantage has autonomous systems are likely to appear first in luxury cars. On the other hand, Tier 1 suppliers have the opportunities to shift their added value from hardware to software with hardware components supporting it. Middle-class OEMs are in the most precarious position. Where luxury OEMs and low-cost OEMs can provide the best of the two worlds that appeals to a large base of customer, middle-class OEMs can have trouble to find their value proposition with a price range too low for early adopters but too high to sustain them as the technology becomes a commodity. Furthermore, middle-class OEMs heavily rely on economies of scale and thus if their market share happens to be reduced the profit margin of these firms will suffer a strong loss (Michael Romer, 2016).

1.2 A Theoretical Model of Internal Factors

We have seen in the previous section that OEMs in the new mobility ecosystem may struggle because of the hardware's commoditization and the lower share value of hardware in vehicle. Middle-class OEMs are especially at stake because of their difficulties to compete between the best of the two worlds: the luxury and low-cost OEMs. As middle-class OEMs heavily relies on economy of scale, a fall in market share will lead to considerable profit loss.

Japanese OEMs are in a delicate situation as most of them belongs to the middle-class OEMs. In the worst case, these OEMs could not be in position to negotiate with a platform leader if their room for maneuvering becomes limited. They therefore may lose the control over their own business models. Whether defending its own business model or depending on a platform leader's model is good or bad, be unprepared to that shift can only be detrimental. Will the

Japanese OEMs be in position to coordinate a mobility ecosystem?

In this section, we elaborate a theoretical model to analyze the Japanese OEMs potential as an industry platform leader in the mobility ecosystem. One of the challenge to define our model is that the literature still has not a precise understanding about how industry platform emerges, maybe because of methodological limitations involved when attempting to follow the emergence of unknown entities (Annabelle Gawer, 2014). We may be able to follow objects as they emerge by utilizing design theory methodologies, however our studies are spread over a too short period of time to use these theoretical and methodological backgrounds. To compensate this lack of scientific literature, we choose to include white papers and academic articles in our literature review to construct this model.

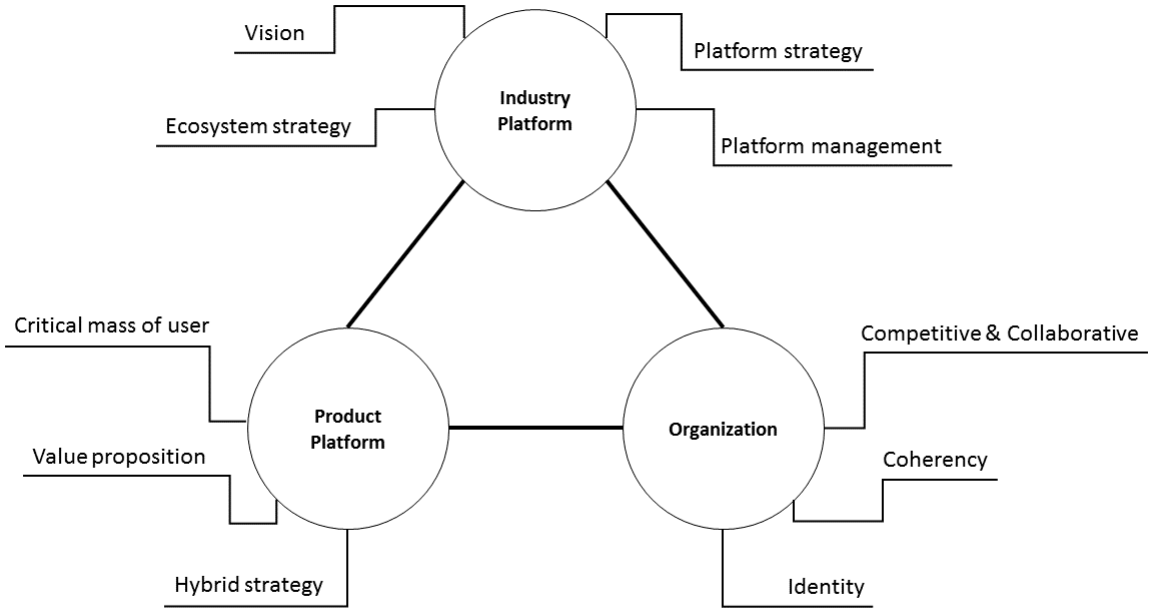


Figure 1.5: Internal Factors Model

1.2.1 Develop product platforms

The first factor to create a successful industry platform is to keep a defensible product. Indeed, building a platform do not magically improve a bad product and make it a success. An industry platform starts with a product that claims a critical mass of user and that provides enough value to keep this customer base from defecting to competitors. An important aspect of an external platform is also to develop a network effect. A critical mass of user is needed to

stimulate the complementors incentives to create value on the platform. For instance, in the gaming industry, console providers develop their own brand games to insure a critical mass of users and thus attract third party game developers on their platforms (Feng Zhu, 2016).

Japanese OEMs are in a good position considering critical mass of user with 25 million of produced vehicles worldwide representing 26,8% of the global production in 2016[4]. The manufacturing challenge doesn't seem to have changed since the Toyota Production System, i.e. produce a wide range of diversity while maintaining the economies of scale. The production system is still one of the core competency and a major source of competitiveness and profit for OEMs, thus having a significant impact on their capacities to become platform leaders.

Moreover, Japanese OEMs should carefully design their value proposition as low-cost and luxury OEMs are threatening their market share by offering the best of the two worlds (Michael Romer, 2016). In many industry platforms the core component's main value comes from the core competency of the platform leader. For instance, Apple counts on its design capability, Amazon on its logistic strength (Feng Zhu, 2016).

Hypothesis 1.2.1.1. *With the increasing competition from low-cost and luxury OEMs which is threatening middle-class OEMs market share, automakers must review their value proposition to have a defensible product and forge a critical mass of user for their platforms.*

Hypothesis 1.2.1.2. *A defensible product and a critical mass of user is needed to build an industry platform.*

Production system

Automakers are rethinking their manufacturing strategy in response to the increasing pressure from competitors.

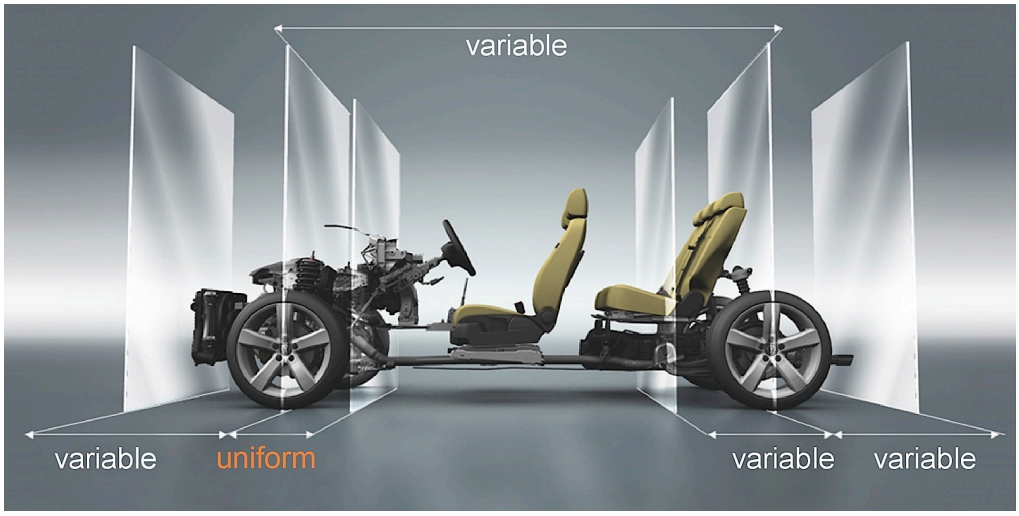
On one hand, OEMs are forming alliances with other vehicle manufacturers to attempt to merge their manufacturing plants. This is clearly seen with the Renault-Nissan-Mitsubishi alliance to leverage economies of scale to the same proportion of top OEMs such as Toyota and Volkswagen. To a lesser extent, Toyota and Mazda are also joining their forces to build a assembly plant and work together on electronic vehicles. These alliances point out the middle-class OEMs dependence on economies of scale. Although this production system could be reconsidered due to a worldwide slowdown in the auto sales growth. The estimated CAGR for global light vehicle sales from 2014 to 2019 is only 3.1% compared to 4.7% from 2008 to 2013 (Fulthorpe, 2015). The current trending for ecological and autonomous vehicles may maintains the current sales growth as well as the increasing demand from China and other emerging countries. Whether the car number will decline in the future decades or not is not

[4]OICA database. Japanese OEMs represented: Toyota, Nissan, Honda, Suzuki, Mitsubishi and Isuzu

clear for the moment.

On the other hand, some OEMs are trying to develop megaplatform by drastically reducing the number of platforms on which vehicles are built. Major automakers are using an estimated 277 individual platforms in 2005 and this is forecasting to fall to 195 by 2020. The leader on this concept is Volkswagen with its MBQ platform. This platform is based on a chassis which can be extended to for example insert different standardized motors. PSA and Daimler have launched similar modular architecture, whereas Toyota, BMW and General Motor has planned to deliver same attributes in the future. This architecture increases the economies of scale and the manufacturing flexibility while reducing the development costs and time (Fulthorpe, 2015; Cameron, 2015). These platforms could be the first step to standardize car components in the same fashion that it is in the computer industry. Therefore, megaplatforms may be the first signs of the car's hardware commoditization.

Figure 1.6: Volkswagen MBQ Platform (Radu, 2014)



Hypothesis 1.2.1.3. *The dependence on the economies of scale encourages the creation of alliances between middle-class OEMs to leverage the extent of these economies by merging their production plants.*

Hypothesis 1.2.1.4. *Modular architecture and megaplatform such as the MBQ platform is now trending among middle-class automakers. With an estimated drop of the hardware value from 90% to 40%, these production platforms may lead to the car's hardware commoditization.*

Hybrid products

> We believe that the most important thing we can do as a company is not just improve how we build cars, but to dedicate ourselves to improving the lives of our customers, every day and in every way possible. (Toyoda, 2016)
>
> (Akio Toyoda)

Although the production system is an important part of the OEMs core competencies, automakers don't want to be reduced to this only aspect. Define a pertinent value proposition is one of the challenges that OEMs are now facing. Moreover, in the case of an industry platform strategy, the transition from a linear product to a platform product is not immediate.
Several hybrid product strategies exist to go through new innovations on the market. These strategies depend on the disruption maturity and in our case, we are focusing on models related to the period where the disruption has just begun or is ongoing.

Blocking hybrids: These hybrids are used to raise entry barriers for a threatening technology by offering alternatives and trade-offs. For instance, when SSD[5] appeared and threatened HDD[6] manufacturers, incumbent firms developed hybrids that employed SSD for frequently accessed files and HDD for general storage. Although not as fast as SDD, these hybrids were 2.5 faster than the old technology and only 50% more expensive than the HDD technology. At contrary SSD drives were 850% more expensive. While this hybrid version will not hold with SSD on the long term, it has successfully delayed the disruption giving time for HDD manufacturers to fully exploit their current assets and learn about the SDD technology.

Bottleneck hybrids: Bottleneck hybrid depends on the lack of a essential complementary technology which is preventing the disruption. Incumbent firms can create hybrids to get around this technology lack, such as hybrid electric cars using small gas engines to make up for the limited charging station availability to date. However, other firms can also play this game to extend the life of an old technology, thus competing with the innovative firm on that segment.

End-state hybrids: Hybrids can also become permanent products, especially when the disruptive technology leaves an important performance dimension unsatisfied. If there are no substitutes for such hybrids, it is then likely that it becomes a lucrative business.

Bridging hybrids: If the disruption is on its premise, then the bridging hybrid can be a way to learn about a new technology that firms intend to use themselves. Toyota has developed the Prius to develop in-house electric technologies and build a customer base likely to make

[5] Solid-state drive
[6] Hard disk drive

the switch to the electric vehicle. This is also a chance to shape the customer perspective in a direction favorable for the firm. These hybrids may need to be protected under a separate business unit because of the shift in the business model and/or the competition for resources within the firm.

Niche hybrids: In order to answer long period of uncertain disruption, firm may choose to develop niche hybrids to cover specific needs of some customers. The hybrid cloud is one example where sensitive data are stored in local computing to mitigate the security concerns of the public cloud.

In the connected and autonomous car industry several hybrid products exist. Obviously bridging hybrids are developed to learn about the technology and eventually give a direction for future development, it is not rare to see cars with autonomous park assist or cross line detection. A less known but noticeable niche hybrids are in the motorsport industry with the Roborace championship in which vehicles are fully autonomous.

Hypothesis 1.2.1.5. *In the case of an industry platform, the bridging hybrid is preferred to build a customer base which is vital to the platform's success. Therefore, an industry platform may also need to be protected in a distinct business unit mainly because of the business model shift that may result in resources competition with other business units.*

1.2.2 Manage an industry platform

An industry platform performs "a function that is essential to a broader technological system" and solves "a business problem for many firms and users in the industry" (Annabelle Gawer, 2014; Michael Romer, 2016) by being a Third-Party Information Mediation. Although this definition is clear, there is no established methods to become such a platform. In this section we present existing strategies and prerequisites to build an industry platform in a mobility ecosystem.

Defining a vision

The first prerequisite and maybe the most vital is to build a vision of the platform. Without a vision, companies may have great difficulties to promote its platform among potential key players.
The reviewed literature does not elaborate further on this point. With the Collins and Porras definition of a vision, we could add that the platform vision must agree with the company core ideology, thus restricting the potential form of the platform.

Hypothesis 1.2.2.1. *Build a vision is essential for an industry platform, especially to promote the platform among potential key players.*

Platform types

According to an extensive survey encapsulating a total of 135 platform companies, industry platforms are limited to four strategies (Peter C. Evans, 2016).

Transaction platforms: A transaction platform provide a core component upon which suppliers, buyers or users are exchanging or transacting in a more convenient way. This platform acts as an intermediary between the different platform users.

Innovation platforms: An innovation platform provide a core component which is the foundation for complementary technologies, products or services developed by other firms.

Integrated platforms: An integrated platform is a service or a product that is both a transaction and an innovation platform. It includes companies such as Apple which has both a matching platform (App Store) and a third-party developer ecosystem supporting content creations on the platform.

Investment platforms: Investment platform are companies that have a platform portfolio strategy and act as a holding company, active platform investor or both.

We could imagine these strategies be applied in Japanese OEMs in a way or another. However, the survey also provides interesting data about company size by market cap and location of these platforms.

Companies with a high market cap tend to be innovation platforms (e.g. SAP, Intel, Oracle, Microsoft) or integrated platforms (e.g. Google, Apple, Amazon, Facebook) whereas transaction and investment platform are smaller companies. Thus, if major Japanese OEMs develop platforms, their platform strategies would likely be innovation or integrated platforms.

North America has the greatest number of platforms with the existence of all platform strategies. Asia is in the second place in term of platform number but do not present innovation platforms at all.

Hypothesis 1.2.2.2. *Because of both their market cap size and their location, the platform strategy of Japanese automakers tends to be integrated platform.*

The survey also puts in light that classical hierarchical organizations with large assets have platforms with a market cap size much lower than those of light assets or mixed companies. Thus, asset heavy companies could develop spin-off companies to build their ecosystems instead of creating distinct business units.

Hypothesis 1.2.2.3. *To circumvent their organizational resistances, asset heavy platform enterprises may create spin-off companies to develop their platforms.*

Organic, Acquisition, Alliance

After having approached different platform varieties, we must look to its ecosystem and the different strategies for incumbent firms to establish their own platforms.

Organic Approach: Companies can build their platforms from scratch, as Johnson Controls with its Panoptix platform. Panoptix is a marketplace to help commercial building owners and operators to save energy and money. This platform is similar to an innovation platform such as the AppStore or the Google Play Store but it is oriented toward managers of commercial building. Applications in this store mostly provide energy saving and building performance solutions, thus enhancing the current portfolio of Johnson Controls for their energy management services as well as leveraging the innovation of other firms and developers (Kho, 2012).

Acquisition: This approach consists to acquire other firms to build platform capabilities. This is the case for several OEMs such as Daimler or Volkswagen. For example, Volkswagen has acquired PayByPhone that lets you pay for parking through a smartphone apps, PTV which writes software in transportation and logistics planning and Split which is a ride-sharing start-up (Fingas, 2016; FleetEurope, 2017; Prenzler, 2017). In the same time, Volkswagen is launching its own mobility company, MOIA, which will surely try to leverage all these acquisitions (Etherington, 2016).

Alliances: Some incumbents focus to build platform through alliances to build up as fast as possible a critical mass of user. This is the case for the alliance between Apple and GE. Predictive data and analytic from Predix, the GE platform, will be available on iPhone and iPad thanks to a new software development kit for iOS. Instantaneously the huge iOS developer ecosystem may create applications with the GE platform and thus enhances the value of their current products. From the Apple perspective, this is an entry door to a new customer base in the medical sector by providing unique applications (Apple, 2017).

Hypothesis 1.2.2.4. *There are 3 strategies for an incumbent company to build an industry platform: organic approach, acquisition and alliance.*

Platform management

A platform is a manageable object and can be thus modeled to attract complementors. This however brings specific governance challenges that we address in this section.

An industry platform must provide some sort of interfaces to its complementors. These interfaces allow complementors to build service, product and technology upon the platform

core component and thus must be sufficiently ”open”. Although API[7] is the most common interface especially in the IT field, other forms may exist such as HPI[8] or specific communication channel depending the platform essence. Notions such as open innovation could give useful insights to build such interfaces. However, the interface openness is a complex trade-off between ”open” and ”closed”. The level of openness can be translated by a level of access to information or its cost to access (patents or licensing fees). Creating the right incentives to increase complementors innovation while protecting its properties is one of the challenges faced by industry platform enterprises (Annabelle Gawer, 2014).

Another challenge concerns the ecosystem governance: who has access to the platform, how to divide value, how to resolve conflicts and in which way the value is created. Indeed, orchestrating free agents does not require the same governance system that directing employees in a functional hierarchy. Thus, some policies and rules must ensure value creations and good behaviors on the platform to maximize ecosystem profits. We clearly understand here that the ecosystem governance goes beyond one's firm and thus deeply shifts from the classical governance found within most common business models (Peter C. Evans, 2016).

The competition landscape is also hugely affected by industry platforms. In a classical arrangement, firms are competing individually with each other. In an industry platform, the competition is taking a more complex shape where entire ecosystems are competitors. This shift in competition is clearly seen in the mobile industry with the fierce battle between iOS (Apple) and Android (Google). The network effect of these platform creates such a growth in adoption that it is acting as barrier entry for individual companies as well as for other ecosystems (Annabelle Gawer, 2014). Industry platform competition can be viewed as a ”team competing which others with a captain” (Gawer, 2016a). As any ”team captain”, platform leader needs to maintain neutrality over its complementors, otherwise it could damage its own legitimacy (Peter C. Evans, 2016).

Hypothesis 1.2.2.5. *The following requirements are needed in order to build an industry platform as a platform leader:*

- *Define interfaces with a certain degree of openness*
- *Adopt an ecosystem governance model by defining policies and rules on the platform*
- *Develop competitive strategies on an ecosystem perspective instead of an individual company perspective*
- *Have a consistent neutral position as platform leader toward its complementors*

[7] Application Programming Interface
[8] Hardware Platform Interface

This hypothesis resonates well with our external platform definition, especially concerning the organizational structure which is a Third-Party Information Mediation. Indeed, venture capitalist are also playing an important governance role in the entrepreneurial ecosystem and thus must be neutral toward them. Moreover, they are defining the level of access to market information which may be seen as a form of interface. Nevertheless, more research should be done to show a concrete relation on this statement.

These requirements still strongly differ from the ones of a supply-chain platform. Therefore, they are unlikely to be present in an OEM and it rises questions about the organizational capacity of automakers to match such requirements.

Hypothesis 1.2.2.6. *Requirements to lead an industry platform are not already present in classical supply-chain platforms.*

1.2.3 Orchestrate Organizational Changes

We have discussed both product platforms and ecosystem strategies as well as associated requirements to form an industry platform. As some of these requirements are not commonly present in OEMs including Japanese automakers, it is rising concerns about the feasibility of such requirements in an organizational perspective.

From competitive to cooperative mindset

Japanese OEMs are today in a strong competitive environment. This competition has even reinforced itself by the entry of new competitors such as Tesla or potential competitors such as Google or Amazon. Thus, the OEMs business mindset is today focused on competition.

However, industry platforms need some degree of openness to stimulate complementor incentives to innovate on these platforms. Therefore, companies need to be both competitor to some firms and collaborator to other ones. Moreover, we have seen that bridging hybrid require protection from resources competition by creating a distinct business unit. Since employees are not evaluated on the same basis, one on his competitiveness and the other on his cooperative performance, this bivalent mindset is almost always a source of tensions within the organization. Indeed, while one part of the organization is willing to share intellectual properties and interfaces, another part is getting nervous about over-sharing and advocates to stop sharing and make money out of their properties (Gawer, 2016b).

Hypothesis 1.2.3.1. *A platform leader is confronted to internal tensions because of the contradiction between competition mindset in some business units and cooperation mindset in other ones.*

Platform Coherence

Another collateral challenge faced by industry platform leader is to be consistent in his posture. For example, while opening an interface for complementors, a platform leader may refrain itself to compete in the same segment than its collaborators to keep ongoing their incentives to participate in the platform. This need for coherence across business and technological design decisions is difficult to achieve because these decisions are often taken in different divisions in the organization.

This coherency degree requires the top management awareness on the inter-linkages between these decisions to establish up an internal process to insure ongoing coordination across functional silos (Annabelle Gawer, 2014). Therefore, it is important to consider roles or creating roles to overlook and coordinate the platform coherence (Gawer, 2016b).

Hypothesis 1.2.3.2. *Platform leader must insure the platform coherence across functional units by setting up internal processes and creating roles to overlook and coordinate the platform coherence.*

Hypothesis 1.2.3.3. *On an organizational level, the cooperation between technological units and business units is more efficient to manage an industry platform than a silo-ed organization.*

1.3 Specific external factors in Japan

After having established a model to identify major internal factors that are influencing Japanese OEMs capacity to become an industry platform leader within a mobility ecosystem, we are now focusing on specific external factors impacting the development of such platform. We are especially drawing our attention on unique institutional factors in Japan. This could however introduce some bias due to the worldwide implementation of most Japanese OEMs. In order to respect our work schedule, we choose to focus one of the most influencing country for these OEMs which is without doubt Japan.

1.3.1 Human assets

In the organizational domain human assets can be categorized into 2 groups: individuated and context-oriented human assets. Individuated human assets are particularly efficient when the ”organizational domain is completely decomposed in a disjointed manner for the specialized division of information processing”. This implies that messages transmitted to the agent is in a ”codified form” such as mail, reports or commands. At contrary, context-oriented human assets are more efficient when the information processing is ”not entirely decomposed in a nonoverlapping manner”. These agents, instead of relying on ”codified information”, are assimilating not only their own perception of the environment, but also the tacit and explicit

messages from others perceiving the same environment. Context-oriented may be more organization-specific than individuated human assets and tend to remain in the same industry. (Aoki, 2001).

An integrated understanding of both technology and business is fundamental to an industry platform success. Thus human assets combining both technology and business skills are better than having narrow specialists (Peter C. Evans, 2016). These well-rounded assets are closer to a context-oriented human assets than individuated ones.

Moreover, J-Firm[9] operates on a intense contextual information sharing and its organizational architecture is a horizontal hierarchy, i.e. operational task units are sharing their common subsystem environment though contextual information. The kaban system is an example of an extreme degree of horizontal information-connectedness. Therefore Japanese OEMs are also included in this J-Firm framework.

Japanese firms also have policies to retain its employees within the company and the industry. These mechanisms are for example the lifetime employment or the shukkou system (temporary or permanent transfer of employee to another firm) (Ralf Bebenroth, 2010; Masahiro Abe, 2007). From these observations, Japan human assets is without doubt mostly context-oriented.

Hypothesis 1.3.1.1. *The strong context-oriented human assets in Japan provides a competitive advantage to Japanese OEMs as an industry platform leader. Indeed, contextual information sharing is efficient when activities are mutually complementary and that subsystem environment are correlated such as between technological and business units in an external platform.*

1.3.2 Legal Framework

No matter how powerful is the desire to speed up the disruption toward autonomous vehicle, it is only happening as fast as major pieces are put together and the legal framework is one of them. This market deeply needs support from the political system to change laws and regulations, make a smooth transition possible and eventually approve infrastructure funding (Michael Romer, 2016).

Licensing: Autonomous is addressing a larger customer spectrum such as younger people, elderly or disabled passengers. This is the Google approach towards this market and governments may need to create new licensing and permit systems (Michael Romer, 2016).

Data ownership: Connected and autonomous vehicles are generating a vast amount of data. The ownership question is a tough one as the list of stakeholders is large. Conflict of interest

[9] Stylized Japanese Firm

could put data privacy at risk, for example OEMs could leverage such data to help insurance companies increase their profits. Driving behavior could be accessed with more or less risky profile, thus segmenting the market to maximize revenues. These data could also be use to enhance the system with traffic control analysis, predictive maintenance or collectively optimize energy usage (Michael Romer, 2016).

Liability: If there is an accident who is liable? The responsibility of each stakeholder needs to be legally defined in this case. Today, OEMs are trying to be free from any liability (Michael Romer, 2016).

Life or Death: In the case that an accident is unavoidable, what decisions should the autonomous system take? This raises ethical questions whether an algorithm can take such a decision. Traffic systems or the car may also need to assess which scenario will cuase the least severe causalities in the most severe case (Michael Romer, 2016).
Autonomous driving and connected car is also a challenge for many attorneys specialized in personal injuries with around 76,000 attorneys in the United States representing 6% of the lawyer population (Lewis M. Clements, 2017). We thus may see some resistance to further develop laws and regulations for autonomous and connected vehicles by the current legal specialists in this domain.

1.3.3 The Role of Government

The Japanese government is highly implicated in the autonomous driving and connected cars development to achieve national goals.

Tokyo 2020 Olympics is one of the driver that encourages the government to take action towards this industry. These Olympics are a unique occasion to demonstrate Japan innovation potential and revitalize the economy (Carl Norsten, 2016).

As a lot of other countries, traffic safety is huge concern in Japan although the traffic-related fatalities are relatively low (32 per million inhabitants). Autonomous and connected cars could also reduce several societal costs such as fatalities and damages, environmental pollution and traffic congestion (Carl Norsten, 2016).

Furthermore, social issues could be addressed with these technologies. The aging population paired up with the demographic decrease are today some of the most concerning issues in Japan with a high rise in elderly people and a workforce shortage. Elderly drivers (65 year old or over) are responsible for a majority of fatal accidents (25% in 2014) and people in rural area cruelly suffer from lack of public transportation partly due to the shortage of bus drivers and other mobility-related workers. Autonomous vehicles bring solution for these increasing

challenges encountered in Japan (Carl Norsten, 2016).

Moreover, the car industry is the first employer in Japan, providing great incentive for governments to protect these firms. The automotive industry is thus a strategic area for the industry competitiveness and economy of Japan.

To transform these ambitions into a reality the government launched in 2013 the Cross-Ministerial SIP[10] to promote public-private partnerships in research and development. On the other hand the private sector has established ITS[11] Japan since 1994 (originally named VERTIS[12]) with the full support of the National Police Agency, the Ministry of International Trade and Industry, the Ministry of Transport, the Ministry of Posts & Telecommunications, and the Ministry of Construction (of Japan & Cabinet, 2016).

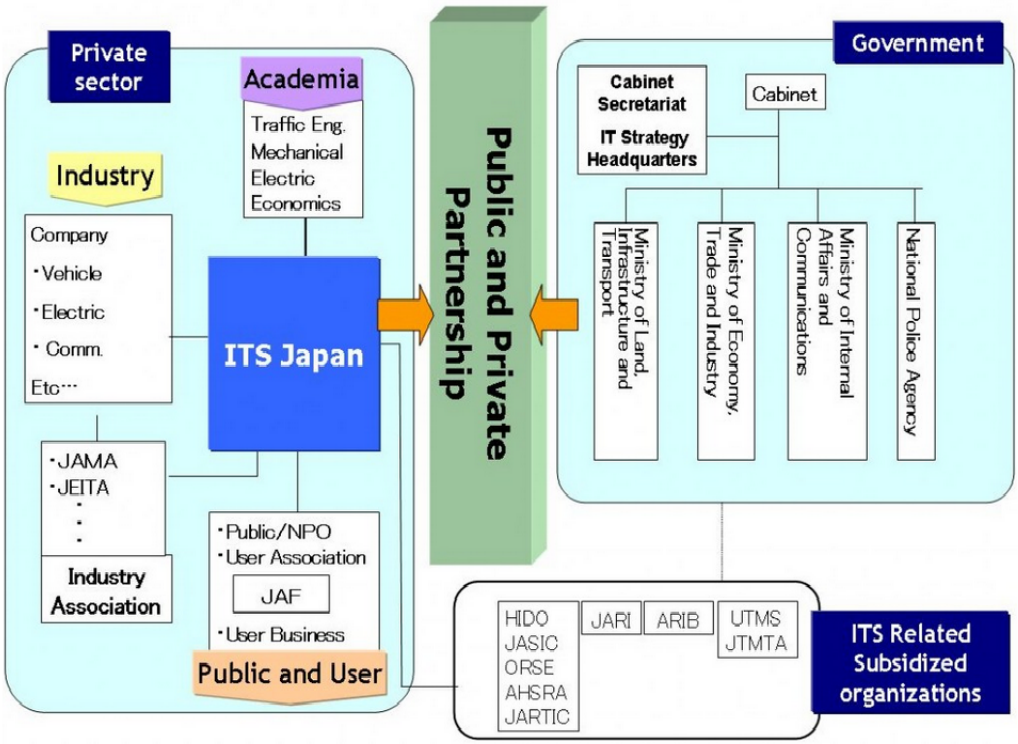


Figure 1.7: ITS Japan Organization (ITS, 2010)

These partnership come to a Public-Private ITS Initiative/Roadmaps in 2015 and 2016 available on the Prime Minister of Japan and His Cabinet website. These guidelines are giving a strong

[10]Strategic Innovation Promotion Program
[11]Intelligent Transport Systems
[12]The Vehicle, Road and Traffic Intelligence Society

vision concerning the development of autonomous and connected vehicles in Japan. This investment from the Japanese government may be an advantage for Japanese OEMs to quickly develop an industry platform in their home country (of Japan & Cabinet, 2016).

Hypothesis 1.3.3.1. *The Japanese government is willing to support home-based OEMs in their autonomous and connected vehicles development by elaborating vision and roadmaps. This may thus strengthens the position of Japanese OEMs as an industry platform leader.*

2 Methodology

2.1 Field Research Methods

To verify the correctness of our hypotheses, we are engaging in a field survey. This approach has for ambition to confront data gathered on the field with our theoretical model. To limit bias, we have set up a rigorous framework which is being described in this section.

2.1.1 Semi-directed interviews

The field survey is done by semi-structured interviews. We choose this approach over other ones to keep a room of flexibility in our interviews. Indeed, internal factors favoring the industry platform emergence are built upon scientific literature that still have not a strong consensus among scholars and white papers may lack scientific rigor. Therefore, our theoretical model is subject to deficiencies such as missing important points or over-emphasizing on others. The semi-structured methodology allows us to further develop topics addressed by the respondents and eventually detects deficiencies in our model.

An interview guide is thus prepared with topics and questions to be addressed. This guide is basically a translation of our theoretical model in a more convenient form to direct the interview.

To efficiently gather pertinent materials, only sub-sections of the framework was addressed with each respondent. These sub-sections were defined according to the experience, the country and the position of the respondents in such a way that the interviewed person is not cornered by questions going beyond their expertise. Moreover, concrete examples are given if necessarily to help respondents to quickly understand concepts and to not be lost in the theo-

		Position	
		Not related to autonomous or connected vehicles	Related to autonomous and connected vehicles
Firm	Japanese OEM	O	O
	Tiers 1	X	O
	Other companies in the mobility ecosystem	X	O

Table 2.1: Respondents Profile Matrix. O: Requirements satisfied. X: Requirements not satisfied.

retical framework.

2.1.2 Respondents profiles

The targeted profile is professional mainly working in Japanese OEMs, but also in Tiers 1 or in any companies that aim to be part of the mobility ecosystem. It is preferred that the respondent is living in Japan, but this is not required. If the respondent is not working for a Japanese OEMs, then his position must at least be related to autonomous and connected vehicles.

Tiers 1 and companies related to mobility ecosystem were included because of their close relations with Japanese OEMs and thus are relevant to this study. Respondents in Japan may have a better understanding of specific institutional advantages in Japan, however as Japanese OEMs are globally implemented there is no need to limit respondents to Japan. Finally, industry platforms may have impacts in other divisions across the organization, we thus have included positions not related to platforms or ecosystems if the respondent belongs to a Japanese OEMs.

This profile range is deliberately large to insure a sufficient interview number in a short time lap. The LinkedIn platform is used to prospect as fast as possible potential respondents in that period. Keywords used is ”ADAS”, ”ADS”, ”autonomous”, ”connected”, ”mobility”, ”ecosystem”, ”innovation” and filters were used on the industry (automotive), the location (Japan) and the company (Toyota, Nissan, Mitsubishi, Honda, Suzuki, Mazda, Daihatsu, Subaru).

2.2 Interview Results

To have a better overview on our observations, we are structuring the following results with the same scheme than our interview framework. Some sections may differ from our framework as the semi-structured approach allows us to explore new domains. These observations will not be commented in this section to keep these materials as objective as possible.

Position	Company	Location	Duration
Customer Relationship Management	Japanese OEM	France	30min
Research and Innovation Manager	Tier 1	Japan	1h
Consultant and Recruiter	Staffing Company	Japan	1h
Principal Scientist	Japanese OEM	Germany	30min
Connected Vehicle Services Engineer and Planer	Japanese OEM	Japan	1h
Connected Services Division	IT Company	Japan	1h
Connected Information Business Marketing	Japanese OEM	Japan	1h

Table 2.2: Respondents list

Our observations are conducted on a sample of 7 interviews with about 130 potential respondents (replying rate of 5%). As shown in Table 2.2, respondents are relatively heterogeneous. Japanese respondents represent 70% of our sample including 2 expatriates, one who has recently moved in Japan and another who has lived for more than 15 years in Japan and can be thus considered as Japanese. People working in three different OEMs was interviewed, thus limiting bias on specific OEMs. Moreover, half of the respondents in OEMs was Japanese and the other half was from France and Germany. This gives a good balance to receive opinions and observations from different perspectives. Respondent positions are diverse and consistent with our interview requirements.

However, the low number of sample may introduce bias to our studies and we should thus take following analysis with a grain of salt. This is in part due to the difficulty to access interlocutor working on platform developments. Indeed, these topics on autonomous and connected vehicles are often strategic for these firms and potential respondents may be reluctant to discuss on these subjects.

2.2.1 The mobility ecosystem emergence

An industry with opportunities and drawbacks

The global market share of leading Japanese OEMs should not be at stake for the time being. They are indeed very strong in the market and represent more than 25% of produced cars worldwide. Moreover, there are specific markets where the ecological conjuncture boosts hybrid vehicle sales. This is for example the case in China where emission and accident regulations that aim to make a term of essence car is advantageous for the hybrid cars market. Incentives to buy such cars are even created by drastically reducing the waiting time to get a vehicle if this is an ecological one. For some respondents, it is just a question of time before the transition to electric and hybrid vehicles becomes a reality.

However, they are still strongly pressured by low-cost and luxury OEMs, especially OEMs such as Nissan, Mitsubishi or Suzuki that are trying to catch up with Toyota. Their follower positions don't allow them to look for new value propositions which is not a current priority. In response to this increasing competition, middle-class automakers are also developing luxury cars such as the Nexus for Toyota or the Infiniti for Nissan. Most respondents also agreed that the hardware value will drop from 90% to 40% in a near future.

A delicate position toward ICT firms and platforms

Since the 2010 announcement of Google to enter the automotive market, Japanese OEMs see these big ICT companies as competitors and don't seem to want any cooperation with them. In response to this new threat, automakers have started to build their own original platforms. However, a respondent clearly indicated that Japanese OEMs may not become platform leaders because of other platform leaders such as the Google or Amazon are penetrating the automotive industry. The main reason pointed out by respondents to explain such opposition between OEMs and ICT companies is that these new players may radically disrupt their market. Indeed, for 20 years the automotive market stayed stable without major changes in the industry landscape. Nonetheless, Japanese OEMs don't know if they could maintain their positions with these massive disruptions envisioned by Google or Amazon. They thus tend to protect themselves and their monopolies to circumvent such disruptions to the point of preventing further autonomous car developments. At contrary, luxury automakers have a less deep-seated posture toward these new players by tracking their actions and not being completely closed to a collaboration depending the topic.

Moreover, Toyota platform is strongly oriented toward SDL[1] advocated by Ford and AGL[2] to integrate smartphone applications into an infotainment system without depending on a smartphone OS. Although each Japanese OEM has different strategies concerning their platforms, one of their common points is that they are often trying to build a consistent system with several ECUs[3] for their infotainment and connected systems. Some initiatives are also perceived such as ITS Japan which is developing a high definition cartography of Japan or the Nissan Smart Cities project. Another well mentioned platform is the SB Drive by Softbank which is a mobility platform.

Customer relationship and perceptions of mobility ecosystems

Japanese OEMs have indeed a strong relationship and a direct access to customers, however Google may have also such advantage with Google Map. Google catch phrase may be "Today

[1] Smart Device Link
[2] Automotive Grade Linux
[3] Electronic Control Unit

we guide you on the road, tomorrow we will go further with our autonomous cars". Thus, there is no obvious competitive advantage regarding the customer relationship. However, OEMs try to go even further in their CRM by guiding the customer from its purchase considerations to the final purchase.

Moreover, purchasers often don't make the difference between distinct entity of an organization and it is difficult to keep a coherent speech across these entities. Some thoughts are initiated around new opportunities in the mobility ecosystem such as enlarging their targeted customers with commercial companies. Nevertheless, these initiatives are not currently developed and no drastic changes in the customer relationship seems to occur.

Autonomous cars may also be better accepted in Japan due to their good image of robot and technology in general. However, other respondents did not agree pointing out problems such as the safety. Moreover, Japanese do not perceive the plus value of autonomous and connected cars. For example, American may find some values because they are already looking are their phone while driving whereas Japanese are commonly looking to the road.

2.2.2 Building up an industry platform

Innovation in Japanese OEMs

Japan is not known for its innovation leadership and some reasons behind that was stated. On one hand, Japanese are very creative and, when they have ideas, there are internal processes to check the quality of these propositions and validate them. On the other hand, Japanese are operating as a group and this does not encourage individual ideas. The Japanese management may be too democratic and excessively looks for consensus from everyone. This behavior drastically slows down decision speed and top management are not able to make deep changes, thus favoring incremental ameliorations over disruptive transformations. This may due because Japanese firms tend to avoid risks as much as possible even when they should take risks. The low bankruptcy rate in Japan may be a manifestation of such risk avoidance behavior. Therefore, Japanese OEMs as well as big Japanese IT companies are not considered by some respondents as innovators. Moreover, Japanese are problem solving oriented and will sometime not come back home until the issue is solved. They however may have difficulties to imagine new way of doing and need directions to not be lost. Younger generations also may nonetheless not follow this pattern and are generally less influenced by conservative employees. Some OEMs are especially looking for younger employees to engage in an employee mindset transformation.

Research also receives fewer subventions from the government compare to France that may slow down innovation in Japan. To speed up their innovation potentials, several Japanese OEMs recently opened offices in the Silicon Valley and respondents didn't know which activities is or

will be pursued over there.

An unclear vision despite of cultural advantages

It is important in Japanese OEMs to have a liaison between top management and the organization through a shared vision. The rooted company culture in these OEMs may facilitate the acceptance of a deep changes in the firm vision. This is for instance manifested by a deep attachment to the brand history.

The Japanese mentality may also favor the development of a shared vision. An illustrated example was given: "A French and a Japanese group must make their ways through a thick forest. The French group may not agree with each other on the path to take and will separate in several subgroups. At contrary, the Japanese group will just sit and discuss how to cross the forest, then they will decide together what to do. Even if they may arrive a little later than a French subgroup, they will arrive all together." This mindset could help Japanese OEMs to construct a coherent vision across the organization. It is even often difficult to introduce young people to other companies because of their loyalty to a company. Furthermore, they are so dedicated to the company that they are proactively trying to understand the firm's vision and the goal to achieve.

However, most of native Japanese interviewed pointed out some issues concerning the current vision of Japanese OEMs. They agree on the fact that there is no vision or not a clear vision in regard of new ecosystems in the automotive industry. If they had a good vision, then Japanese automakers will talk with international firms such as Chinese, Taiwanese or Korean companies to build their ecosystems. Nonetheless, they are currently only discussing with local firms in Japan and mostly with other Japanese OEMs. Respondents feel that Japanese automakers are not taking drastic actions. They are not really trying to be platform leader and in the same time they are defending their market by innovating just enough to prevent ICT firms to penetrate the market. This is in part due to the lack of cooperation between each OEM and their focus on the current competition which are sterilizing discussions about connected services. The downside of developing a shared vision accepted by all is that it may be very harsh to switch toward another vision, more a vision will be disruptive more it will be difficult to reach a consensus among everyone. A concrete example of these issues may be the big data tentative of an OEM by opening an interface to request these data. However, with a closer look, we can realize that the openness of such interface is hugely limited. This is because OEMs try to protect the dealership service and these data may harm their business as third parties could be able to offer car diagnostics. In short, native Japanese don't perceive a clear vision of both current and future positions of these OEMs in an ecosystem and for sure Japanese automakers are not currently leader in autonomous and connected cars.

Nevertheless, luxury OEMs encounter different issues concerning vision. The Japanese

management is also present in all division worldwide, but they now have issues with different vision in each division. There is a global management to transmit such vision, but local management are stronger. As pointed out by another respondent, Japanese OEMs have difficulties to transmit their visions to other subsidiaries outside Japan.

Finally, for a respondent, the 2 most leading OEMs are Tesla and FIAT which has both a strong vision. FIAT is especially interesting because they as already given up the platform competition and are focusing to become leader in hardware supply by focusing on their manufacturing competencies.

Difficulties to develop an industry platform and its ecosystem

There doesn't seem to have a correlation by being a Japanese OEM more than another OEM regarding their capacities to be platform leader. The winner will be the one which influences or understands better the market, and which can pass down these directions across the organization through a vision. It also the one which achieves strategic partnerships to develop its ecosystem. Major OEMs such as Toyota may have an advantage to develop such partnerships and alliances because of their international recognitions which could positively affect their partners brand image.

However, these partnerships are today limited to local firms and especially other Japanese OEMs. Moreover, partnerships are often only built through financial bindings and thus OEMs stay relatively closed to collaboration. Automakers also avoid collaborating with startups because the development is often too long before a prototype is delivered (1 or 2 years). Furthermore, OEMs have difficulties to transfer the developed technology in their products. This may be due to the lack of interfaces with their products that doesn't allow other firms to develop technologies for them. Thus, because automakers have the financial resources to do it, they often choose to acquire these ventures by buying them to quickly get the technology.

Moreover, OEMs are developing both inside platforms and platforms built with third parties. However, automakers are used to be vertically integrated and often work with the same partners for a long period, thus opening their doors to other firms is challenging. Indeed, finding the right balance of openness is not easy, especially because there are no models or guidelines that defines how to do it. Only their personal experiences may help them to determine this delicate balance.

Attract potential complementors in their platform is not an issue when we are talking about mass production. The huge volume often attracts other firms to collaborate with OEMs because of the high profit prospect. Nevertheless, concerning research projects and prototypes, automakers have a hard time to find firms which want to work with them. Nonetheless, small companies and startups may want to work with OEMs to increase their visibilities.

Japanese OEMs attempt to create some interfaces especially in the infotainment system. One example is the interface with mobile to be able to export some applications of its smartphone to the car infotainment system 2.1. It was however remarqued that OEMs focus too much on the in-car experiences and do not think their solutions in a more integrated way including outside and in-car experiences. Automakers may also try to define new value propositions by identifying customer needs, developing original technologies and defining how to sell these technologies. The bridging hybrid may be a means to achieve this goal, but an immediate leap to the new technology may be viable as well.

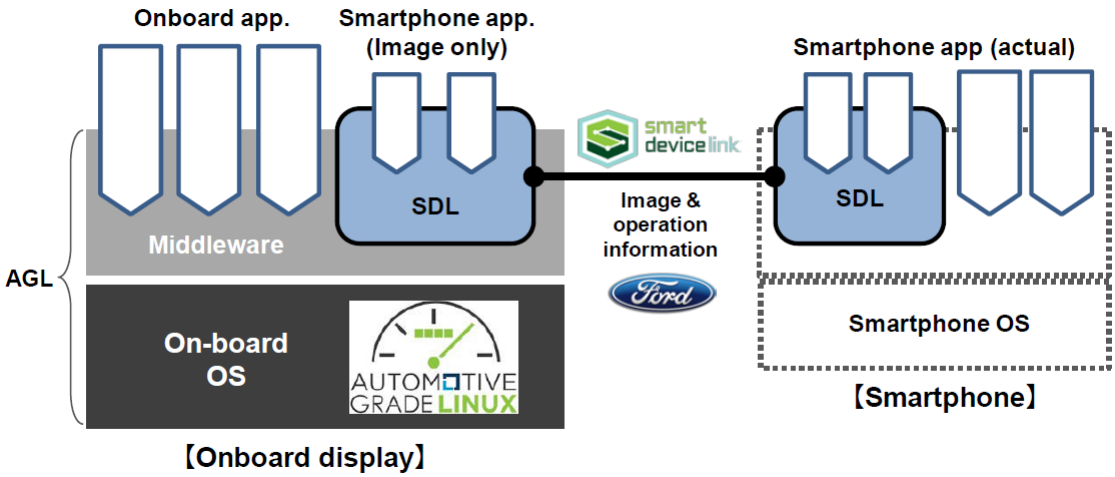


Figure 2.1: Infotainment System Interface (Tomoyama, 2016)

Luxury OEMs especially encounter these issues as their postures toward the mobility ecosystem are evolving at a global level. This shift raises problems in the OEMs identity which is a great and important value in Japanese OEMs. However, these automakers recognize that technologies are going too fast and that they need to collaborate with other companies to keep going. Internal resistances are also encounter toward these changes which is normal because it affects a lot of division across the organization.

The duality of competitive and cooperative mindset

When developing an industry platform, some tensions may appear in the organization because some divisions need to compete with other firms while other divisions need to collaborate with third parties. Most respondents did not perceive such tensions in Japanese OEMs which are by the way already working with others OEMs (e.g. the Renault/Nissan/Mitsubishi alliance). One reason behind this smooth collaboration may be the established hierarchies that exists between Japanese OEMs. Nevertheless, Japanese luxury OEMs do encounter such tensions in

their organizations. For example, each division has its own vision that may create frictions inside the firm. As stated by a respondent, the organization is very large thus these kinds of issues may be inevitable. A concrete example of these tensions is the sharing of knowledge between divisions: to keep their intellectual properties, business units with competitive objectives may not divulge any information to division with collaborative goals.

2.2.3 Government, Legal and Human Resource in Japan

Government

The Japanese government has a strong role in the definition of the mobility ecosystem. There are great incentives for the government to make autonomous and connected cars a reality. Indeed, they have strong social issues concerning the increasing aged and isolated population which are ”traffic refugees”. Other solutions are often not economically viable, for example nowadays it is difficult to hire bus drivers because the workforce shortage. For some respondents, the government has a more advanced vision than Japanese OEMs. The Prime Minister of Japan, Shinzō Abe, is pushing several policies to make autonomous and connected cars a reality, however OEMs only focus on the local market competition and thus don’t engage a lot of action to collaborate with the government.

To prepare the future, automakers has launch ITS Japan to define a roadmap about autonomous and connected vehicles. Moreover, politicians in Japan may be more technocrat than in other countries. Although Japan may not be the first country to launch autonomous vehicles, they will launch it with a mature proposition. Other respondents did not think that government has that much power in the definition of a mobility ecosystem. Policies concerning autonomous vehicles may be just political talks without any real actions behind. The government is mainly pushing forward autonomous and connected cars for the 2020 Olympics showcase with a short-term approach and without the intention to make it a long-term plan.

Japanese OEMs may also wait for the government to act instead of them. At contrary, America automakers move before the government are taking the initiative and try to create standards as soon as possible to promote their platforms. However, this is not the case for all Japanese OEMs which are independent from the government to build their own visions by, for example, developing open innovation.

Legal

Government is not focusing too much on the legal aspect for the moment, but as the government is pushing for autonomous vehicles, they will surely do the needed so that legal issues will not be an obstacle. One big step will surely be the commercialization of autonomous shuttle which should become legal in 2020. For most of the respondents, legal issues in Japan are

close to the ones encounter in German especially concerning safety regulations. For example, OTA Update[4] is still not legal for safety system. Nevertheless, all respondents admit that they were not well informed on these issues.

Human Resources

Japanese employees are often well rounded, for example engineers do not only focus on engineering but also have skills in supply chain or business. It is also rare that employees leave the automotive industry once they have joined it and even often keep relations with the company after they had retired. Moreover, Japanese firms do not recruit people for their potentials as they will take care of their training. In Japan, the life prime employment is still very present, and this may be a strong advantage to retain and develop talent in the company.

[4]Over the air update (e.g. update by Wifi)

3 Analysis

3.1 Internal Factors

3.1.1 The hardware commoditization

From our studies, the average vehicle value shift from 90% hardware and 10% software to 40% hardware, 40% software and 20% content seems close to the reality. Moreover, middle-class OEMs are indeed pressured by both low-cost and luxury OEMs that offer the best of both world. However, defining a new value proposition is not a priority in Japanese middle-class OEMs as they are too busy in dealing with the current competition. This may be alarming as other actors such as ICT companies could develop these value propositions and thus take a strong place in the market. In the worst case, middle-class OEMs could be forced to become hardware supplier in the mobility ecosystem and thus compete against low-cost OEMs with very low profit margins.

Comment 3.1.1.1. *The shift in the hardware value from 90% to 40% may endanger middle-class OEMs and steers them to develop new value propositions. Nonetheless, middle-class Japanese OEMs are too preoccupied with the current competition to consider value proposition creation as a priority.*

3.1.2 An overly-conservative posture

The conservative mindset of Japanese OEMs is especially a concerning point as it may hugely impact their capacities to become an industry platform leader.

To begin with, being conservative is not necessarily negative but being overly conservative may rise concerns. First, middle-class OEMs must protect their market from the ongoing disruption

to maximize their profits with their current assets. This could be done by using blocking hybrids to raise entry barriers in the current market or bottleneck hybrids to extend the life time of an old technology. While this hybrid strategies can delay the ongoing disruption, it will not hold it on the long term. In the autonomous and connected vehicles market, such behaviors can be characterized for example by slowing down regulations or offer products with a good trade-off between the safety and the autonomous driving.

However, while protecting their market middle-class also need to build up their value propositions. This may be the case with ecological vehicles and an evolved infotainment system. Nonetheless their new competitors such as Google, Apple or Amazon are used to build ecosystems around their products which are a lot more competitive than a firm alone. However, Japanese OEMs seems to cruelly lack of vision to build such ecosystems and sometimes wait for the government to bring their vision to them. Moreover, they are only building partnerships with local firms and especially other automakers. This may be due to the over-protection of their market thus preventing them to develop an industry platform.
This overly conservative position is more remarkable when middle-class and luxury OEMs in Japan are put in perspective. Luxury OEMs tend to not be as deep-seated as middle-class OEMs regarding partnerships with ICT firms or other companies. This may also explain the lack of cooperation among Japanese OEMs on connected service topics.
If this behavior is too persistent, Japanese OEMs and Kodak may share the same fate, unable to transform them-self while still knowing they must do it.

Comment 3.1.2.1. *To protect the current industry, middle-class OEMs in Japan may be overly conservative thus preventing them to efficiently define new visions in the mobility ecosystem and build partnerships.*

3.1.3 The customer relationship management

Our interview results show that customer relationship may be a factor to the industry platform success. However, this is not a competitive advantage as new players in the automotive industry have also some direct relations with the customers. This customer relation maybe maintained through applications such as Google Map. It is still interesting to point out that Japanese customers may not perceive the added values of autonomous cars, but this is more related to some specific solutions.

Comment 3.1.3.1. *Customer relationship is not a competitive advantage for incumbent OEMs.*

3.1.4 Vision and innovation in the Japanese management

The Japanese management may also have a great impact on OEMs visions as well as their capacities to innovate. First, Japanese are very creative, but they are also looking for consensus. This

may be related to the deeply rotten notion of "harmony" in the Japanese society. To ensure that a consensus is reached, there are internal processes to check the quality of new propositions and validate them. An example of such processes is the "ringi seido"[1] which is a "bottom-up" process of reaching consensus. The positive side of such systems is that the proposition implementations are rapid and efficient. Nonetheless, these processes are time consuming and do not promote radical innovation as consensus will be difficultly reached.

Comment 3.1.4.1. *The process of reaching consensus do not promote disruptive innovation, thus limiting the innovative potential of Japanese OEMs in the mobility ecosystem.*

Their capacities to define a vision suffer from the same issues. Moreover, Japanese OEMs may have difficulties to transmit their vision to other subsidiaries. Thus, the tentative to open office in the Silicon Valley may not bring the expected results if the Japanese management is applied over there. This is especially concerning as building a vision is essential for an industry platform leader.

Comment 3.1.4.2. *The process of reaching consensus may prevent a radical change in the Japanese OEM vision, thus hugely incapacitating them to become industry platform leaders.*

3.1.5 Platform strategies and associated issues

As a lot of OEMs are still not at the point of building their ecosystems, we cannot state whether hybrid strategies are employed. However, organic approach is used in many Japanese automakers by building their own original platforms. Moreover, acquisition is also preferred over partnership with small firms and startups. This is because the development time till a prototype is often too long and OEMs have difficulties to integrate the technology in their systems. Nonetheless, alliance is rarer with only a few examples such as the Microsoft and Toyota alliance. Most of the alliance are between Japanese OEMs with for instance ITS Japan.

Comment 3.1.5.1. *The most common strategies of Japanese OEMs to build an ecosystem is the organic approach. Acquisition are also preferred over alliance to acquire new technologies and intellectual properties.*

Japanese OEMs that are very advanced in developing an industry platform such as in luxury automakers are now facing issues to define their interfaces. On one hand, finding the right balance between closed and open is difficult to find because no models describe how to do it. On the other hand, OEMs may have difficulties to develop the competitive strategy on an ecosystem perspective instead of an individual company perspective and to define the ecosystem's governance. Indeed, attracting potential complementors is not an issue when we are talking

[1] http://pspl.culture-quest.com/pspl/index.php/japan-doing-business-doing-business/japan-decision-making-the-japanese-way-doing-business

about mass production as it is the case with potential supplier in the supply-chain platform. However, on research projects or prototype developments, automakers have a hard time to find firms that want to work with them. Indeed, complementors do not clearly perceive what benefit they will get from the platform (governance) and they may fear that the platform will be in direct competition with them (competitive strategy on an ecosystem perspective). Nevertheless, more studies need to be pursued to confirm these propositions.

Comment 3.1.5.2. *Luxury automakers in Japan start to encounter issues in regard to the development of their platform:*

- *Difficulty to define the right degree of openness in interfaces*
- *No clear ecosystem's governance model*
- *Competitive strategy developed in an individual company perspective*

These issues are consistent with the requirement that we had defined to build an industry platform as a platform leader. Nevertheless, more studies are needed to confirm that middle-class OEMs will also encounter these issues.

3.1.6 Organizational concerns within an industry platform

The development of an industry platform raises also organizational concerns. Indeed, the competitive and collaborative mindset in the same organization may be a source of internal tensions. This is observed in the field with for example some divisions that are not willing to shared knowledge to business units in cooperation with external firm. However, it is interesting to note that this phenomenon does not appear in the case of collaboration with other Japanese OEMs. This may be because there is established hierarchies between these OEMs thus preventing tensions.

Comment 3.1.6.1. *Internal tensions may rise while coordinating an industry platform because of the contradiction between competition mindset in some business units and cooperation mindset in other ones.*

Moreover, the coherence of the vision across the organization is challenging in part because of the company size. A global management may try to transmit coherent visions and directions to the different business units, but the local management is often stronger and thus each division has their own visions.

Comment 3.1.6.2. *Japanese OEMs do not have processes or roles to overlook and coordinate the platform's coherence across functional unit. Therefore, local management may harm the overall platform by taking decisions which are only beneficial for their units.*

3.2 External Factors

3.2.1 Institutional advantage in the Japanese human asset

Human assets in the Japanese automotive industry is indeed strongly context-oriented:

- Employees who enter the automotive industry generally don't leave it
- Companies take care of the employee training
- Policies to retain employees are commonly present such as the lifetime employment
- Employees have a broader knowledge of a specific firm and industry, thus being well rounded in that context

Comment 3.2.1.1. *As an integrated understanding of both technological and business is vital to an industry platform, human resources of Japanese OEMs may be a competitive advantage to become platform leader.*

3.2.2 An unclear role of the government

To solve strong social issues concerning the mobility access of "traffic refugees", the Japanese government is promoting autonomous and connected vehicles by pushing several policies. The government vision may even be more developed than these of OEMs. However Japanese automakers are not cooperative because they may try to slow down the disruption to protect their current market.

Nonetheless, the government may also just push policies and do not take real actions to promote a mobility ecosystem. This could even more true because of the 2020 Olympic that provides strong incentives to demonstrate the innovation capacity of Japan in a showcase. After Olympic the government may not be as interested as today to develop mobility ecosystems. Therefore, it is possible that some bias don't allow us to perceive the real role of the Japanese government.

However, some Japanese OEMs are strongly influenced by the government directive. Indeed, the ITS Japan organization was created to facilitate the exchange between the public and the private sector to build a coherent roadmap for the Japanese automotive industry.

Comment 3.2.2.1. *Japanese OEMs are without doubt influenced by the government. Although the government is strongly promoting autonomous and connected cars for the 2020 Olympic, the position of the government toward mobility ecosystems in the long-term is not clear as some bias may put us in error.*

4
Recommendation

4.1 Define its position in the mobility ecosystem

Through this paper, we supposed that Japanese OEMs are trying to become an industry platform leader. This proposition is based on the fact that Japanese OEMs may not want to depend on other firm's business models and also the opportunities for them to clear profit.

However, this position is not the only one that automakers may target. For example, FIAT has already given-up their intentions to become a strong platform leader and focus on becoming an excellent hardware supplier for other actors in the mobility ecosystem.

By not clearly defining their positions in the ecosystem, OEMs expose them-self to be arbitrary forced into a position by the ecosystem. In this case, automakers are losing their freedoms of movement with little or no bargaining power. The worst case is to be totally ostracized by the ecosystem thus competing alone against one or several ecosystems. Nokia may provide a good example of these issues.

Recommendation 4.1.0.1. *Japanese OEMs should clearly define their position in the mobility ecosystem to not lose their bargaining powers and to not compete against one or several ecosystems.*

4.2 Avoid the Kodak effect

The Kodak effect was identified as a main threat to Japanese OEMs. Indeed, these OEMs like Kodak have a comfortable situation in their current market and may avoid the disruption at all cost. Although most OEMs are developing autonomous and connected technologies, these innovations may be dropped in the fear it would threat their core competencies: car

assembling.

We put in light in this paper some fact that may indicate overly-conservatism behaviors from Japanese automakers. The top management awareness and neutrality on these issue are needed to manage the right balance between conservatism in order to maximize profits with current assets and the transition toward new mobility solutions.

Furthermore, the separation between management and supervision is not always clear in Japanese corporate governance. This thus introduce the risk that executive officers strongly influence the OEMs strategies to protect their current assets, thus increasing the likelihood of the Kodak effect.

Recommendation 4.2.0.1. *Top management awareness and neutrality are essential to develop new business opportunities that may threat a current business. A special attention regarding the separation of management and supervision in the corporate governance may be needed to reduce the likelihood the Kodak effect.*

4.3 Define new process to encourage disruptive innovation

The process of reaching consensus embedded in the Japanese management both affects OEMs capacities to innovate and define a vision in a disruptive environment. This is mainly due 1) the time needed to reach a consensus and 2) the difficulties to reach a consensus when the proposition is disruptive. This is especially concerning as defining a vision is essential to build an industry ecosystem while the capacity to innovate may be less preoccupying as automakers may take advantage of other management styles in foreign office such as in the Silicon Valley.

We however do not advocate the opposite where a vision is imposed without further discussions and communications to the stakeholders. Japanese OEMs may want to create new processes to encourage disruptive innovations by finding a trade-off between a high degree of consensus and the time needed to reach the consensus. Further studies need however to be done to insure the feasibility of such processes in the Japanese cultural and institutional framework.

Recommendation 4.3.0.1. *To increase their capacities to innovate and define a vision, OEMs may create distinct processes to promote disruptive innovations over incremental ones. This could for example be done by finding the right trade-off between a high degree of consensus and the time needed to reach the consensus.*

4.4 Take advantage of the context-oriented human asset

An overall understanding of both technology and business is essential to build an industry platform. The specific context-oriented human asset in Japan is favoring the development of such skills in the automotive labor market. It could thus be a competitive advantage to set up the division developing as well as overlooking and coordinating the platform in Japan.

Recommendation 4.4.0.1. *Japanese OEMs may set up the division overlooking and coordinating the platform coherence in Japan to take advantage of the context-oriented human assets. Indeed, this organizational institution increase the likelihood to have personnel with an understanding of both technological and business aspects of an industry platform.*

5
Conclusion

This paper has discussed some of the major factor influencing Japanese OEMs in their capacity to be platform leader in a mobility ecosystem. These OEMs are already platform leader in a specific platform arrangement which is the supply-chain. Nonetheless, supply-chain platform belongs to internal platform and greatly differs from industry platform found in ecosystem.

Industry (or external) platform provide the technological foundation upon with a set of complementor innovate to develop new product or services, thus generating an innovative business ecosystem. The success of such platform often relies on the network effect which arises the benefit of at least one group when the number of user in another group increase.

The potential of incumbent Japanese OEMs to establish itself as industry platform leader rest upon their capacity 1) to develop a core component, 2) to manage the platform and its ecosystem 3) to undertake associated organizational change. First, the core component must be defensible and have a critical mass of user to leverage the network effect. We identified the bridging hybrid as the most efficient strategies to develop a customer base while keeping a strong value proposition, thus facilitating the transition from a linear product to a core component. Second, defining the interface openness, the ecosystem's governance and the ecosystem competitive strategy in neutrality is the substantial role of an industry platform leader. Third, organizational issues may arise when positioning itself as an industry platform leader. The duality of competition and collaboration observed in incumbent firm leads to incoherence in regard to the platform and tension across the organization.

The emergence of an industry platform leader may also be facilitating by external factors. On one hand, a context-oriented human asset is favoring the understanding of both technology and business which is essential to an industry platform. On the other hand, the government

and current law may affect the development of mobility ecosystem within and across countries. Japanese government is especially promoting such ecosystem to resolve increasing social issues and bring attention to Japan in the 2020 Olympics.

The field analyze through several interviews put in light major difficulties to manage the platform and handle related organizational issues. These concerns was mainly related to the interface openness, the ecosystem's governance and the ecosystem competitive strategies approach, thus reinforcing our model on these points. However, middle-class Japanese OEMs still not encountered such issues as they whether do not aim or did not engage to become an industry platform leader. We explained such observation by 1) an overly-conservative posture and/or 2) a lack of vision and innovation. On one hand, respondents has indeed often mentioned the fear of middle-class OEMs toward the ongoing disruption on their market. This is manifested by resistance to cooperate with the government on the future mobility as well as collaboration with almost exclusively other Japanese OEMs. On the other hand, the widespread "ringi seido" process to innovate are not design for disruptive innovation. By reaching consensus this process may prevent radical change to be adopted. Therefore this process is also limiting Japanese OEMs to define a disruptive vision.

Nonetheless, the hardware commoditization appears to urge Japanese OEMs to take strategic action in regard to the emergence of mobility ecosystems. The first step may be to clearly define its position within a mobility ecosystem such as being a hardware supplier or a platform leader. The vision and the strategy is obviously not the same depending the targeted position. If the position of platform leader is aimed, then the top management must have a strong awareness concerning potential tendency of over-conservatism. The separation of management and supervision in the corporate governance is needed to insure neutrality while considering disruptive innovation that may threaten current business. Failure in preventing over-conservatism may result in a Kodak effect with both high economic and social causalities. In order to enhance their capacity to innovate and define a vision, Japanese OEMs may also define new processes to stimulate disruptive innovation by for example finding a right trade-off a high degree of consensus and the implementation speed. Japanese automakers should also take advantage of the specific context-oriented human asset in Japan to establish the platform division in their headquarter. However other countries with a context-oriented human asset may also be considered.

This paper limit its analysis to Japanese OEMs in the passenger car industry (i.e. Toyota, Nissan, Honda, Suzuki, Mazda, Daihatsu, Subaru and Mitsubishi). Moreover, a significant focus on these organizations in Japan was done without extensively analyzing these OEMs on a global level. Thus a country bias may appear in our studies. Lowcost OEMs are also not covered as such OEMs are not part of Japanese OEMs.

We also restricted our studies to mobility ecosystem whereas other ecosystem may emerge in

the automotive industry. Although this restriction may not dramatically affect our model, it reduce our attention toward scientific literature concerning other ecosystem and which may be pertinent in regard to this paper. The chosen platform theory by Gawer and Cusumano greatly influenced the construction of our theoretical model. Results may thus be specific to the definition of an industry platform and do not extend to other platform model. The quality of the literature used to construct our analytic model may also introduced some bias. Indeed, the literature review included both rigorous scientific papers and white-papers from several firm or organization.

Furthermore, interviews introduced some bias that must be acknowledged. First interviews was conducted in English which was not the native language of both the interviewer and the respondent, thus obviously leading to potential misunderstanding. Most respondent was also not from the same cultural background than the interviewer. For example, information may have been communicated in a less verbally explicit manner not comprehensible for the interviewer or the respondent.

The field access was also a major limitation to this thesis. Indeed, as we are not located in Japan and also not working in a Japanese OEMs, it was more difficult to access potential respondent. Moreover the method used to find respondent, LinkedIn, limited the scope for searches to our network. Finally, our study background is mainly in engineering and not focused on management. We may have not fully grasp the concept in the literature despite our hard work to understand them. Furthermore, we entered the automotive industry recently, thus our overall comprehension of this industry may also be limited in some way.

This paper may be easily enlarged to other middle-class or luxury OEMs which are also facing the emergence of mobility ecosystem. This could be the basis for a comparative studies to identify competitive advantage. Further research on the commercial vehicle industry may also put in light specific factors not embedded in the passenger car industry. Moreover, a focus on other countries than Japan could reveal distinct characteristics that favor or prevent the development of an industry platform. On another extent, this studies may be useful when analyzing an industry platform in any manufacturing industry. This is for example the case for industry impacted by the development of smart cities such as building industries.

Research on the entry of ICT firms such as Google and Amazon in the automotive industry could also help us to understand the maturity of OEMs as industry platform leader compared to these new players. This may lead to a better comprehension of the competitive landscape between ICT firms and OEMs which is without doubt a high priority for manager in both ICT companies and automakers. This comparison may be extended to any actors within the ecosystem such as Telecom companies, Tiers-X suppliers or device manufacturer. Furthermore, putting this studies in perspective with research on the well-known platforms in the mobile industry may show similarities and can thus help us to postulate on the evolution of platform

in the automotive industry.

This paper also put in light influence of the Japanese management on the innovative capacity of Japanese OEMs. Scholar working on innovation in Japan may be interested to further investigate this relation to eventually elaborate a more general statement. Finally, the current automotive industry is also a rare chance for the research community to have a better understanding on platform emergence. Economics literature has so far not approached this question as they tend to assume that the platform already exists. Such researches may however be confronted to methodological difficulty to follow the emergence of unknown entity. This studies attempted to give some guidance concerning the challenges encountered in early phase of platform emergence.

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