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**Autonomous driving and the emergence  
of new ecosystems: Cognitive antecedents,  
forms of ecosystem strategies, and  
corporate resource mobilization**

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To my family and friends, my source of energy.





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# Abstract

In times of emerging technologies and increasingly intertwined ecosystems, traditional incumbents are confronted with radically changing environments. They may gain or lose positions from their initial situation, depending on their adaptability to novel ecosystem structures and new market entrants. They face in particular challenges in ecosystems characterized by multifaceted complexities across technological, market, legal, and societal dimensions. Empirical studies of incumbents like the case of Kodak, Blockbuster, and Polaroid have shown how large firms that were successful in the past failed to make sense of the emerging technology and became obsolete. To complement the research on incumbents, I aim to shed light on the incumbents' conditions in the context of emerging ecosystems and their ability to create and capture value.

This dissertation studies strategic management as well as corporate entrepreneurship inquiries in an incumbent setting during the ecosystem emergence. The context of autonomous driving—a technology that stimulates new forms of ecosystems—builds the framework of the dissertation.

Paper 1 focuses on the intra-corporate sensemaking of a single incumbent. It addresses the research question of how incumbents define important components and bottlenecks of an emerging ecosystem and how they construct their strategic response to important ecosystem events. The study examines the cognitive antecedents and potential bias of an incumbent's ecosystem strategy. The in-depth empirical study of a single firm points at four themes which influence the incumbent's sensemaking and thus the strategic response in forming the ecosystem strategy: the established business model logic, the overvaluation of the firm's core competences, the distinct patterns of intra-corporate sensemaking, and the embedded resource allocation tactics.

Paper 2 deals with the hype dynamics of autonomous driving, how these lead to changing corporate strategic foci and a challenge for corporate entrepreneurs in mobilizing resources. Corporate entrepreneurs with novel ideas that require a long-time horizon to commercialize may struggle to meet short-term oriented corporate performance criteria and stakeholder expectations. This study examines a decade-long case of a specific innovation project and suggests that corporate entrepreneurs can leverage both multiple hypes and material proof to navigate changing stakeholder expectations in case of hype disillusionment and the resulting risk of terminating the project too early.

Paper 3 outlines a teaching case of a corporate innovation project applying the autonomous technology in the parking domain. The case describes the shifting paradigms in the automotive industry as well as the digital transformation within the

incumbent firm. The teaching case addresses the challenges of a corporate entrepreneur in meeting stakeholder expectations while pursuing a novel idea that demands longer commercialization period against corporate expectations. This setting is particularly conducive for MBA students to learn how to strategically position innovation projects in a corporate setting to cushion hype dynamics, overcome hype disappointment, and still gain stakeholder interest.

Paper 4 represents an outside-in view on the ecosystem strategies of incumbents as well as new market entrants. It takes stock of the maturity of the autonomous driving ecosystem and examines the opportunities and risks of the identified value creation strategies. It also addresses the value capture options of either integrating incumbents into the ecosystem building or constructing a entirely new blueprint of the ecosystem. This paper emphasizes the importance of the time in the market to experiment as well as build its ecosystem position.

Taking all four papers into consideration, this dissertation presents empirical insights contributing to the ecosystem, cognition, hype, and corporate entrepreneurship literature. It aims to create in particular an understanding of the interplay of incumbent sensemaking and ecosystem strategy as well as the interplay of cultural and material practices in corporate entrepreneurship.

**Keywords:** corporate entrepreneurship, corporate resource mobilization, ecosystem emergence, ecosystem strategy, ecosystem bottlenecks, framing, hypes, incumbent, sensemaking, stakeholder expectations.

# Kurzfassung

In Zeiten von neuen Technologien und zunehmend miteinander verflochtener Ökosysteme werden traditionelle, etablierte Unternehmen mit radikal veränderten Umgebungen konfrontiert. Abhängig von ihrer Anpassungsfähigkeit an neue Marktteilnehmer und neue Ökosystemstrukturen können sie in einem entstehendem Ökosystem von einer neuen Rolle profitieren oder verlieren. Ökosysteme, die meistens technologisch und marktseitig vielschichtig komplex und mit rechtlichen und gesellschaftlicher Akzeptanzfragen verbunden sind, stellen insbesondere etablierte Unternehmen vor Herausforderungen. Branchenbeispiele über vergangene Marktführer wie Kodak, Blockbuster, und Polaroid haben gezeigt, wie Großunternehmen Schwierigkeiten hatten, die aufkommende Technologie rechtzeitig zu verstehen, und wie sie dabei als Unternehmen obsolet geworden sind. Aus diesem Grund untersuche ich die Vorgehensweise der traditionellen Unternehmen in Hinblick auf ihrer Entwicklung einer Ökosystemstrategie und ihrer Fähigkeit zur neuen Wertgenerierung.

Diese Dissertation untersucht Fragestellungen sowohl im strategischen Management als auch im Corporate Entrepreneurship und fokussiert sich auf das traditionelle Unternehmensumfeld und die Entstehung von neuen Ökosystemen. Dafür eignet sich der Kontext des autonomen Fahrens und bildet somit den Rahmen der Dissertation.

Forschungsprojekt 1 untersucht die kognitiven Vorläufer und die potenzielle Fehlinterpretation der Ökosystemstruktur innerhalb eines etablierten Unternehmens. Die empirische Untersuchung weist auf vier Themenbereiche, die die Wahrnehmung des etablierten Unternehmens und damit die strategische Reaktion in der Gestaltung einer Ökosystemstrategie beeinflussen: die etablierte Geschäftsmodelllogik, die Überbewertung der Kernkompetenzen des Unternehmens, die unterschiedlichen Muster der unternehmensinternen Wahrnehmung, und die bisherige Logik der Ressourcenallokation.

Forschungsprojekt 2 beleuchtet die Dynamik des Hypes, welche kontinuierlich strategische Schwerpunkte von Unternehmen beeinflusst. Diese Studie untersucht, wie Corporate Entrepreneurs Ressourcen für ein Innovationsprojekt mobilisieren können, das voraussichtlich mehr Zeit für die Kommerzialisierung als kurzfristige inkrementelle Innovationen benötigt. Die Integration von mehreren Hypes und materiellen Beweisen von Fortschritt ermöglicht den Corporate Entrepreneurs in der Projektpositionierung auf veränderte Erwartungen der Stakeholder im Falle einer Hype-Desillusionierung

flexibel zu reagieren und somit gegen das Risiko eines frühzeitigen Endes des Projektes zu steuern.

Forschungsprojekt 3 skizziert eine Fallstudie, die auf der Anwendung der autonomen Technologie im Parkbereich basiert. Der Fall beschreibt die Transformation zu Softwaregeschäft in der Automobilindustrie als auch die digitale Transformation auf Unternehmensebene. Er adressiert die Herausforderungen eines Unternehmers bei der Mobilisierung von internen Ressourcen für eine Innovationsidee, die jedoch entgegen den Firmenerwartungen längere Zeit für eine Skalierung beansprucht. Diese Fallstudie, ermöglicht insbesondere Masterstudierenden die reale Situation kennen zu lernen, wie sie Ressourcen in einem strukturierten Unternehmensumfeld mit definierten Performance Kriterien mobilisieren und gleichzeitig die Erwartungen der Stakeholder erfüllen können, um letztlich die Hype-Dynamik abfedern und einen möglichen Stopp ihres Projektes vermeiden zu können.

Forschungsprojekt 4 stellt einen Blick von außen auf das Ökosystem im Bereich des autonomen Fahrens dar. Diese Studie erfasst den Reifegrad des Ökosystems und untersucht die Ökosystemstrategie von etablierten Unternehmen und neuer Marktteilnehmer hinsichtlich ihrer Wertschöpfung. Des Weiteren werden Wertgenerierungsstrategien untersucht, wie entweder Unternehmen mit etablierten Unternehmen kollaborieren oder komplett neue Ökosystemstrukturen aufbauen können. Abschließend weist diese Studie auf die Wichtigkeit hin, zeitnah im Markt zu sein, da dies das Experimentieren mit der Technologie und den Aufbau des Ökosystems ermöglicht.

Diese Dissertation präsentiert die Erkenntnisse und Beiträge aller vier Arbeiten, um die Literatur zu den Themen Ökosystem, Kognition, Hype, und Corporate Entrepreneurship zu erweitern. Es soll zum ganzheitlichen Verständnis des Zusammenspiels von Kognition und Ökosystemstrategie sowie zwischen Hypes und der Erfüllung der Erwartungen der Unternehmensinteressengruppen beitragen.

## 1.1 Motivation

*All our knowledge has its origins in our perceptions.*  
– Leonardo da Vinci (1478–1518)

This dissertation is a result of the increasing importance of forming ecosystem strategies to secure former value positions or establish new ones to create and capture new value. Autonomous driving (AD) has evolved as a suitable research context to study the ecosystem emergence around a hyped technology which is promised to become a trillion-dollar software and service business. With technology and market potential attracting numerous new market entrants from Silicon Valley, receiving billions in investments, new value propositions are formed, and new forms of ecosystems are beginning to take shape.

However, the emerging ecosystem structures lead to challenges on the traditional automotive incumbent side which already faces a limited growth in its core business and the losing significance of its core technical competence such as in diesel technologies or hardware focused vehicle systems. Trusted long-year partnerships between incumbents are no longer a solid basis for technology development. Instead, constellations with new market entrants become more common to create and capture the new value of the emerging technology of AD. In the realm of AD, firms must embrace the holistic sense-think-act paradigm. In other words, firms that aim to offer the core of AD must develop a virtual driver capable of making sense of the environment, interpreting the sensor data, and acting on these.

Applying this AD language to the firm's behavior during ecosystem emergence, firms must similarly make sense of their changing business environment, assess it, and formulate their strategic response. All of these are causally linked. Consequently, sensemaking already defines the firm performance which can be challenging in an emerging ecosystem if historically grown cognitive models bias the incumbent's sensemaking. Making sense of the ecosystem, then allocating internal resources to the firm's belief, and creating collective beliefs outside the firm represent requirements in entering the ecosystem but also a multi-faceted challenge.

AD itself revealed to me to be a captivating research context to study. Not only is it the emerging fascinating technology but also the different set of entrepreneurial as well as traditional spirits that raise my interest. Being immersed in two incumbent settings—first at an automotive truck OEM and second at an automotive supplier—for several

years, I was primed with straight-forward hardware-centric core business. I find it therefore particularly intriguing to study the so far unchallenged incumbent which was not required to contemplate its value proposition but is suddenly confronted with losing its core business, value chain and hard-earned market leadership position.

## 1.2 Scope and Objectives

Considering the lasting novelty of emerging ecosystems, this dissertation aims to generate qualitative insights into how primarily incumbents and their ecosystem co-actors behave vis-à-vis the radically changing business environment. During my research three interesting lines of inquiries evolved: Cognitive antecedents of an ecosystem strategy, forms of ecosystem strategies, and corporate resource mobilization. The three research areas form the cumulative structure of this dissertation.

Having the ability to be immersed in an incumbent firm, I conducted in-depth empirical studies to shed light on the three research areas. I followed two main objectives:

- (1) I aim to shed light on the cognition of an incumbent in an emerging ecosystem, how cognitive antecedents guide the strategic response. I particularly look at a multiproduct organization which is confronted with internal challenges in channeling new knowledge and creating collective beliefs—an additional complexity in an already volatile environment.
- (2) I aim to create an understanding on corporate resource mobilization for long-term innovation projects. I particularly aim to solve the theoretical gap and empirical puzzle of dynamic framing without losing legitimacy by shedding light on the interplay of cultural and material practices.

An additional and crucial research interest is to offer practitioners support by guiding them in the development of their ecosystem strategy.

## 1.3 Form and Extend of Contribution

During the dissertation I conducted four research projects, all in co-authorship. Below, I outline my contributions to each research project.

In the first research project, I designed the study with Jana Thiel and Bart Clarysse. I implemented the study by collecting and analyzing the data and drafted the first manuscript. Under the supervision of Jana Thiel, I iteratively improved the manuscript. In the second research project, I designed the study with Bart Clarysse and Jana Thiel. I implemented the study by collecting and analyzing the data and drafted the first manuscript. Under the supervision of Bart Clarysse and Jana Thiel, I continuously

improved the manuscript. The third research project represents the teaching case which I developed under supervision of Jana Thiel and Bart Clarysse. Finally, in the fourth research project, I together with Jana Thiel designed and implemented the study. The manuscript is co-written with Jana Thiel. The following Table 1 summarizes the publication status of the resulting papers.

**Table 1: Publication Status**

Paper	Title	Authors	Personal contribution	Status
1	The Bottleneck That Wasn't: Cognitive Antecedents and Potential Biases in Intra-corporate Sensemaking of an Emerging Ecosystem	Viet Duyen Le, Jana Thiel, Bart Clarysse	Study design with co-authors Study implementation Paper development with second author	Working paper
2	Overcoming Disappointment: How Corporate Entrepreneurs Can Leverage Hypes and Material Proof	Viet Duyen Le, Bart Clarysse, Jana Thiel	Study design and implementation Paper development with both co-authors	Accepted for Paper Development Workshop of Journal of Business Venturing Special Issue: Hypes and Entrepreneurship Accepted for 43rd Strategic Management Society Annual Conference Journal submission under review
3	Mobilizing Corporate Resources for a Strategic Innovation Project: The Case of Connected Parking at the Bosch Group	Viet Duyen Le, Jana Thiel, Bart Clarysse	Case development under supervision of both co-authors	Under preparations to be submitted to the Case Clearing House
4	The Tough Bet on the First-to-Scale Autonomous Trucking Ecosystem	Viet Duyen Le, Jana Thiel	Study design, implementation, and paper development with second author	Presented and published at 7 <sup>th</sup> International VDI Conference for Autonomous Trucks

## 1.4 Overview of this Dissertation

This dissertation took place under the overarching theme of emerging ecosystems in the field of autonomous driving. Autonomous driving itself provided an ideal ground to study how incumbents define their ecosystem strategy vis-à-vis the ambiguity and dynamics of an emerging ecosystem. With the transformation of the automotive

industry towards a software-defined vehicle, the influx of high-tech companies and software startups could break up long-established industry structures. Incumbents face negative shocks struggling to make sense of valuable ecosystem positions and altering power structures. As corporates undergo different phases in defining their ecosystem strategy, the first paper focuses on the intra-corporate sensemaking process which lays the foundation of their strategic behavior. The second paper brings in a different perspective on the ecosystem strategy formation—the corporate venture level. In the phase of resource mobilization corporate entrepreneurs not only need to fulfill expectations of resource providers but also sell their desired ecosystem position despite the ups and downs of the ecosystem dynamics. To transfer the theoretical insights into the student classroom, we developed a teaching case as paper three. After conducting the in-depth inside view of an incumbent, the dissertation concludes with an outside-in view of autonomous driving firms on the ecosystem emergence.

In the following, I provide the summaries of the four papers.

#### **1.4.1 Cognitive Antecedents – Sensemaking during Ecosystem Emergence**

The first paper serves as a basis to gain an understanding how incumbents make sense of emerging ecosystems.

Business environments have evolved from traditional supply chain relationships to ecosystem networks, which lead to new questions like who will lead the newly emerging ecosystems or occupy critical bottleneck positions to benefit from high value creation (Hannah & Eisenhardt, 2018). To this end, the current ecosystem literature has produced a sizable body of research about configurations and strategy options of different ecosystem actors. Prior literature is dominated by largely rational economics view in prescribing how to best match firm strategies to environmental conditions and structures of the ecosystem (e.g., Adner, 2017).

However, especially in emerging ecosystems the interpretation of what are available options and which ecosystem components are critical bottlenecks is not *ex ante* given. Within a given firm, these are the result of managerial interpretation and collective decision-making processes. In particular, in incumbent firms with grown cognitive models and organizational structures, strategic behavior might be less rational than assumed (e.g., Cyert & March, 1963). Subsequently, our research aims to investigate the pre-stage of developing an ecosystem strategy in a large firm. We address the research question how social-cognitive processes impact how incumbents define important components and bottlenecks of an emerging ecosystem and how they construct their strategic response to important ecosystem events.



We followed an in-depth inductive qualitative approach. Studying the research question in an automotive incumbent setting enabled us to examine internally how intra-corporate sensemaking evolves and shapes corporate strategy with respect to its ecosystem involvement in the autonomous driving domain. Based on internal interviews with autonomous driving stakeholders we analyzed the different intra-corporate perceptions and multi-fold impediments of an incumbent on future ecosystem positioning.

Through the internal lens of an incumbent, our findings shall demonstrate the interrelations of subjective frameworks, environmental changes, and strategic behaviors. Our research pursues to connect the sensemaking with the ecosystem literature. It shall thus complement the theories of ecosystem strategies by identifying patterns and dependencies of traditional intra-organizational sensemaking in an emerging ecosystem.

#### **1.4.2 Resource Mobilization – Leveraging Hypes and Material Proof**

This research paper forms the core of the dissertation.

Despite novel approaches to the design of corporate entrepreneurship programs (Leubner & Vedula, 2022; Shankar & Shepherd, 2019), the perennial problem of successfully scaling and integrating entrepreneurial projects into corporate business units is far from being solved (Burgelman, 1983; Leiting, 2020; Raisch & Tushman, 2016). Especially, the time horizons associated with the commercialization of emerging technologies (Agarwal & Bayus, 2002) challenge corporate entrepreneurs in their attempts to meet the corporate expectations of financial impact, scale, and other criteria (Vinokurova & Kapoor, 2020). The failure to meet expectations becomes even more amplified for projects that engage with hyped technologies. The original excitement that often surrounds novel technologies can, on the one hand, unlock strategic funding while, on the other hand, the overinflation of expectations also lead to inevitable disappointment when promises do not materialize (Borup et al., 2006). Prior research has emphasized storytelling and generally cultural and relational practices to maintain legitimacy for entrepreneurial endeavors (Garud et al., 2014; Logue & Grimes, 2022). Social proofs have received heightened attention in their function to culturally engage with hypes and thus maintain a venture's legitimacy (Logue & Grimes, 2022).

However, social proof may be more difficult to leverage for corporate entrepreneurs, who often need to gain short-term managerial support defend their project performance against unambiguous financial objectives and against a portfolio of alternative corporate investments (Bower, 1970; Vinokurova & Kapoor, 2020). Subsequently, many corporate entrepreneurs find themselves in an impossible situation to satisfy corporate

expectations. In this paper, we thus explore the research question of how corporate entrepreneurs can continuously mobilize managerial support for long-horizon innovation which fail to meet short-term key performance criteria and stakeholder expectations.

We study our question in the context of a large, multinational automotive supplier and the trajectory of one of its successful strategic innovation projects—the investment in an autonomous driving technology. This project stood out in its prominence gained within the company and in its overall level of success compared to other projects initiated under the same strategic impetus. We analyzed the actions and narratives of the corporate entrepreneur over the course of a decade.

Our corporate entrepreneur orchestrated in particular three foundational cultural practices to engage in what we call ‘hype hopping’ i.e., a repeated leveraging of collective excitement and resource mobilization potential of multiple successive hypes. We find that such a strategic move between hypes requires the built-up of material proof as a key enabler. By showing how corporate entrepreneurs can use hype frames strategically, we contribute to the larger research on entrepreneurial resource mobilization and future-making (Garud et al., 2014; Logue & Grimes, 2022).

### **1.4.3 A Case of Resource Mobilization – Navigating Stakeholder Expectations**

This chapter represents a teaching case that zooms into a corporate venture in the field of autonomous driving. We set the scene around an internal venture that consists of a set of digital and autonomous parking services. Along a seven-year journey, the venture undergoes typical corporate entrepreneurship challenges as well as uncertainties during the emergence of an ecosystem.

Taken the perspective of a corporate entrepreneur, students are asked to re-frame their venture idea when managing three levels of challenges: First, the corporate entrepreneur needs to fulfill corporate performance criteria such as the strategic fit, promising market potential, and global scalability to acquire corporate funds. Second, the corporate entrepreneur needs to meet the expectations of resource providers who change over time as well as are guided by the business performance of their organizational unit. Third, the corporate entrepreneur needs to weigh the options of project frames. In case of a hyped technology—as in our case of autonomous driving—corporate entrepreneurs are faced with the challenge to navigate varying stakeholder expectations vis-à-vis the course of the hype.

The teaching case is complemented with a teaching note. It states the teaching objectives and gives recommendation on the audience suitability. Moreover, it includes

a set of additional readings and video material to sketch a profound introduction to the focal topic of corporate entrepreneurship to the students.

#### **1.4.4 Ecosystem Strategies – The Outside-in View**

The fourth paper of the dissertation embodies a whitepaper that shall complement the formerly outlined corporate view on the emerging ecosystem.

Forming an ecosystem requires the understanding of how other parties, from competing actors to complementors make sense of their environments to foresee their respective strategic behavior (Teece, 2007). With this paper, we aim to shed light the primary inquiry of practitioners in this field: Which ecosystem will be the first to scale and gain sustainable profitability? Ecosystem actors are severely concerned about the duration of the commercial take-off since investors and industry players already poured in total 75 billion USD into the technology (Bloomberg, 2022).

This paper shall thus provide a more holistic understanding of the ecosystem emergence. Our research context specifically centers on the application of the AD technology in the truck sector. Since autonomous trucking represents the earlier application than autonomous robotaxis or privately-owned vehicles, we could study a more advanced stage of the ecosystem formation that is close to commercialization.

Based on interviews with ecosystem actors such as the automotive manufacturer, autonomous technology startup, and logistics firm, as well as based on contextual data from industry conferences and press releases, we took stock of the ecosystem maturity including the outer perception of the emerging and changing bottlenecks. We gained an outside-in view and identified how firms in the autonomous driving field intent to enter the ecosystem to create and capture value. With the more holistic perspective on the ecosystem, we aim to reflect on our findings from the first two research projects within the incumbent setting.



# The Bottleneck That Wasn't: Cognitive Antecedents and Potential Biases in Intra-corporate Sensemaking of an Emerging Ecosystem

## 2.1 Introduction

*We cannot solve our problems with the same level of thinking that created them.*  
– Albert Einstein

Processes of digital transformation have become significant drivers of creating new forms of how business is organized, and value is created and captured. Especially traditional incumbents with their long histories of industry success are under heightened pressure from changes to their established ecosystems. Newly emerging ecosystems lead to new structures of competition and cooperation (Hannah & Eisenhardt, 2018) with interlinkages between firms no longer being hierarchically defined, but often more flexible depending on the ecosystem requirements (Jacobides et al., 2018). New forms of interdependent networks of firms have emerged that engage in the creation of a joint value proposition to the end customer (e.g., Adner, 2017). These changes have led to substantial pressure for many incumbent firms of finding new and sustainably differentiated positions that allow value capture at least at comparable levels to the old ways, if not beyond. Building new ecosystem strategies requires firms to make sense of different options to design economic exchange relationships, interpret the expectations of various market actors, and understand what relative value their products and services will add and finally which role they take in the new ecosystem.

This adaptation process is particularly challenging for firms with long histories of industry success as they are operating on existing organizational configurations, routines, and mental models (Eggers & Kaplan, 2013). There is a substantive body of research into the impact of manager's cognitions and attention on firm strategy, especially with a focus on how pre-existing mental models of the firm's business logic and how to allocate resources may create interpretive filters and inertial barriers in transformation processes (e.g., Eggers & Kaplan, 2009, 2013; Ocasio, 1997; Tripsas & Gavetti, 2000). Cognitive models shape strategic actions managers take to make sense of issues and interpret them (Eggers & Kaplan, 2009; Kaplan, 2008). It also impacts the organizational sensemaking how individuals create collective beliefs and justify

decisions (Weick, 1995). More recently, scholars have begun to argue that cognitive models might also be a central element when entering new digital ecosystems (Volberda et al., 2021). Scholars identified top manager sensemaking frames which may cause the different perceptions and actions within an ecosystem, which are their understanding of technology, the need for strategy change, business models, and their local embeddedness (Penttillä et al., 2020).

While prior research provides important pointers to managers' sensemaking, we have yet to understand how different frames and interpretations in a multi-national corporation with multiple different internal stakeholders come to their respective strategic assessments. Subsequently, in this paper, we aim to deepen the understanding of intraorganizational sensemaking across various units that influences the corporate shaping of the future ecosystem role. Specifically, we set out to better understand the role of cognitive processes on the formation of ecosystem strategy within an incumbent corporate context, considering, in particular, the multiplicity of cognitive models and socially embedded managerial tactics regarding resource allocation. We seek to illuminate the managers' perceptions of ecosystem dependencies and the relative importance of ecosystem actors and roles in an emerging ecosystem. Specifically, we aim to shed light on: *How do social-cognitive processes impact how incumbents define important components and bottlenecks of an emerging ecosystem and how does this influence their construction of strategic responses in the evolving ecosystem?*

This research is particularly interested in a setting in which incumbents would need to disrupt their own business logic and the mental models associated with those. By gathering first-hand information inside an incumbent firm that aims to evolve from a component supplier position to an ecosystem orchestrator, the research is expected to create an internal holistic understanding of the related sensemaking processes. The study aspires to find empirical evidence of the cognitive impacts on the strategic behavior in emerging ecosystems.

## 2.2 Background

### 2.2.1 Emerging Ecosystems and Bottlenecks

With industry becoming increasingly interconnected, and consequently, product and service offerings becoming more intertwined, there has been a heightened interest in strategic management regarding the understanding the ecosystem constructs. Ecosystems constitute a much more complex environment compared to traditional value chains; moving away from a single firm toward a network of firms that are engaged jointly in higher value creation (Adner, 2006). They represent a "set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully

hierarchically controlled” (Jacobides et al., 2018, p. 2264). Subsequently, researchers identified different structures that ecosystems could take: the business ecosystem with a focal firm, the innovation ecosystem with a focal innovation and complementing actors, and the platform ecosystem which facilitate the convergence of firms (e.g., Adner, 2006; Gawer & Cusumano, 2014; Jacobides et al., 2018; Teece, 2007).

A crucial question of interest for scholars and practitioners alike is how firms can form a successful ecosystem strategy (e.g., Adner, 2006; Furr & Shipilov, 2018). Ecosystem strategies have been studied to better understand value creation and capture through cooperative versus competitive entries, leading to the insight that in particular so-called ecosystem bottlenecks—i.e., positions in the ecosystem that are temporary barriers for an ecosystem to grow—are sources of superior performance for ecosystem players (Furr & Kapoor, 2018; Hannah & Eisenhardt, 2018). Occupying the ecosystem bottleneck as well as an architectural component that defines the functional concept of a technical system entails the prospect of gaining a more sustainable role in the ecosystem (Baldwin, 2015; Furr & Szerb, 2021). As numerous scholars favor the bottleneck position in the ecosystem, Baldwin (2015) classifies two types of bottlenecks in the ecosystem: the technical and strategic bottleneck. While the first outlines the necessity for proper system functioning, the latter describes a gateway position—a firm controlling and monetizing the access to the solved bottleneck.

However, finding a company’s role in the ecosystem—the desired bottleneck position—might not be straight-forward. In particular, firms struggle to adapt to ecosystems when faced with negative environmental shocks that demand the cannibalization of their foundational business (Burford et al., 2021). Up to this point, prior literature in ecosystems has primarily studied the firm’s material capabilities to occupy a bottleneck but has neglected preceding processes of judgment and differential assessment that may go into identifying what exactly the technical or strategic bottlenecks would be. As the formation or restructuring of an ecosystem unfolds over time during which bottlenecks might also be dynamically change (Baldwin, 2015; Hannah & Eisenhardt, 2018), actors may place different interpretations onto what roles might become critical and when. We know currently very little about how firms make sense of critical bottlenecks and how they may come to different interpretations of technical and strategic bottlenecks. This sensemaking process may become even more demanding while the ecosystem is emerging, and bottlenecks are dynamically changing.

### **2.2.2 Managerial Cognition and Challenges of Incumbent Adaptation**

Going back to the roots of the behavioral theory of the firm, scholars found that firms do not act rationally (Cyert & March, 1963; Gavetti et al., 2012). Managerial cognition of

managers as the underlying construct of decision-making in the firm prescribes the “knowledge structures, mental processes, and emotions” (Helfat & Martin, 2015, p. 1291). The cognitive work of individuals or social groups has been thus further studied in the notion of organizational sensemaking (e.g., Maitlis, 2005; Thomas et al., 1993). Making sense of unusual events called cues, interpreting, and forming a response comprise the sensemaking process (Weick, 1995) which explains why firm performance differ from one another (Eggers & Kaplan, 2013). In particular, in radically changing environments, sensemaking of the environment becomes a crucial element to increase the firm performance and prevent displacement by new market entrants. However, well established firms struggle to make sense of those radically changing environments as these lead to a mismatch to their historically grown cognitive models. In-depth single case studies of Polaroid (Tripsas & Gavetti, 2000), Kodak (Kaplan & Henderson, 2005), and Blockbuster (Raffaelli et al., 2019) have shown how incumbents struggle with inertial forces and how these limit their strategic response to radically changing environment.

Inertial forces emerge not only from prior mental models but also from their perceptions of core capabilities and routines (cf. Eggers & Kaplan, 2013). Gilbert (2005) shows how firms can become rigid in routines and resources which hinders them to adapt new investment behaviors. Also, Eggers and Kaplan (2013) identified a causal link between experiences, cognition and capabilities which implies the challenge in changing the cognition if the experience input may be uniform. As firms are constrained by the firm’s cognitive models and interpretation of business opportunities (Tikkanen et al., 2005), newer research (Martins et al., 2015) has suggested that firms may use analogical reasoning to import other business model logics into their own domain.

Despite the challenges in traditional business logics, organizational sensemaking most importantly builds on social processes, where individuals and their interplay play essential roles (Maitlis, 2005). Large organizations, particularly those with diverse stakeholders and their respective cognitive frames require well-defined social processes to make sense of external knowledge. In times of high velocity industry changes, Maitlis (2005) points out that restricted sensemaking with selective groups of individuals may occur more frequently. Monteiro and Birkinshaw (2017) suggest forming a dedicated unit that actively acquires external knowledge as well as uses the right channeling techniques to transmit acquired knowledge within the organization. However, gaining new knowledge can lead to conflicting information for individuals (Garud & Rappa, 1994) which impedes their fast or pending response to key ecosystem events.

Complementing cognitive theories of how managers shape a firm strategy is the inquiry into how socially embedded firm competencies and resource allocation processes form inertial forces through political maneuvering (e.g., Danneels et al., 2018). Understanding firm-level decisions as a result of intra-firm attentional and negotiation



processes and legitimacy creation for what constitutes viable firm action (e.g., Ocasio & Joseph, 2005; Suchman, 1995) helps to explain transformation processes in incumbent organizations. When disruptive technologies emerge and future business fields do not match the existing organizational set-up, it can be expected that intra-firm legitimation processes and negotiations between actors emerge over interpretations and resources, which will impact what position the firm will take vis-a-vis a new ecosystem.

To summarize, incumbent firms do not operate on a blank page; they start from existing organizational configurations, processes, and mental models. Prior research has shown that managerial cognitions as well as political power relations with regards to resource allocations impact organizational adaptation and strategy processes (e.g., Bower, 1970; Danneels et al., 2018; Kaplan, 2008; Tripsas & Gavetti, 2000). Pre-existing mental models of the firm's business logic and how to allocate resources may create thus interpretive filters impacting the ecosystem strategy building.

## **2.3 Data and Methods**

### **2.3.1 Research Context**

One of the industry sectors currently most pressured by advances in digital technologies and the subsequent emergence of new business models and ecosystems is the automotive sector. Large automotive players, who have been traditionally strong in the hardware component business, need to explore new territories and grapple with the challenges to find their places in newly emerging ecosystems.

### **2.3.2 The Emerging Ecosystem of Autonomous Driving**

A transformation in the automotive ecosystem is exemplified by the emergence of AD, signifying substantial shifts in the power of leading firms within the automotive industry (Shirokinskiy, 2021; Deichmann et al., 2023). Industry conversations address AD when the technological advances surpass the automation level four defined by the SAE (SAE International, 2021). Enabling AD on public roads exceeds the mere development of the vehicle and thus the power of an individual firm. Instead, managing the digital infrastructure on the road as well as the extremely large amount of data becomes crucial and lends impetus to the development of the AD ecosystem (Curry & Sheth, 2018) attracting a multitude of potential players. Subsequently, the decade between 2010 and 2020 has seen eager market entrants like new startups and diversifying technology companies with non-automotive legacies enter this newly emerging ecosystem and striving to form relevant partnerships (Le & Thiel, 2023).

After a decade of exploration and alliancing, as the industry is moving strongly toward a first commercially viable use case in autonomous trucking (Bishop, 2022), the general elements and components within such an ecosystem, as well as the potential roles of various companies, have become clearer. Yet, at the same time, the exact structures and dependencies in this ecosystem are anything but clear. One still observes different options for how players define their collaboration and co-delivery of value. Different alliance consortia, involving both incumbent and new players, follow different design philosophies. The question of who will emerge as ecosystem leaders is yet to be decided. These dynamics make the context extremely fitting to study our research question. On the one hand, sufficient legitimacy and attention is focused on this sector for ecosystems to form and emerge, yet there is substantive collective sensemaking and strategic rivalry going on to examine how our partner organization intends to position itself and what the driving cognitive and behavioral factors are.

### **2.3.3 The Perspective of an Automotive Incumbent**

We selected a traditional automotive supplier—named AutoCo in this research—as one of the major incumbent suppliers in the automotive sector undergoing a digital transformation. The corporate strategic renewal involved fundamental changes in the firm’s sensemaking framework, making the focal company as an ideal research ground for our question.

From the perspective of an incumbent automotive supplier, revenues of the traditional automotive business have dropped significantly since the automotive market is stagnating globally and is ruled predominantly by one-time-sales. Our focal supplier faces the significant downturn of the automotive business, which results from the general industry decline and recent disruptive events such as the COVID19-pandemic and semiconductor crisis. While the traditional business of diesel technology crashes as well as cars become part of a greater shared user-centric mobility ecosystem, the automotive firms start to experiment on new technologies and service business fields. External pressures by customers and legislators, for example to reduce CO2 emissions sustainably and to enable contemporary and flexible mobility and transport solutions, ask automotive players to make important decisions about strategic focus and respective resource allocation, all the while facing diminishing financial resources.

Executives at AutoCo faced the digital transformation pressures and started to embark on newly emerging market opportunities, such as AD, and the new business models which held promising recurring revenues. However, within the field of AD, AutoCo was confronted with the changing value chain logic towards an ecosystem logic in digital business. The construct of emerging ecosystems increases complexity for intra-corporate sensemaking on the incumbent side. How the firm will position itself in the

ecosystem and approach other actors to realize its target picture of the ecosystem will depend on how managers interpret the new industry structures and how they identify and legitimize adaptive actions.

## 2.4 Research Design

We chose an in-depth single case study approach. In our view, analyzing the socio-cognitive processes and the strategic behavior of an incumbent requires the complete inside view of a corporate. A single case allows researchers to generate insights of new evolving processes such as for internal corporate venturing (Burgelman, 1983) or the organizational inertia (Tripsas & Gavetti, 2000). Like our research context we study changing socio-cognitive processes vis-à-vis the ecosystem emergence. Interesting for our line of inquiry is also the possibility, through our setting, to study different groups of sensemakers within the focal organization that investigate separately the use cases of AD in both the private and commercial vehicle sector. We followed the extended case study method (Burawoy, 1998) by identifying conceptual clusters in the theory and use them as the structure against which we analyzed data. We based our study on cognitive theoretical foundations in the context of intraorganizational sensemaking. By reflecting the theoretical findings with our empirical insights, we aim to create a granular understanding of intraorganizational sensemaking in the context of ecosystems.

## 2.5 Data Collection

We collected data on intraorganizational sensemaking processes and organizational structures. For this purpose, the lead author of this paper joined the incumbent firm and specifically the in-house consulting department. As the in-house consulting was allocated to the corporate strategy reporting directly to the CEO, the organizational proximity facilitated to generate insights of the focal firm's intraorganizational sensemaking structures. In her role in the management consulting, the lead author was able to observe first-hand the ongoing AD projects that the focal company had initiated. Due to her in-house position, she was also able to access substantial archival material to trace decisional antecedents of those projects. She participated in weekly project meetings, and first conducted primary exploratory interviews to make sense of the different projects and constellations. As the second step she conducted over a one-year period semi-structured interviews with 30 internal stakeholders involved in the field of AD—ranging from corporate strategy to specific business-unit functions as well as from senior management to the president level. As the third step, she collected secondary external data, that are whitepapers and market reports from consulting firms that puts the corporate interviews insights into perspective. Table 2 summarizes the data sources.

**Table 2: Data Collection**

Source and type of the data	Details	Use in the analysis
<b>Interviews:</b> 35 in-depth semi-structured interviews with 30 internal stakeholders in the field of autonomous driving, leading to 2881 min in total	15 interviews with autonomous driving project representatives (president, project leaders, engineering, and business leads)	Core data source to gather understanding for intraorganizational sensemaking process and build the chronology of the knowledge structures and cognitive models
	9 interviews with business unit representatives (president, engineering, and sales functions)	
	5 interviews with strategists (corporate, divisional, autonomous driving specific)	
	6 interviews with internal strategy consultants (head, senior consultants)	
<b>Internal autonomous driving project documents:</b> PowerPoint presentations of conducted workshops in autonomous driving projects, ecosystem strategy development, internal whitepaper	825 pages of internal documents	Complementary data to trace back results of sensemaking process and strategic recommendations to the board of management
<b>Context-related articles:</b> Whitepapers and market reports of the autonomous driving ecosystem, ecosystem actors	586 pages of external documents	Complementary data to put findings into the perspective of intraorganizational sensemaking within focal company

## 2.6 Data Analysis

Our data analysis is split in four steps covering context-building, decision mapping over time, coding of primary interview data, and running exchanges between our data and theory lenses. First, we built the context by creating a timeline of the AD corporate ventures, enriched by internal instrumental events such as strategy revisions, organizational changes, and input from external stakeholders. Second, we mapped the internal sensemaking activities to key events on the ecosystem-level; events that draw on market entries, demonstrations, and ecosystem building formation. Both steps are summarized in Table 3.

Third, our analysis of the interview material pointed us in particular to different perceptions of the firm's role and bottlenecks in the ecosystem. Our interviewees shared with us interpretations that differed between intra-corporate units. We grouped them accordingly and mirrored the intraorganizational interpretations to external views. As our research led us to the theory of managerial cognition (e.g., Eggers & Kaplan, 2013), we identified four core theoretical conceptual clusters: the interplay between cognition and business model logic, the interplay of cognition and capabilities, cognitive foundations of organizational sensemaking with its impact on knowledge accumulation as well as the interplay of cognition and resource allocation. Table 4 presents our conceptual framework.

**Table 3: Intra-corporate Sensemaking at AutoCo**

	Phase 1: 2013-2018	Phase 2: 2018-2019	Phase 3: 2020-2021
<i>Intra-corporate strategic developments in AD</i>	<p>Strategic renewal towards a software driven company</p> <p>After severe investments and losses in new energies, the company focuses on returning to profitability</p> <p>Development of AD functions and their showcase at different industry fairs (CES, IAA) and press conferences</p> <p>Company follows gradual development towards AD. Technology roadmap involves a stepwise approach coming from partial to fully autonomous</p>	<p>Start of thinking in ecosystem strategies by establishing business model tools</p> <p>Establishment of partnership with a car manufacturer</p> <p>AD for private vehicles has been deleted from tech roadmap</p> <p>At the CES 2019, the company reveals its AD shuttle to the public as well as its concept of mobility</p> <p>AD initiatives are later set on hold due to limited resources and huge required investments</p>	<p>Change of partnership constellations lead to reconsideration of AD</p> <p>European automotive incumbents face immense pressure to lower CO2 emissions due to EU legislation. They thus focus to solve electromobility first, then autonomous</p>
<i>AD ecosystem-level developments</i>	<p>Google as one of the pioneers starts to test its AD developments on the road and measures its advantage per vehicles-miles driven. In 2015, it tests its first autonomous ride in Phoenix</p> <p>In 2013, Mercedes-Benz tests the first autonomous ride with its S-Class on a 100km route</p> <p>AD software tech startups are founded (Cruise in 2013; TuSimple in 2015; Plus, Embark Trucks, Argo.ai in 2016)</p> <p>Automation levels are standardized by the Society of Automotive Engineers (SAE)</p> <p>Ride-sharing companies Uber and Lyft invest in own AD developments</p>	<p>Strategic partnerships are formed, but from 2018 onwards AD firms start to cancel partnerships or pivot from robotaxi to trucking use case due to various reasons (less use case complexity, earlier return on invest)</p> <p>The Tesla Autopilot crash in 2018 raises the industry awareness around safety. Doubts about AD technology readiness emerge. Safety validation of AD technology turns out to be an open world problem</p> <p>COVID-19 pandemic impedes ride-sharing companies to further develop AD technologies. Hence, Uber and Lyft sell their AD business</p>	<p>Starting in 2020, SPAC/IPO are booming for AD startups</p> <p>First consolidation of startups due to the lack of investments</p>

**Table 4: Conceptual Clusters**

<b>Core concepts</b>	<b>Key references</b>	<b>Key ideas</b>
<b>Cognition and business model logic</b>	Gilbert (2005)	Categorization of inertia forces within a firm that are resource and routine rigidities. Development of model to adapt to changes and overcome traditional cognitive models and behaviors
	Martins, Rindova, & Greenbaum (2015)	Outline of business model schemas representing cognitive frameworks. Proposal how business model schemas can be cognitively proactively changed by e.g., “analogical reasoning” and “conceptual combination”
	Tikkanen, Lamberg, Parvinen, & Kallunki (2005)	Development of framework presenting the relationship of business models and cognition. A business model evolves based on material artefacts and belief systems of the firm
<b>Cognition and capabilities</b>	Benner & Tripsas (2011)	Sequential behavior of firms when facing technological change coming from own beliefs, adapted beliefs according to similar parties, to declining value of own beliefs
	Eggers & Kaplan (2013)	Taking stock on the cognition and capabilities research streams. Interlinking the research streams resulting in the development of cognitive process model with the focus on three phases, namely “constructing routines”, “assembling capabilities”, “matching capabilities to the environment”
	Kaplan & Tripsas (2008)	Understanding of cognition along technological change. Development of model presenting the impact of firm’s technological frames and interpretations on technology trajectories over lifecycle
	Tripsas & Gavetti (2000)	Incumbents face challenges in responding to radically new technological changes. Illustration of the interplay of cognition, capability and organizational inertia based on the Polaroid case during the emergence of digital imaging
<b>Cognitive foundations of organizational sensemaking</b>	Maitlis (2005)	Study on social processes in large organizations with different stakeholders. Identification of four different forms of organizational sensemaking that differ based on the mechanisms of animation and control: “guided”, “restricted”, “fragmented”, “minimal”
	Monteiro & Birkinshaw (2017)	Process of multinational corporations in acquiring and processing external knowledge. Channeling techniques can help to “translate”, “matchmake”, and “transform” knowledge
	Weick (1995)	Outline of firm complexity in processing interpretations and understandings
<b>Cognition and resource allocation decisions</b>	Nadkarni & Barr (2008)	Study of interdependence between industry context, managerial cognition, and strategic responses to environmental changes

## 2.7 Findings

### 2.7.1 Established Incumbent Business Model Logics

We find that the business model logic of an incumbent acts as a crucial interpretive lens and hence also potential rigidity (e.g., Gilbert, 2005), with two avenues through which it acts: First, the incumbent's current value chain position and exchange relationships impact how corporate decision-makers evaluate emerging ecosystem design options and determine the aspirations for roles and positions the incumbent aims to occupy. Second, through the economic logics associated with the existing business model, decision-makers privilege roles and value propositions that have a comparable anticipated value capture potential. As we will outline below, both are rationally understandable but feature also a very incumbent-centric interpretation that may miss out on how other ecosystem actors interpret new opportunities differently. This limits potentially the ability to experiment with alternative configurations, which may lead to missed alliance opportunities for an incumbent if they are unable to come to agreements with other ecosystem parties.

#### *Ecosystem aspirations based on incumbent business model logics*

Historically, the role of an automotive supplier emerged from manufacturing components, which a car manufacturer did not consider as key technology. In this traditional model, the OEM defined product specifications triggering the supplier's development. Hence, the supplier's business model was premised on clear customer requirements and scaling ramp-up curves by increasing vehicle volumes across multiple OEMs. Due to historical factors, the success of automotive suppliers relied on engaging in high-volume business strongly influenced by the OEM.

However, with growing global economy and the subsequent cost pressure, the OEM progressively outsourced technologies to suppliers to benefit from scaling effects. As a result, suppliers were more able to introduce own technology approaches and evolved towards the position of becoming a solution provider. Our focal company put its competitive emphasis on its product quality, safety claim, and innovative power, underlined by its strong patent position. Because of its built-up technology knowledge over more than a century, our focal firm AutoCo held market leadership positions such as in the current vehicle developments for driver assistance systems.

Coming from the history of driver assistance systems, which depicted the beginnings of handing over driving responsibility to a vehicle system, AutoCo was used to accustomed to fostering evolutionary developments and exploit the capabilities of



the technological base. Entering the AD field was technically the logical next step as outlined by an internal management consultant:

*AD itself is, of course, one of the topics of the future in the automotive sector. That's for sure. We don't have that many. There is fuel cell, electric drive—but it must be said that electric drive or an electric vehicle is simpler on a scale than a combustion engine. So of course, it's clear that we may also have overcapacity. And if there is simply less stuff in the car, of course you earn less money with a car. That's clear. So, the value creation is getting narrower in the corner. If we really want to stay in business here, then we must get involved in future issues.*

Being limited in the growth choices, individuals on middle and top management level believed in the need of entering the AD field. Resulting from the evolutionary approach and historically tight customer relationship, AutoCo focused on collaborating with the OEM, which was the supplier's only upstream relation. The OEM continued to hold customer ties to B2B customers—the fleet operators—or the B2C customers—the drivers.

In entering new business fields, AutoCo evaluated new investments based on two dominant business case logics. First, investments were mostly borne by the firm's own resources. As an alternative, past investments in new technologies were shared among the supplier and OEM. Second, AutoCo considered business cases to be profitable if it held the promises of a return on investment after three years and an overall business potential of minimum a three-digit million-dollar business. Because of this cognitive imprint one the AD project leaders described the process in approaching the decision makers:

*So, I think it's important to take these two steps, so to say, ok, we continue to believe that AD is a meaningful business for AutoCo. Then first of all, I have to have, so to speak, business cases and business models with which this works, where I say there is a business case, there is a business model. So it can work and then I have to go and say, what premises do I have in this business model, what do I have to achieve by when, if I now say, so to speak, I want to do something with any [partner] in 2030, then I have to look at the business case and say, ok, it's worth it until then and then or the business case in total maybe pays off.*

Here the incumbent cognitive representation, the logic of self-financing innovation, clashed with the entrepreneurial logic of new market entrants relying on external funds and having thus a wider scope of experimenting in the emerging technology. Influenced by the firm's dominant business model logic and past market leading positions, we observed the aspiration of taking a leading position in AD. AutoCo rather took a leading

position for granted as this fit to its reputation in the traditional automotive space. A mobility strategist shared the vision for AutoCo:

*For me, AutoCo should participate in all use cases that are possible. If we go to the old world, yes, we developed many technologies for the car in the old world, then gradually employed them in other areas. [...]. All things that were developed in cars and then sold for motorcycles. We now have driver assistance, which we have now brought into the truck. We were very strongly focused on cars and carried these things out of it. But the fact is that some applications only emerge in other areas and especially now driver assistance, there are applications that were first created in the truck and then come in the car. That's why I think we should now try to participate in all use cases at an early stage when it comes to automation. And my idea of AutoCo's role is different, namely that of an enabler. We have an incredible amount of skills to understand the requirements, to think systemically and then to implement them.*

Our data shows how current market leadership impacted the firm's aspirations in the newly emerging ecosystem and how this influenced the automotive incumbent while making sense of radically changing ecosystem structures.

### ***Industry perception of the supplier's role in the autonomous driving ecosystem***

Taking the view of the industry on the supplier's role in the AD ecosystem, we identified diverging perceptions. Incumbents, in particular the OEM, still saw automotive suppliers in their traditional hardware-centric supplier role. Pioneering OEMs were reluctant in establishing high technology dependencies on suppliers, as it could potentially lead to lock-in effects based on underlying software architectures. Hence, the OEM persisted on its historically grown cognitive representation of a hardware-centric supplier that could gain revenue proportions from AD by scaling its hardware-centric sensor technology, as the AD strategist of an OEM described:

*I also do not see too much change. We need redundant vehicle instead of the normal vehicle, redundant steering instead of normal steering. Mostly it is the same supplier. They will need more sensors than today and crazy expensive computers and a middleware. So, I think, there is enough room for suppliers to grow their business and over time I would also say in parts of the perception. There is also an upside for tier ones. I mean, today we develop the perception as part of the stack. Maybe in five years or ten years from now, you can buy it, you can get it with a camera, lidar, I think I would not be worried as tier one. There is only chance to grow your business.*

By holding a powerful value chain position serving the customer interface, the OEM was thus able to act as a gateway between down- and upstream value creation and capture. Based on the abovementioned imprint of business models logics within the long-established supplier-OEM relationship, AutoCo was not able to encounter the OEM on partner level, as an internal management consultant described:

*It was simply difficult to do business with an OEM on eye-level. If 98% of your business relationship with this OEM is typically based on hierarchies and since we—with me as the supplier and you the OEM—are not really financially profitable, it was clear to us that this is actually only possible on a partnership level. As soon as when it [the situation] got a bit tight with the OEM [...] of course there comes this OEM-tier one bite reflex in the end—'I'm the OEM and you're the supplier.'*

Consulting firms confirmed this supplier perception of power imbalance. For instance, McKinsey reported limited chances for suppliers in a full software provider role if this may overlap with the OEM ambitions (Deichmann et al., 2023). Moreover, the consulting firm emphasized the critical bottlenecks such as data and funding. Both proved difficult for AutoCo: First, it was constrained in building fleets since the supplier avoided to intervene in the OEM's business. Second, the executive board attached high value on the financial independence of the company, imprinted by the founder's vision. Next to McKinsey, Roland Berger pointed at the necessity of automotive suppliers to evolve in new business models. However, a more downstream role or additional data driven end-customer business led to the question of the right to play of the supplier (Shirokinskiy, 2021). In the eyes of new market entrants, predominantly AD technology startups, AutoCo was neither perceived as software player nor known for its software ambitions, as one sales vice president retold a conversation with an AD startup:

*Can AutoCo AD? I have never heard of that you do a whole system. I thought, you only do sensors. This is what you hear over and again [from the AD startups].*

A rising startup, taking the role of a software provider in the ecosystem, shared its view in an AD conference on the supplier's future role:

*Tier ones are incredibly important. For us. We work very closely with tier ones in all the markets we are. Our specialty is software development, software for automated vehicles. For everything else we look to partner. So, the tier ones are incredibly important partners of ours globally in each market they are in.*

In sum, we propose a first argument based on our findings in how business model logics bias the incumbent's role definition and ambition in the emerging ecosystem. The incumbent's overconfidence emerged from historically established market positions and past market strategies biases the status quo.

**Proposition 1: Ecosystem sensemaking in incumbents is strongly related to past positions in the value chain and past economic logics. This risks overvaluation of past capabilities and industry power for future developments.**

### 2.7.2 Core Capabilities, Routines and Learning the New

As a second cognitive antecedent of the ecosystem strategy, we point at the incumbent's manifested cognitive scripts and routines how it makes sense, evaluates cues, and form its strategic response (Eggers & Kaplan, 2013; Leonard-Barton, 1992). We spotted variation when it comes to making sense of ecosystem bottlenecks which promise a favorable competitive position if the firms are able to control these (e.g., Hannah & Eisenhardt, 2018).

First, we found variation in the perception of what a bottleneck is in the AD ecosystem. The classification of what is actually a bottleneck or rather important but not a bottleneck may become highly relevant in forming ecosystem structure. Second, even if incumbents share the same view on the bottlenecks, they will rather work on solving their "preferred" bottleneck, i.e., define the industry timeline in favor of their perception. These conflicting perceptions in the bottleneck type and timing may lead to a risk of missing out opportunities to enter the ecosystem as other actors might not perceived the firm as legitimate ecosystem partner.

#### *Emphasis on own core capabilities as core bottlenecks*

Over more than a century, AutoCo had built its foundational engineering competencies in vehicle technologies, influenced by the founder's mantra on high product quality:

*It has always been unbearable for me to imagine that someone could inspect one of my products and find it inferior in any way. For this reason, I have constantly tried to deliver only products that withstand the closest scrutiny — products that are, so to speak, the best of the best.*

An internal management consultant outlined how the supplier was still imprinted by the high-quality aspirations of the founder and emphasized the launch of products which must comply to legal obligations:

*Actually, entering a business with prototypes would AutoCo never do. We once had [at another business unit], projects, where it is about, for example, field tests with systems. There are murder instructions on how to ensure afterwards that those systems are returned from the field, for example. So that no system without appropriate approval, CE*

*[Conformité Européenne] certification, at [consumer goods] or so remain in the field. AutoCo is simply very risk-averse, as the old [founder] already said: Yes, I'd rather let some business be ruined before I damage my perception of quality in the market. That's how AutoCo still ticks after 135 years. I'd rather lose a business before ruining my good name.*

AutoCo was perceived as premium quality provider and technology standard-setting company. It was also known for its capability to mass-produce sensors for millions of vehicles and at the same time ensure the performance and robustness. One representative of the internal management consultancy highlighted the difference in quality management between automotive and consumer electronics business:

*Quality management was totally different, [OEM] customers came for audits. That's not happening in consumer electronics. You do your stuff and then you give it to the [retailer] and case closed. But when you have to provide products for premium customers, these guys are really a pain in the neck. So, they're coming to check every line, every process which is not in line, you don't get released. If you don't get released, you cannot start the SOP and so on and so forth. [...] It showed that it's more than having a fantastic strategy. It showed it's more than having a good development and engineering process. It has also a production and fulfillment process.*

Overall, AutoCo's key technological achievements contributed to the safety of human lives and partly became legally mandatory in vehicles. Error-free, reliable, and safe products went hand in hand during the firm's technical developments. The focal firm thus much relied on its built industry legitimacy, company size, self-perception, one AD project leader depicted:

*AutoCo is a safe partner in automation, so it's not a startup. If a customer, a major customer, logistics customer, somehow outsources its business processes into the hands of an external partner, then AutoCo is a safe bank, solely from the perception. Exactly the same applies to technology partners, who see AutoCo similarly as an automotive professional. Safe, reliable. Exactly, these are the attributes that stick to AutoCo why AutoCo is attractive.*

From the beginning of the AD ecosystem emergence, AutoCo focused on the commercialization phase when identifying the bottlenecks. The internal consultant described the firm's temporal focus in the AD ecosystem strategy:

*When we look now into the further development of the AD ecosystem, because you are very much in the in the first steps developing, designing, thinking about what hardware components should be integrated in make a prototype run, we are still away from the*

*execution and mass market part, but the mass market part will appear and we should also take into consideration, from my point of view, how do we organize this?*

Because of the automotive supplier's origin in launching new products, past engineering processes were designed to bring innovation to series-production readiness that scales in million units and ensures optimum performance quality. Products needed to be fully developed, safe and legally approved.

When internal stakeholders compared their commercialization approach with others, new market entrants, regularly reported in the press, seemed to aim for high functional driving performance. In contrast to this, these project leaders approached the AD development systematically, meaning that the vehicle showed incrementally functional advancement but incorporated full safety measures during the early stage of development. They were operating with the assumption that those new market entrants might later face the issue of having immense efforts to bring their well-performing software to an automotive-safe level at some point. With this technology approach—which may seem to be less attractive for investors due to the comparably low functional performance in the field—AD stakeholders started to socialize their perceived critical bottlenecks and ecosystem entry strategy internally. Consequently, from the AutoCo's point of view, the technical safety concept was the key bottleneck for achieving a legal approval and a possibly scalable technology roll-out.

### *Disparity between identified bottlenecks and the core capabilities of other ecosystem actors*

We identified not only a mismatch of the perception of ecosystem bottlenecks with the perception of the remaining ecosystem actors, but also the misjudgment of timelines of the emerging bottlenecks. Based on the publications of consulting firms, we identified changing bottleneck perceptions in the ecosystem. For instance, consulting firms such as McKinsey indicated sensor technologies and vehicle architectures in 2016 (e.g., Kaas et al., 2016) while in 2023 they suggest that data as well as funding will be critical resources in the ecosystem (e.g., Deichmann et al., 2023). The latter was perceived to be critical by only few stakeholders within AutoCo, the majority treated data and funding with high importance but not as critical components that would influence their strategic direction. From the new market entrants' point of view, those firms set their focus on financial resources to experiment in the AD technology which led to short-term artefacts like showcasing their driving performance. As a consequence, new market entrants did not perceive the safety concept, the perceived bottleneck of the incumbent, as a sellable bottleneck at that time. Their chance in partnering with startups as well as the financial burden of developing this technology may have been underestimated by incumbents.

The non-incumbent ecosystem actors, predominantly AD tech startups, rather focused on the experimentation phase instead of the commercialization as the incumbents outlined above. This may be rooted in their lack of legacy business as well as the need for unique value propositions to capture investors' interest. Therefore, those firms tackled bottlenecks like the technological progress towards AD and the lack of ecosystem structures by testing the technology on the road and forming strategic and loose partnerships to experiment.

Apart from the technical bottlenecks, new market entrants approached bottlenecks which dealt with societal needs. For instance, they much engaged in broadcasting efforts such as in autonomous-focused podcasts or social networks like PAVE, the group for Partners for Automated Vehicle Education, to educate users and governmental institutes from the technology. Sharing cognitive models shows how this could positively influence the perception of ecosystem bottlenecks, ideally followed by the ecosystem-wide acceptance and perceived value of the ecosystem bottleneck. Here, we also identified a difference in the behavioral patterns of incumbents and new market entrants to create a collective belief and legitimate its defined bottlenecks externally. On the one side, incumbents such as AutoCo were not used to share their technical progress prior to the product launch. Due to past exclusive development with OEMs to secure technology leadership, innovations were kept secret. The founder of AutoCo also expressed the mentality at AutoCo, which still holds true:

*I myself know that I have made a greater impact with the quality of my products than with advertising.*

On the opposite side, new market entrants that need to prove themselves pursue an open communication strategy. We identified that they use their communication channels on website, conferences, social media on at least monthly basis. Even the way how business meeting was conducted among the automotive incumbents changed when it came to AD, as the mobility divisional strategist described:

*Which is more relevant again, because if you have such decision-influencing meetings, that you can also show something, i.e., demonstrators that you bring with you somewhere. The classics at autonomous driving has always been: If you drive my car, I drive your car. How good is yours? [...]. This is really typical, so usually before you go into the meeting room, the fleet is first presented, let the system a little bit play and impress us a bit. You didn't have to do that everywhere, but that was part of it. So, if you only come with PowerPoint and the others with funny cars, then of course it's bad.*

This shows how ecosystem actors built legitimacy by socializing their perceived bottleneck and how incumbent's misperception on ecosystem bottlenecks correlated. In

conclusions, our case showed how the incumbent overestimates the difficulties for the newcomers to develop capabilities backward and underestimates the challenges of forward-developing new competencies on its own part.

**Proposition 2: Bottleneck perceptions are strongly influenced by the core capabilities and competitive advantages of the firm. Incumbents may overvalue their existing capabilities and hence construct self-serving bottleneck perceptions risking misallocation of investment to suboptimal bottleneck strategies.**

### 2.7.3 Structural-organizational Design and Internal Knowledge Accumulation

As third cognitive antecedent of the ecosystem strategy, we propose that structural components like the organizational design and the industry embeddedness of the firm affect how incumbents achieve to accumulate important knowledge that helps them to make sense of the emerging ecosystem and ultimately form their strategy. Organizational sensemaking most importantly builds on social processes, where appointed individuals and their interplay play essential roles (e.g., Maitlis, 2005; Monteiro & Birkinshaw, 2017). We thus investigate how organizational sensemaking in our focal firm in a dynamically changing ecosystem context took place. We find two structural-organizational impediments: First, the group of selected sensemakers with uniform cognitive models limited the sensemaking spectrum of the emerging ecosystem. Moreover, ecosystem strategy formation became challenging if the decision committee held different cognitive models and interpretations of successful business. Second, we find the prior position the incumbent held in the industry value chain limited its possibility to acquire heterogenous and crucial knowledge. In the following, we outline the organizational conditions incumbents bear when making sense of an uncertain, radically, and fast-changing environment.

#### *Intraorganizational groups of sensemaking*

Related to our context of emerging ecosystems, AutoCo was faced with high environmental ambiguity through newly emerging ecosystem roles and actors, uncertain technical feasibility, the re-distribution of value creation, and new allocation of the revenue pools. As Maitlis and Christianson (2014, p. 92), reviewing the organizational sensemaking literature, emphasize the impact of learning:

*Ambiguous contexts trigger sensemaking but are chronically hard to make sense of: cues are often unclear, actions muddy, and meanings equivocal.*



On top of the ambiguity, sensemakers such as the top managers are influenced by their dominant mental model, which guides their perceptions and, consequently, decisions (Stimpert & Duhaime, 1997). We thus studied the individuals where sensemaking on the AD ecosystem was triggered. This took mainly place on the level of middle managers, who channeled their interpretations to the top management which then decided on the ecosystem strategy approach. Our grouping of the middle managers is summarized in Table 5 and consists of the inner, middle, and outer circle:

- The **inner circle** constituted a group of individuals who was actively involved in AD. First, the head of AD as well as the ones of the AD corporate ventures acting as an overall project, engineering, or business lead. In their role, they were able to share their interpretations understanding in project review meetings to the top management, as well as actively propose the strategy.
- The **middle circle** formed the group of influencers who were partly involved in the AD strategy questions and development. These were individuals from the internal management consulting allocated to the corporate strategy as well as from the divisional strategy department allocated to the mobility business division. These parties were either involved in direct partnership negotiations or in consulting the teams during the development of the company's AD ecosystem strategy including the definition of use cases and simulation of business cases.
- The **outer circle** composed of a group of individuals who were passively involved in AD activities. Their cognitive models were rather directed towards the market, such as customers who sent them direct requests and offered short-term business opportunities. These stakeholders were either not involved in the autonomous driving strategy making, partly not asked to give their opinion, or partly involved for information.

**Table 5: Groups of Sensemakers**

	<b>Inner circle</b>	<b>Middle circle</b>	<b>Outer circle</b>
<b>Description</b>	Activists. Mandated to create collective belief on emerging ecosystem and propose future role of the company	Influencers. Mandated to share their view on the ecosystem and support the inner circle in partnership discussions and strategy development	Not mandated to influence the defined strategy. Partly not being asked for their perspective. However, they needed to steer their business according to the AD strategy
<b>Involved business functions</b>	AD project representative (president, project leaders, engineering, and business leads, strategy lead)	Internal strategy consultants (head, senior consultants) Divisional strategist	Business unit representatives (president, engineering, and sales functions, non-AD project lead)
<b>Business background</b>	Physics, Information Systems, Electrical and Mechanical Engineering, Exceptions in Business Engineering	Physics, Political Science, International Business, Information Systems, Engineering Fields	Mainly Electrical Engineering, Exceptions in Business Administration, Computer Science, Automotive Technology
<b>Beliefs</b>	Target ecosystem position based on value chain logic Debate on tackled use cases, use case decision based on engineering vs. economic logic Partnership search based on social ties, technology advances Strategy revision, pivoted to smaller increments	Ecosystem position based on value chain logic Use case preference based on economic logic	Ecosystem position based on tangible business opportunities or entrepreneurial logic (like learning in increments) Partnership search based on market insights

As sensemaking is individual and thus requires different frames to identify issues, we therefore found in our case that the variety across the circle was more preexisting than within it. The inner circle predominantly owned an academic background in physics (6 of 13), few in electrical or mechanical engineering (3) and information systems (3), and very few in management (2). Looking at the middle circle, we saw a mix of agents in engineering fields (3), physics (1), information systems (1) and social and management science (2). In the outer cycle, we see similar patterns: engineering fields (4), management (3), physics (1), other natural science (1). When we studied more the inner and middle circle as they could make a direct impact on the ecosystem strategy

development, we observed a primary engineering logic that tended to solve the issues based on logic reasoning as an interviewee outlined:

*Physicists have an education that allows them to think very broadly, to question overall relationships again and again. Of course, the subject matter is nature. However, you can also easily transfer this to engineering applications and, in many places, also to business questions, i.e., trying to put together this puzzle in the overall system, which is then coherent in itself.*

The professional background of the sensemakers revealed to be crucial, since at our focal company selective individuals were mandated to develop the ecosystem strategy. These stakeholders steered ecosystem strategy activities mainly from their home region in Europe; excluding regional offices and established local sales channels to mobility and logistics players. The middle circle revealed to be relevant and perceived as neutral party in the sensemaking as internal management consulting was organizationally located close to the board members and outside of the operating business units.

Because the strategy team claimed that AD represented a new business field and thus differed much from the driver assistance system business, they built a closed circle of strategy makers. However, the established modus of operandi hindered an internal exchange among the AD stakeholders. Highly valuable technology developments were discussed between the supplier and OEM in exclusive rounds as in traditional manner. For this reason, the inner and middle circle of AD could not share its external acquired knowledge within the organization. In sum, we found the intraorganizational groups as challenging in accumulating knowledge within the firm.

Moreover, we noticed the channeling process to transfer external knowledge at the automotive incumbent as challenging. As the automotive incumbent also served different business sectors such as consumer goods or building technologies, the decision committee displayed divergent cognitive models influenced by their business foci. For instance, parts of the executive board were formerly holding management positions at the OEM, whereas other parts did not own stocks in automotive and thus held different experiences and interpretations of business success. In addition, AutoCo steered the development of business strategies bottom-up, meaning that middle managers proposed a strategic avenue on which the executive board decided on. There was little top-down strategic guidance. Therefore, the inner and middle circle were frequently questioned because of doubts on the firm's competitive position and technological realization of AD. For instance, they were asked to provide a mathematical proof showing the theoretical feasibility of the AD technology. This showed how individuals within an incumbent firm built its cognitive models and decision-making on calculation bases where the perception widely differed from the remaining ecosystem actors.

Moreover, it slowed down the sensemaking process and strategic responses as not only multiple parties needed to be involved but also ecosystem uncertainties needed to be quantified. This hierarchically and democratically driven organizational sensemaking created additional complexity as middle managers aimed to create collective beliefs to enter the ecosystem while the decision makers needed to process the variance of interpretations and changing conditions of the ecosystem.

**Proposition 3a: Coming from the engineering logic and past successes, incumbents may show uniform cognitive models since incumbent firms may likely appoint individuals with an engineering background or success avenue in firm's key technologies to strategy making roles.**

### *Industry embeddedness and knowledge accumulation*

Linking the tasks of ecosystem building and bottleneck solving to a meta-problem that cannot be addressed by a single firm alone leads us to the research stream of inter-organizational sensemaking. Seidl and Werle (2018, p. 834), both studying inter-organizational sensemaking, find that the merge of various cognitive frames can facilitate to make sense of surprising events:

*[...] in order to make sense of a meta-problem it is necessary to have access to a variety of frames with which to comprehend the variety of cues that are associated with it.*

In analyzing AutoCo's cognitive frames to resolve uncertainty and find its ecosystem position, we found two main intra-corporate impediments to necessary knowledge acquisition through the industry embeddedness in the current value chain. On the one hand, the lack of new customer knowledge limited AutoCo's cognitive representations of future roles. On the other hand, the structural embeddedness influenced AutoCo's interpretation of its future ecosystem role. AutoCo revealed high industry embeddedness in various vehicle domains like commercial and passenger vehicles which increased the complexity of coherent intraorganizational sensemaking.

When analyzing internally the focal firm's future role in the AD ecosystem, the inner and middle circle of the AD stakeholders derived the future role based on their traditional analytical engineering and business case logic. AD project members designed a value chain consisting of 32 value chain elements pointing at the essential activities required in the final stage of the AD ecosystem. Based on that, they assigned revenue potentials for each value chain element such as the AD software, ride care service or the component supply. As the AD stakeholders recognized the value of software from AutoCo's partnership with the OEM as well as from the shifts in the automotive industry, they were also attracted by the greatest potential revenue pool in

the AD software business. To validate its ecosystem aspiration, AutoCo mainly acquired information from well-established sources such as from their core customer group—the automotive OEM—the big five management consulting firms, and sought for internal knowledge at corporate research and among those internal stakeholders who had been investigating in AD.

*So, we also did studies with [consulting firm 1], for which, for the narrative of the automotive strategy for the narrative and on the one hand [consulting firm 1], but also [consulting firm 2] confirmed that to us. The background is relatively simple. Hardware is not a scalable business. I can sell hardware for every newly sold vehicle [...] and I can only sell as much hardware as new vehicles are sold. When I enter the service area, i.e., enter the operating area of vehicles, so to speak, then I am no longer dependent on how many vehicles are sold per year, which are probably decline. But how many vehicles are on the road in the field and have to be operated— as operations? If I predict, let me say, how many vehicles will be in the future, I can speak of several hundred million. Everybody, for every km, where I bring a vehicle from A to B through a control center, for every service I offer per kilometer, per use, pro whatever and trip and ride, I naturally benefit from the fleet that is in the field, from every mobility offer and can also talk about cent amounts, get much greater scalability for my services.*

Considering the confirmation biases through other incumbent firms, our focal company was additionally focused on its established knowledge structured and undervalued expanding cognitive frames beyond its existing ones especially in the early stage of the ecosystem. It had opened another corporate research branch in Palo Alto, well-placed at the center of entrepreneurial firms, but closed this due to economic reasons as one AD project member described:

*So, we had as a research area, that was still a small group in Palo Alto in 2015, and that was for us the antenna in the States, actually in the hotspot of AD. The five people kept making scouting reports for us. What is currently happening in the US? Which companies, which startups have which ideas and solutions? But there we saw that this is very expensive, i.e., keeping a research center abroad and that there is an extremely high fluctuation, so maintaining such a center is not easy.*

While the inner and middle circle focused on the vision of becoming a full stack software provider based on their traditional logics, the outer circle showed more flexibility in also striving for adjacent business to the software. Some stakeholders of the outer circle respectively proposed to serve extant customer requests from their vehicle domains and thus sell hardware systems or parts of the software to the AD market to have at least a foothold in the emerging market, as one stated in the following:

*What is ultimately missing at some point in time is then the joint consideration, to say, okay, now we already have products in other business areas, we have relationships with customers, let us take advantage of that, even if it is only 20% of the total AD share of the value added. [...] If we no longer have the chance to offer the overall system approach, we should focus our offering on selected components, software modules and something else. Then let's use the system knowledge we've developed. Yes, let's at least use that, if you can't sell the entire system, to coordinate the management internally and develop virtually all our AD components according to an enveloping AD specification, so that they also fit together and can be used by the customer as a complement to each other.*

Next to the debate on the ecosystem roles, AutoCo's corporate research revealed a more entrepreneurial mental model than the operating business units and identified ecosystem bottlenecks in the Silicon-Valley manner. Interestingly, the corporate research group decided on experimenting the autonomous roboshuttle application within a gated area. This approach generally showed much less technical complexity than urban or highway use cases and thus represented an entrepreneurial mindset by starting with a manageable use case and testing the technical feasibility:

*Because, let's say, we didn't really believe in the big bang approach [...] that after a long development period behind closed doors, you could set up the all-encompassing robotaxi that solves the open world problem somehow and can drive everywhere, but we were convinced that you have to take an iterative approach. And I am also responsible for robotics, which has a lot in common with autonomous driving. They are also autonomous systems, but in a different environment. Our experience has always been that if I don't have a new system proven in use and learn from feedback what works, which algorithms work and prove themselves, then I'm not in a position to develop it further, so we've really been convinced right from the start that we should make a proof of concept with the status we have, learn and improve it, and develop it further into the next proof of concept.*

Similar to this exotic approach within the corporate firm, external ecosystem actors, in particular tech startups, shared these cognitive representations as they sliced the AD developments into smaller increments, enabling the demonstration of technical progress.

The divergent beliefs among the organizational units about the company's future role in AD may result from variance in the customer proximity. The degree of structural embeddedness of the organizational units led to an ongoing debate on the application of AD. Our focal company initially started in 2016 with an evolutionary favored application, automating the privately-owned car, and most importantly, with its key

customer, a pioneering automotive OEM. Almost after every year, the AutoCo added another application such as the automation of robotaxis and -shuttles, light- and heavy-duty trucks. Each application was studied by a different business unit which was either centrally allocated to corporate research or directly to a business unit for passenger cars or commercial vehicles. While the organizational vehicle identity clearly influenced which application the individuals favored, for instance the robotaxi versus truck application, the sensemaking at our focal firm was in sync with its main customers—the OEM. In addition, the partnering OEM’s market power and strong relationship with the end customer carrying the business pain and thus willingness-to-pay highly influenced the application tendency of AutoCo and the following ecosystem role. Moreover, the historically grown power imbalance resulted in AutoCo relying its ecosystem success on that particular partner. As one of the AD project members described, AutoCo was very cautious about intervening in the OEM’s business.

*AutoCo has in no way a good position as a vehicle provider, I would rule that out. In principle, in my opinion, the old rules of the game apply, that even if it is a new vehicle provider, we are intruding too much into the domain of our OEM customers, so to speak, and that potentially leaves a negative impression for other businesses.*

Concluding from the multiple views of the AD projects, the ecosystem perception depended on the structural embeddedness of the organizational unit. Traditional ties and the high structural embeddedness of AutoCo in the value chain did not allow the focal firm to break out and accumulate new external knowledge on a blank page. Instead, the exchange with known parties led to confirmation biases due to also traditional logics of the other incumbents and emphasized the AutoCo’s insistence of its core competence, such as the vehicle safety, as ecosystem bottleneck.

**Proposition 3b: Structural embeddedness in the extant value chain may hinder “de novo” field experimentation since incumbents may overvalue their sensemaking opportunities within their established network.**

#### 2.7.4 Decision-making and Resource Allocation Under Ambiguity

Prior literature highlights that strategic responses are the result of the managerial cognition and allocated attention of decision-makers (e.g., Bower, 1970; Nadkarni & Barr, 2008), something that also plays out in the resource allocation process in our case. We find two notably complications around the resource allocation process and the resulting strategic decision-making: First, the initial allocation of resources follows—not surprisingly—the traditional R&D model and innovation logic the incumbent had successfully deployed in its existence. That meant, resource would be typically deployed to projects that were well specified and calculable in their future revenues (*see*

also Chapter 2.7.1 on business model logics). Second, the traditional bottom-up logic of engineering project proposals led to a multi-pronged investment approach, enabling the incumbent to experiment in parallel with multiple use cases and technological approaches, which yet came also with risks. The disparate resource allocation impacted naturally what each single project was able to achieve and produce in terms of market learning and knowledge accumulation.

### *Allocating resources based on traditional predictive logic*

Conditioned by the predictability of past technological innovation, resource providers at AutoCo posed the requirement to calculate a business case for each innovation project. Project initiators needed to predict potential markets and revenues when submitting novel ideas. Also valid for AD and the built-up of multiple AD projects, each project needed to deal with the uncertainties during the ecosystem emergence. As the decision makers of AutoCo asked for a quantified basis before allocating resources, an AD project member explained the challenges:

*But that's just very difficult, because this is a business, we're talking about a market that doesn't exist today. We are talking about products that are just starting to emerge. Of course, there are extremely many risks, there are technical risks, there are market risks, there are regulatory risks and this business case, which will always be much more uncertain than a usual business case for which AutoCo decides. And I think that's the difficulty we have today. In other words, which we have above all in convincing our stakeholders.*

Even though the ecosystem uncertainties and dynamics were hardly predictable, we observed that this search for predictability was not only on executive board level but also in the business units. One of the AD project members described how difficult it was to create a shared belief with other business units located far from the AD technology:

*When you are an organization, we are only controlled as the business plan is. [...] Today we are not able to do a cross business unit business. [...] Yes, you would need a collaborative platform. Who pays what now? The usual who-pays-what game because nobody has air to breathe and says, ok I need this to do that, that's so and so many millions more, from whom does it come? Each business unit is controlled differently, and you will certainly find a way. You learn that now, because these are the big killers for all ecosystems, if you have no one there who is responsible for the business, and then also has the grains. Then it doesn't happen.*

We discovered that traditional resource allocation tactics at the incumbent were short-term focused. This established tactic combined with the predictability may



hamper incumbents in forming their ecosystem strategy as during ecosystem emergence strategic responses may be adaptive to the circumstances and may require a foundational belief and a top-down vision to enter the AD field to guide the firm towards the strategic direction.

### *Focused versus parallel learning under resource constraints*

We discovered that arriving at a singular strategy was difficult within our case company, as many AD projects got started but were underfunded or not financially supported by other business units leading to deferred resource allocation. Due to different intra-corporate ecosystem hypotheses and different funds for innovation, different AD projects emerged. AutoCo had thus put different bets in autonomous driving, one of the AD project members described:

*Where AutoCo didn't agree, it actually started with this disaster, that we actually sent out different teams [...]. And it was extremely clumsy that this was a team that worked independently of the vehicle-centric business unit on the market entry for automated driving. Now I wouldn't say that one was right and the other wrong, but at least they were two different directions. One area focused on robotaxis, the other on trucks. This [...] certainly costed the company alone a year to have a uniform direction.*

Coming from the supplier's current leading position in automotive technology, AutoCo transferred its technical competencies to the emerging AD ecosystem. One could notice this based on the ongoing comparison of the technology approaches with new AD actors. Based on externally hyped ecosystem events AutoCo's executive board raised repetitively questions about the competitiveness of the company and asked the AD projects to make an assessment of the new market entrants. One of the mobility sector strategists outlined the uncertainty within the focal firm:

*Continuously and again the question was asked [by the executive board], are we doing the right thing here? Do we also focus on the right path? Is that the right thing? They [AD project leaders] had to answer them if not only monthly, almost on a weekly basis, again and again under a different heading. [...] Is the topic in sum meaningful at all? Is there even a willingness to pay, are there customers at all? So, so to speak, regarding the market and on the business model side are we even in the right use case? Are we technologically on the right path? [...]. They constantly had to justify themselves and put an incredible amount of energy into permanent justifications. So, that's really, setting up the path and follow this was really difficult.*

Due to the limited financial resources at the automotive incumbent, resource allocation on a specific application may limit the experimentations in other applications

and ultimately also the integration of knowledge in the firm. Building an ecosystem strategy which would involve several business units for a common value proposition may thus become challenging as non-AD business units were not able to make sense of similar cues as the core AD stakeholders could do.

**Proposition 4: Incumbents tend to allocate resources to short-term business opportunities due to extant customer requests. In doing so, they may channel their sensemaking away from building a sustainable ecosystem strategy.**

## 2.8 Discussion and Implications

Our findings highlight a set of crucial cognitive channeling mechanisms that direct attention of corporate actors as well as influence their sensemaking of an emerging ecosystem and thus the forward-looking strategizing around assumed incumbent positioning options. We find that traditional market strategies and positioning (collaboration with longstanding trusted partners as upstream supplier) offer strong interpretive lenses, which have the power to shape decisions although their viability in the new ecosystem might need to be revisited. Likewise, the social embeddedness of firm's competencies appears to be a strong undercurrent in discussions of the relative value of components in the newly emerging ecosystem. These findings have a number of important implications for further research on ecosystem emergence and incumbent strategy as well as for practice.

### 2.8.1 Ecosystem Strategies

Cognitive antecedents and intra-corporate social processes are crucial for large organizations to understand when forming their ecosystem strategies. By analyzing these cognitive antecedents and causal relations to the ecosystem strategizing in incumbent firms, we contribute to the cognition and organizational sensemaking literature in the context of ecosystems. We aim to shed light on the relationship between intra-corporate sensemaking and strategizing in an ecosystem. Our findings inform the dynamic managerial cognition literature which emphasizes the flexibility of individuals in changing environments.

We also contribute to the ecosystem literature in adding insight to firm strategy in regard to occupying bottleneck positions as a function of subjective judgment more so than rational analysis. We posit that emerging ecosystem architectures are highly perceptual and thus contested but also the question of 'what' constitutes a valuable bottleneck is a critical component in how different actors work on implementing new ecosystem structures. Prior research has put the bottleneck position in the ecosystem as the most favorable one, offering the firm competitive advantages and a legitimating role

during ecosystem emergence (Hannah & Eisenhardt, 2018). Yet, different players in the industry may hold very different perception about what the valuable bottleneck will be.

### 2.8.2 Implications for Practice

Our findings clearly highlight risk factors for incumbents in failing to detect crucial bottleneck positions. We show that incumbents are systematically biased by their business model logic, strong technical competences, value chain relations and exchanges—all of which had been the drivers the incumbents' past successes. Failing to identify or being able to occupy the “right” bottleneck can substantially increase the disruption risk for the incumbent. This issue was also addressed by the scholars' proposing the concept of organizational ambidexterity which outlines the firm's ability to separate the exploitation in the current business from the exploration of new business opportunities (e.g., O'Reilly & Tushman, 2013; Tushman & O'Reilly, 1996). Still our findings show the importance of enabling intraorganizational actors to change perspective. In particular, individuals who may come from the exploitation part of the organization need to shift their cognitive models to make sense of the changing environment and deploy different cognitive models that may resemble the cognitive models of non-incumbents in the emerging ecosystem.

The most useful advice for practice which result from our study to corporates is that the task of ecosystem strategy building is not analytical-only and static. It is rather dynamic and requires a diverse set of cognitive models, experiences, and the right channeling techniques within the company. Knowing the cognitive antecedents of the company helps to create awareness of the bias when developing the strategy. Firms that face emerging ecosystems and the threat of new market entrants may benefit from taking experts from other technology or business fields to make sense of the emergence and illuminate different perspectives on the ecosystem structures. Most importantly, it is here to say that ecosystem bottlenecks perceived by the own company may differ from those perceived by others.

For this reason, the company shall also decide on whether it is willing and capable to take a bottleneck position in an ecosystem. Bottleneck positions may offer competitive advantage but require constant sensing of the future evolving bottlenecks as well as socializing efforts so that other actors share the belief and recognize the value of the bottleneck. Some bottlenecks may not be valuable enough for the others which then lead to the risk of not being perceived as a legitimate ecosystem partner. Especially during the ecosystem emergence, uncertainties on technology, market and legal side may increase the velocity of the changing bottleneck perceptions.

## 2.9 Limitations

This research has only looked at one single case within the emerging ecosystem. Other empirical studies in top-down steered organizations, or organizations with a globally acting sensemaking team would provide additionally useful perspectives on intra-corporate sensemaking. Beyond that, a comparison analysis of the different firms within an ecosystem would provide a more profound evaluation of the firm's sensemaking processes and the opportunity to study how inter-organizational sensemaking within the ecosystem impacts the intra-corporate process.

## 2.10 Conclusion

Our aim was to shed light on the cognitive implications on forming an ecosystem strategy. Through the internal lens of an incumbent, our findings demonstrate the interrelations of subjective cognitive models, environmental changes, industry perceptions, as well as strategic behaviors of especially traditional firms. In the age of digitalization, traditional firms are increasingly faced with new customer promises that offers greater value leading to newly emerging ecosystems. With this paper, we aim to provide guidance for particularly large incumbents which are subject of disruptive technologies and business models and seek for guidance how to form an ecosystem strategy and find its ecosystem position.

## Overcoming Disappointment: How Corporate Entrepreneurs Can Leverage Hypes and Material Proof

### 3.1 Introduction

The transformational pressure from digital disruption and related technological opportunities is not only a broadly agreed challenge for many incumbents (e.g., Clarysse et al., 2022; Cozzolino & Rothaermel, 2018) but also offers new opportunities for corporate entrepreneurs to step up and generate impact by driving projects of strategic importance. A hotbed of opportunities for future-making has opened up (Augustine et al., 2019; Wenzel, 2022). However, an expansive body of research has documented that incumbents present themselves often as a complex and difficult environment for corporate entrepreneurs (e.g., Ahuja & Lampert, 2001; Burgelman, 1983; Van de Ven, 2017). Especially when faced with potentially competence-destroying technologies, incumbents may struggle to assess the potential (e.g., Danneels, 2011) and subsequently struggle to support corporate entrepreneurs who build upon the new technology, who often have to ‘cut corners’ or ‘bootleg’ to keep their projects alive (Burgelman, 1983; Salter et al., 2015).

Most studies that examined this problem have focused on the cognitive reasons why internal decision makers do not observe the potential of the new technology (Danneels, 2011; Tripsas & Gavetti, 2000) or on the impetus by external stakeholders such as existing customers (Christensen & Bower, 1996) or on analysts and shareholders (Benner, 2010) who draw resources and attention to improving existing competences at the expense of investing in new competences. However, even when there is alertness about the new technology and willingness to allocate resources, the time to market of such technologies often takes several decades (Agarwal & Bayus, 2002) and the path to market is very unclear (Andries et al., 2021; Molner et al., 2019). During this time, the imagined future needs interim material proof to maintain stakeholder support (Thompson & Byrne, 2022). Many originally promising innovation projects are stopped when the corporate entrepreneur ultimately fails to satisfy corporate stakeholder expectations in terms of financial impact, scale, and other corporate criteria (Vinokorova & Kapoor, 2020).

Indeed, meeting stakeholder expectations is a fundamental challenge in entrepreneurial resource mobilization, especially during phases of hypes that overinflate expectations on new technologies and can lead to substantial disappointment (Borup et al., 2006). Prior research has emphasized storytelling and generally cultural and relational practices to maintain legitimacy for entrepreneurial endeavors (Garud et al., 2014; Logue & Grimes, 2022). In particular, social proofs have received heightened attention in their function to culturally engage with hypes and thus maintain a venture's legitimacy (Logue & Grimes, 2022). However, social proof may be more difficult to leverage for corporate entrepreneurs, who often need to gain short-term managerial support and defend their project performance against unambiguous financial objectives and against a portfolio of alternative corporate investments (Bower, 1970; Vinokurova & Kapoor, 2020). Subsequently, in this paper, we explore the research question:

*How can corporate entrepreneurs continue to mobilize managerial support for long-horizon technological innovation projects which fail to meet short-term oriented key performance criteria and stakeholder expectations?*

We study this question in the context of a large, multinational automotive supplier and the trajectory of one of its successful strategic innovation projects. We analyze the actions and communications of the corporate project lead over almost a decade, which allows us to contribute novel insight to practices of entrepreneurial resource mobilization and future-making strategies (Augustine et al., 2019; Logue & Grimes, 2022; Wenzel, 2022).

## 3.2 Background

### 3.2.1 Corporate Resource Mobilization

Resource mobilization in large firms is complex: Novel ideas need not only to overcome the general legitimation challenge (Fisher et al., 2016; Tolbert et al., 2011; Suchman, 1995) but also need to be aligned with the corporate environment (Vinokurova & Kapoor, 2020). For example, corporate entrepreneurship research has typically looked at internal structural impediments to resourcing projects (e.g., Burgelman, 1983; Zahra & Pearce, 1994) and has highlighted biases that make corporate resource providers often favor known technologies and business structures (Ahuja & Lampert, 2001). Large firms thus tend to favor ideas supporting their current core customers (Christensen & Bower, 1996) and struggle more in new resource allocation when novel ideas are cannibalizing their core business (Henderson, 1993). More recently, research has also shown that the typical innovation performance criteria in corporations need to be managed and potentially adapted by corporate entrepreneurs

(Vinokurova & Kapoor, 2020). It is no secret that corporate entrepreneurs often struggle to meet the corporate expectations in the context of breakthrough innovation regarding financial impact, scale, and other criteria (Vinokurova & Kapoor, 2020). Especially, the time horizons associated with the commercialization of emerging technologies (Agarwal & Bayus, 2002) often clash with corporate requirements to contribute to the bottom line.

By contrast, the more general entrepreneurial legitimacy research has studied in great detail how entrepreneurs construct narratives (Garud et al., 2014; Lounsbury & Glynn, 2001; Martens et al., 2007; Navis & Glynn, 2011), use frames (Cornelissen & Werner, 2014; Snihur et al., 2022), and symbolics (Aldrich & Fiol, 1994; Zott & Huy, 2007). Surprisingly, those so-called cultural practices have seen much less emphasis in the corporate entrepreneurship research. Given that also corporate stakeholders exhibit expectations and that corporations make investment decisions based on developments in their larger ecosystems, studying how corporate entrepreneurs use cultural practices to narrate and frame their projects can add important insight into corporate resource mobilization.

### **3.2.1 Expectations and Hypes in Entrepreneurial Resource Mobilization**

Successful resource mobilization is deeply rooted in raising and fulfilling stakeholder expectations (Van Lente, 2012). Those expectations arise from making promises and thus suggesting actions (Borup et al., 2006; Van Lente, 2012)—typically an iterative process as circumstances change. Expectations are typically temporary and of subjective nature (Borup et al., 2006) and they emerge from the interactions between corporate entrepreneur and resource provider. The challenge for the corporate entrepreneurs lies in creating excitement for an idea, attracting stakeholders, and at the same time fulfilling the promises to stakeholders (Borup et al., 2006). Ideas that are directly linked to hypes tend to receive higher interest among stakeholders, but also increase the risk of causing disappointment, resulting in failed resource mobilization.

Prior literature has studied the construct of expectations in particular through the lens of hypes (Brown & Michael, 2003; Logue & Grimes, 2022). Hypes are so far defined as a collective vision which holds a prediction of the future (Logue & Grimes, 2022). Accordingly, through the shared belief and publicity hypes will trigger attention and stakeholder expectations which may overinflate and lead to disappointment (Fenn et al., 2017). Hype cycle models such as the Gartner hype cycle prescribe that hypes will undergo absolute hype phases from growing expectations until the peak of inflated expectations to disillusionment and finally an incline in towards the final stage of a plateau of productivity. How the hype cycle evolves depends on the course of the

technical progress, media, and social system (Dedehayir & Steinert, 2016). Prior literature has looked at the role and utility of hype dynamics in resource mobilization (e.g., Garud et al., 2014; Logue & Grimes, 2022). Generally, ventures may benefit from the up hype but may also be exposed to the hype downturn which then hinders them to access drying up resources during such a downturn (Pontikes & Barnett, 2017).

Scholars have subsequently focused on the entrepreneur's ability to gain buffer through hypes (Berends et al., 2021; Logue & Grimes, 2022) rather than being constrained by hypes (Pontikes & Barnett, 2017). Logue and Grimes (2022) identified two practices entrepreneurs can make use of. According to them, cultural practices facilitate the transfer of the hype phenomenon to a more concrete vision of the idea e.g., the promising market size and future role. Relational practices facilitate the social validation by others via e.g., exchange, partnerships, and networks. Logue and Grimes' work (2022) particularly points to the goal of social proof ventures should seek as it provides entrepreneurs with the flexibility to navigate uncertainty and pivot. Garud, Schildt, and Lant (2014) outline that dealing with new circumstances and new expectations need to be supported by a change of story to achieve continuous stakeholder support. Extant literature mentions that material elements are also of importance (e.g., Garud et al., 2014), but has so far neglected how both material elements and hypes as cultural resource may correlate in mobilizing resources. As hypes are short-term and likely lead to disappointment, we find it intriguing to study the impact of stakeholder expectation vis-à-vis the ability of the corporate entrepreneur to navigate innovation projects beyond the levels of disappointment.

### **3.3 Methods**

#### **3.3.1 Research Design**

As our research aims to solve the empirical puzzle in the field of corporate entrepreneurship, we find that a zoomed-in view into an innovation project within a company would provide an ideal ground to study our research question. This gives us the opportunity to gain an in-depth understanding of expectations of corporate resource providers, the avenue of the innovation project, and the corporate entrepreneur's practices. We thus decided for an inductive, single case study design which resulted in an extensive process study. We traced back, partly accompanied the innovation process, and gained a comprehensive understanding how the corporate entrepreneur navigated expectations and used specific resource mobilization mechanisms over time.



### 3.3.2 Research Setting

A corporate innovation project at a traditional incumbent firm is a well-suited setting since the formalized and structured innovation process in corporates sets clear expectations how to foster innovation. Established firms define evaluation criteria to measure the innovation potential. Decision makers thus tend to allocate resources through their lens of past successes (Vinokurova & Kapoor, 2020). We selected an outlier case in which—against common odds—a corporate entrepreneur has been able to mobilize corporate resources over many years even though the innovation project failed to meet several of the typical business model and revenue key performance indicators set by the corporation. Using an outlier case helps us to solve the empirical puzzle and identify resource mobilization mechanisms and their relation that have so far been neglected in the literature (George & Bennett, 2005).

Our selected innovation project started with the idea of digitizing the parking industry. When the project had taken its first steps, the corporate entrepreneur struggled to acquire resources. However, after nine years since the first idea, thereof seven years of corporate funds, the parking project has become the poster child of the company for the AD field with the world's first approved SAE level 4<sup>1</sup> driverless system. This illustrates that the time between first idea and implementation is much longer than the common funding time of three years at our focal company. Over time our project had to face significant delays in the business plan, new insights into technical and market requirements, as well as shifting agreements in the larger ecosystem what key important problems the AD space should solve. Those dynamics pinpointed common challenges that can also be found in other innovation projects: missed deliverables on technology progress and delayed traction in the market, compared to original estimations when first pitched.

Moreover, the parking project faced two different resource allocation settings when it was allocated first to a central then second to an operational business unit. The first requested an extensive assessment of 129 pre-defined questions to evaluate the fit between the novel idea and corporate key performance criteria, while the second required less performance criteria but short-term results to solve the business unit's negative cash flow. Those changing circumstances highlight how the corporate entrepreneur needed to adapt the project's strategic directions and project framings to meet the changing stakeholder expectations. Both, the uncertainties in the evolving AD

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<sup>1</sup> SAE (Society of Automotive Engineers) levels indicate the industry-wide used definition to distinct automation levels ranging from 0 to 5 (SAE International, 2021). From level 4 the vehicle system takes over the driving responsibility, a human driver is no longer needed.

field as well as in the changing corporate structure increased the complexity for the innovation project to receive continuous managerial support.

Going forward, we developed a historical case study of the parking project that starts in October 2013, when the novel idea was pitched the first time, and ends in December 2021, when the project had been transferred to a core business unit of the company. We present the different strategic trajectories of the project, how the corporate entrepreneur survived the organizational dynamics, and managed to mobilize resources beyond the usual funding time despite not meeting stakeholder expectations.

### 3.3.3 Data Collection

The lead author of this paper was able to join the company and was granted unique data access to the studied innovation project. She conducted primary interviews with important stakeholders and the focal corporate entrepreneur, she was also provided with extensive archival documentation of the case, notably important project presentations and internal as well as external project communications. Due to her multi-year immersion in the case company, she was also able to attend project presentations in real-time, follow internal townhalls, business unit strategy presentations, and corporate business dialogues around the strategic thrust into AD. As a result, we were able to build a rich account of our case, summarized in Table 6, using a large foundation of data from several sources: (1) internal documents, (2) interviews and field notes, (3) corporate internal journals and annual reports, (4) internal blog entries, (5) internal videos, and (6) external communication.

- (1) **Internal documents.** In this context we received full data access to 1,551 pages of internal documents of the innovation project for the period from 2013 to 2021. From the recipient and decision-making side, we gained in-depth insights on the evaluation based on 110 internal evaluation documents as either Excel sheets, PowerPoint presentations, written text documents, or emails. In addition to that, we studied 143 pages of internal documents about the current strategic direction including target definitions, strategy papers, and an analysis of the business field in which the innovation project operates.
- (2) **Interviews and field notes.** To complement the extensive data base with the participants' personal experiences we conducted seven interviews with the project champion ranging from 30 to 130 minutes to better understand the project's motives and practices. In addition, we conducted six semi-structured in-depth interviews ranging from 60 to 140 min with former decision makers to understand their perspective on the project. These resulted in 367 pages of transcripts.

- (3) **Corporate internal journals and annual reports.** Outside from the innovation project, we collected data of the business environment the innovation project was situated. As the project was at first assigned to the central organization, we studied 1,857 pages of corporate annual reports and 774 pages of internal corporate newspaper from 2012 to 2021. We added one year before the studied time of the project as this helped us to make sense of intra-corporate strategic developments that could impact the project start as well as the intra-corporate view on the project afterwards.
- (4) **Internal blog entries.** When the innovation project was later allocated to a business unit, we studied additionally 251 pages of internal blog entries composed by the project or business unit to further build the business context.
- (5) **Internal videos.** We rewatched the recorded videos of the business unit's decision meetings which overall comprises 589 min footage. The board of the business unit explains their assessment of the innovation pipeline and their decisions on streamlining the project portfolio.
- (6) **External communication.** Next to the internal data, we collected external communications from the project itself and from the company about the project. These resulted in 177 pages of press releases and 119 min of video.

**Table 6: Overview of Data**

<b>Data sources</b>	<b>Time period</b>	<b>Data collected within the period 08/2018 – 12/2022</b>	<b>Use in data analysis</b>
<i>Internal documents by the project</i>	2013-2021	1,551 pages	Identify the project's narratives, positionings, stakeholder interactions, actions, and strategies. Triangulate observations.
<i>Internal documents of the project evaluation</i>	2015-2020	110 files	Investigate evaluation of the project since the official project start in 2015.
<i>Internal documents of the corporate strategy department and business unit</i>	2013-2021	143 pages	Investigate situation of resource providers.
<i>Interview transcripts</i>	2021-2022	367 pages	Triangulate observations about the project's avenue from the corporate entrepreneur and resource provider perspectives.
<i>Internal corporate journals</i>	2012-2022	774 pages	Investigate corporate foci and CEO's views. Establish timeline of events.
<i>Corporate annual reports</i>	2012-2021	1,857 pages	Investigate corporate foci and CEO's views. Establish timeline of events.
<i>Internal blog entries by business unit</i>	2018-2021	251 pages	Establish timeline of events. Triangulate observations about the project's avenue.
<i>Internal videos of the project evaluation</i>	2019-2022	589 min	Investigate evaluation of the project.
<i>Press articles of the company mentioning the project</i>	2015-2021	177 pages	Identify the project's importance for the company, establish timeline of events.
<i>External videos by the project</i>	2013-2022	119 min	Identify project's stakeholder interactions and actions.

### 3.3.4 Data Analysis

Our analysis followed a five-staged approach. In sum, we conducted a phase of contextual case building by means of temporal brackets, continued with multiple rounds of inductive coding and findings discussions within the author team, and recurrently developed a process model.

*Case chronology.* First, we created a case chronology based on our database of archival and interview data. We traced back the internal venture process involving the different decision committees and resource acquisition requirements our selected internal venture faced as well as its undertaken narratives and actions. We further studied the changes of our focal internal venture in the technology approach, portfolio setup and corresponding business. As an additional layer, we mapped the internal venture's developments to the activities of the company in AD and the emergence of other internal ventures in this field. As an overarching layer, we included in the case chronology the key events and strategic directions on corporate level to make sense of the top management's and equally the resource providers' interest and expectations.

*Temporal bracketing.* Second, we used temporal bracketing to disassemble thematically the decade-long single case study which facilitates us to identify new mechanisms to succeed in acquiring resources (George & Bennett, 2005; Langley et al., 2013). We divided our in-depth single case study into four phases based on the changes of key resource providers on top management level and their expectations on our focal internal venture. Per period we thus describe the project's organizational allocation, the stakeholder expectations, and the firm-level strategic foci. This shall provide the basis to further understand how our corporate entrepreneur—named John in this research—was able to navigate stakeholder expectations and continuously mobilize managerial support. Table 7 summarizes the four phases of our focal corporate innovation project.

**Table 7: Temporal Bracketing of Corporate Innovation Project**

	<b>Phase 1 (late 2013-2014)</b> Corporate vision and the digital parking idea	<b>Phase 2 (2015-2017)</b> Corporate innovation program and corporate expectations	<b>Phase 3 (2018-Q2 2019)</b> Short-term business unit targets	<b>Phase 4 (Q3 2019-2021)</b> Stakeholder disappointment and AD hype disillusionment
<i>Project's organizational allocation</i>	John pitches parking idea to board members and later to the decision committee of corporate innovation funds. The decision committee consists of the CEO, CTO, the head of corporate research, central strategists, internal venture capitalist.	John receives official project approval and receives corporate funds. The project is set up and assigned to a board member who is responsible for the business domain of mobility solutions.	Project is transferred to a newly established automotive software and service business unit. A new decision committee is in place consisting of the business unit president, head of finance, portfolio manager.	Project is still allocated to the software business unit. However, a new president has been elected for the business unit. The decision committee consists of the new business unit president, new head of finance, same portfolio manager.
<i>Project-level stakeholder expectations</i>	The CEO is not satisfied with the proposed market launch and asks John to shorten time-to-market. From the beginning the decision committee asks to solve the chicken-egg problem if automotive and infrastructure players need enter the ecosystem.	The CEO asks the project to think big and scale globally. The CEO seeks for market leadership in automated technologies as the CEO publicly announces in 2017 to present driverless parking in the following year.	The business unit president is pressured to solve the cash flow problem of the business unit and demands John to achieve better financial results. Sub-projects are at risk.	The business unit president asks for scalability and a solution for the remaining chicken-egg problem. A business field analysis has been conducted which points at the limited market potential of digitizing the parking industry.

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<p><i>Firm-level strategic foci in automotive sector</i></p>	<p>The automotive incumbent is undergoing a strategic transformation towards IoT.</p>	<p>The CEO emphasizes the need to “rethink mobility”. Mobility will be “emission-free, stress-free, and accident-free”.</p>	<p>The incumbent strives to accelerate automotive software and service business and builds a dedicated business unit.</p>	<p>Due to the automotive crisis resulting from increasing chip supply chain shortages and COVID-19 business effects the automotive software business unit needs to streamline its innovation portfolio and set strong focus on short-term profitability.</p>
	<p>The focal firm aims to become a mobility solution provider and works on the topics of electrification, automation, and networking.</p>	<p>The company aims to gradually develop from its driver assistance systems to fully AD.</p>	<p>The focal firm establishes a strategic partnership with a premium car manufacturer for co-developing robotaxis.</p>	<p>Key AD partnership is cancelled which leads to reconsideration of AD at the focal company. Meanwhile, competitors like AD startups succeed in further forming ecosystem partnerships.</p>
	<p>The company does not see AD to materialize in the next decade due to the required real-time exchange of data.</p>	<p>The focal firm started experimenting in robotaxis and AD shuttles. In parallel, AD technology startups were founded and compete with the tier-1 supplier. The external hype around AD turned from passenger car to trucking applications as investors called for earlier return of investment.</p>	<p>At the CES 2019, the company reveals its AD shuttle to the public and its concept of mobility.</p> <p>AD projects are partly set on hold, pivoted, or new emerged from the trucking use case. Our focal firm aimed to prove the AD technology realization in a mathematical model. In addition, AD ecosystem actors start emphasizing safety as fatal crashes with AD prototype vehicles shook up the industry.</p>	<p>The automotive incumbent is pressured towards an emission-free future by legal regulation. It builds a modular platform to develop electric cars more quickly.</p>

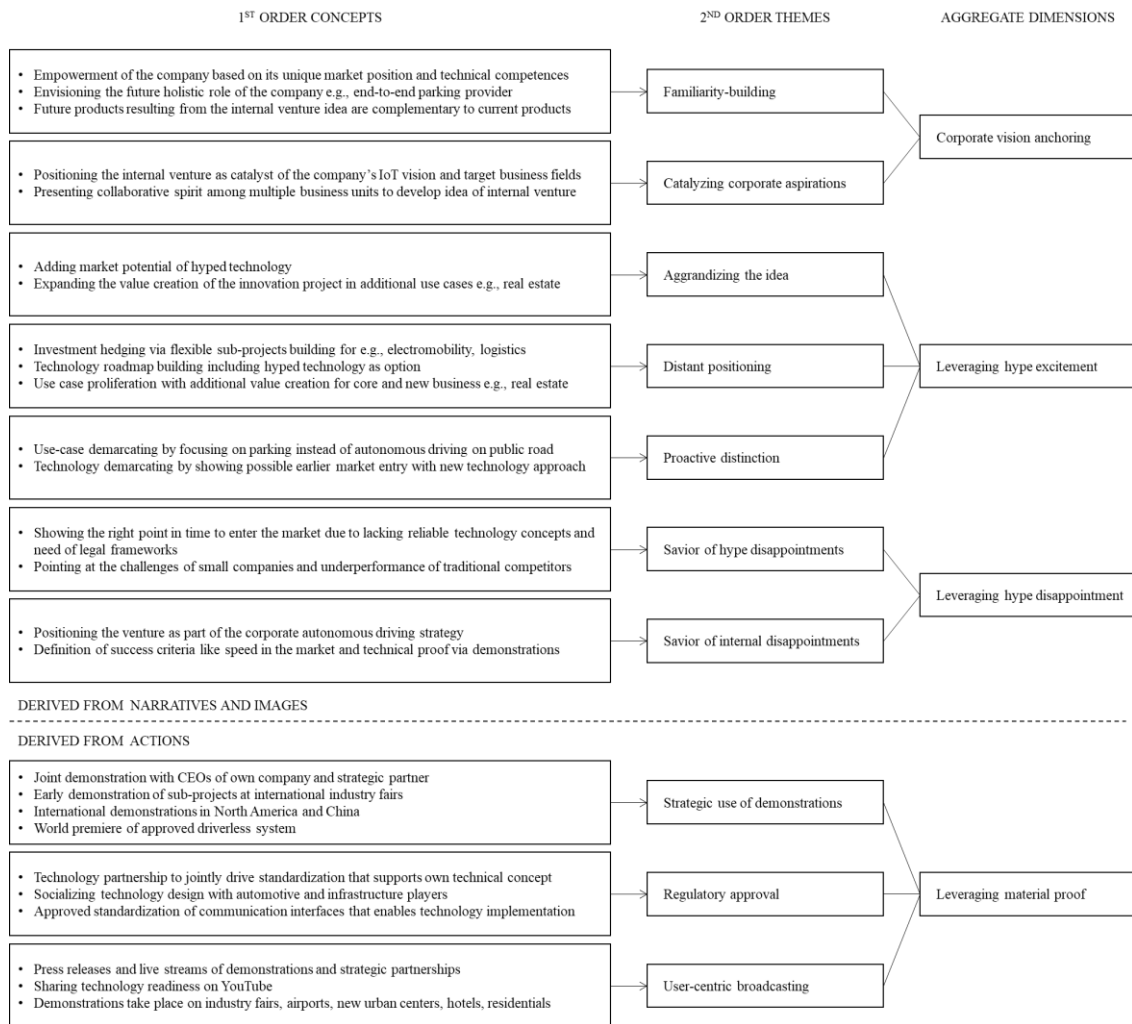
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*Open coding.* Subsequently as third step, we analyzed each temporal bracket and compared them against each other. Two authors conducted a first round of open thematic coding of the corporate entrepreneur's used narratives and images, and undertaken actions (Gioia, 1991, 2013). We made sense of the narratives by alternating all presentation slide decks and written project reports. In addition, we studied the images which the corporate entrepreneur used to build the narratives. The corporate entrepreneur uses in particular symbolic pictures e.g., placing the internal venture in the center of the company developments as the joint effort of multiple business units or positioning the venture—visually—as the leaves, in other words the resulting product, of the growing tree of the service vision of the company. Furthermore, we studied the actions and how the corporate entrepreneur incorporated them for his project framing. For instance, the corporate entrepreneur started one of his strategy presentations with the field test video or with the positive market feedback of the last overseas demonstration. For each element—the narratives, images, and actions—we continued with axial coding, made notes of our interpretations and our remaining questions which we clarified with the project leader and resource providers in bilateral meetings. We triangulated our interim interpretations with interview data, field notes as well as corporate evaluation documents to understand the effectiveness of the corporate entrepreneur's practices. In particular supportive in the analysis were the corporate evaluation documents, which stated the overall performance of the internal venture based on their pre-defined criteria and outlined the reason why the internal venture received corporate funding. For instance, the decision committee once decided for continuous support since “despite the planned revenue decline [the project] was still seen as relevant topic with IoT potential”.

Figure 1 summarizes our data structure.



### 3 | RESOURCE MOBILIZATION



**Figure 1: Data Structure**

*Theoretical lenses.* Forth, we discussed the emerging codes, themes, and interpretations within the entire author team and mirrored them against theoretical lenses in prior research that offered meaning and perspective. We went through iterative cycles between our data and the theory lenses. Our case demonstrated the inability of the corporate entrepreneur to change the resource acquisition environment to define subjective performance criteria, which excluded the resource mobilization strategy according to prior research (Vinokurova & Kapoor, 2020). We found evidence in the impact of the corporate entrepreneur's changing frames that would lead to the entrepreneurial framing literature (e.g., Snihur et al., 2022). However, our data also revealed the importance of material proof to convince resource providers when the corporate entrepreneur did not fulfill formal corporate key performance indicators. Moreover, the internal venture was perceived as a catalyst of the corporate vision. This pointed us specifically to the role of cultural as well as material practices and their legitimizing impact (Garud et al., 2014; Logue & Grimes, 2022).

*Process model.* Finally, we synchronously created a model of the identified interplay of the cultural and material practices. We developed various process models to find the well-fitting model of our findings. In this context, we looked at our dependent variable of managing stakeholder expectations and zoomed into our independent variables how these change over time in the different expectation stages of an internal venture.

### 3.4 Cultural and Material Practices in the Corporate Context

Our case revealed that John dynamically changed his project framing which helped him to navigate stakeholder expectations along the hype dynamics.

Our findings evolve around two pillars: First, we show how John was able to leverage hypes in his project framing strategically. Within our focal company, we found that particular hypes—in this case AD and electromobility—became intra-corporately a strategic focus which was induced by top or middle management. While orchestrating the hype dynamics in the project framing, John deployed cultural practices, in other words he could convince stakeholders from the opportunities resulting from the hype to gain managerial support. These practices were *corporate vision anchoring*, *leveraging hype excitement*, and *leveraging hype disappointment*.

Second, we find that such a strategic leverage of multiple hypes requires the built-up of material proof as a key enabler. Our case shows how corporate entrepreneurs can back their changing hype frames by *leveraging material proof* in a form of the *strategic use of demonstrations*, *regulatory approval*, and *user-centric broadcasting*. Table 8 shows the corporate entrepreneur's cultural practices *corporate vision anchoring* and *leveraging hype excitement*, and Table 9 the cultural practice *leveraging hype disappointment* and the material practice *leveraging material proof*.

**Table 8: Corporate Vision Anchoring and Leveraging Hype Excitement**

Corporate vision anchoring		Leveraging hype excitement			
	Familiarity-building	Catalyzing corporate aspirations	Aggrandizing the idea	Distant positioning	Proactive distinction
<i>Description</i>	Empower the company because of its market leadership, position future role and product as complement	Link to corporate thrusts like strategic tasks derived from changing technology or organizational culture	Increase the attractiveness of the opportunity by the hyped technology, extend to new use cases to increase the value contribution	Integrate hype as part of project portfolio, hedge investment by building options	Demarcate own use case and technology from the prevailing approach of the hype
<i>Representative quotes or images described</i>	<p>“Here, we bring together the competencies from automotive and from building security technology. There is no competitor who can unite these competences/technologies under one roof!”</p> <p>“Existing market access to OEMs is being leveraged. [The project] as a functionality fits very well into automotive product roadmap. In this context, automated parking vehicles are placed in [the project] as the next step to the parking maneuver assistant. Furthermore, the monitoring technologies of [the project] can be used in addition to installations of [company’s] security technology.”</p>	<p>“First data-based business model in [company]; blueprint for [company’s] IoT strategy”</p> <p>“For creating our products, we are using the whole range of the [company] building kit, [list of business units]. We are not only using components but even competencies like [departments with data and business model methods].”</p>	<p>“Service ‘automated’ offers the possibility of scalable business models, independent of the share of fragmented and hyperlocal digital parking services in the value chain.”</p> <p><i>John adds additional use cases to increase the market potential e.g., by creating value for buildings (“increase living space by reducing the integrated parking area – offer attractive car sharing for residents“)</i></p>	<p>“Significant offset in the break-evens of the four business cases makes cross-financing possible, especially in the direction of [automated].”</p> <p>“[The project] is a holistic approach, containing the elements of automation and connectivity, concentrated in a balanced solution portfolio (products &amp; services).”</p>	<p>“[Company] [project] offers car park operators new business opportunities and suggestions for increasing the market value and range of services for drivers.”</p> <p><i>John presents in an image the market entry timeline with different product generations of parking systems which will be introduced in 2017. This underlines the earlier market entry with an infrastructure-centric technology approach.</i></p>

Table 9: Leveraging Hype Disappointment and Material Proof

<i>Description</i>	Leveraging hype disappointment		Leveraging material proof		
	Savior of hype disappointments	Savior of internal disappointments	Strategic use of demos	Regulatory approval	User-centric broadcasting
	Point at legal, technical, and market challenges which own project can solve	Position own project better than other internal ventures by defining own success criteria, position project as part of hyped technology strategy	Addresses key stakeholders, generates material proof via public demonstrations which grow by size, partners, and regional footprint, shows ecosystem-building capabilities	Addresses legal authorities, generates material proof via industry-wide legal agreements	Addresses the end-user, generates material proof via trust-building among the customers and showcasing the technology readiness
<i>Representative quotes or actions described</i>	<p>“The project is a key milestone on the road to highly automated driving. The goal is to be the first on the market and to set standards.”</p> <p>“In parallel competitors invest in infrastructure-based solutions which have a technology gap of about two years.”</p>	<p>“[The project] paves the road to automated driving and parking.”</p> <p>“The greatest success factor is the speed with which we bring our solutions to market. For this, visible reference projects are crucial. [...] We address the necessary local knowledge us with a [...] concept in the regions.”</p>	<p><i>Celebrity effect through joint demonstration with the CEOs of the oton company and strategic partner</i></p> <p><i>Overseas demonstration in North America with a reach to 1 billion people</i></p>	<p><i>Standardization of oton technical concept</i></p> <p><i>Achievement of being the worldwide first SAE level approved system</i></p>	<p><i>Technology demonstration as part of a company's TV spot about the firm's IoT campaign</i></p> <p><i>Published articles in automotive journals to advertise the technology and educate about the project's safety concept</i></p>

### 3.4.1 Corporate Vision Anchoring

From the beginning when attracting resource providers John made use of the practice of *corporate vision anchoring* and set a sustainable backing for the project. Going beyond the early stage, he used this cultural practice throughout the project phases to ensure the anchoring in corporate thrusts. Such anchoring provided a cognitive beacon for corporate decision-makers amidst project redirections and shifting frames. The corporate vision anchor builds on the two mechanisms which we term *familiarity-building* and *catalyzing corporate aspirations*.

*Familiarity-building.* John repetitively pointed at the company's unique technical competences, market footprint, and reputation as enabler for entering the digital parking market. He also showed the opportunities of the company to take an active role in orchestrating a new ecosystem as well as in becoming a holistic parking solution provider. To pave the way towards his desired new role, John lowered entry barriers for the formerly hardware-focused company by linking physical with digital offerings in his idea, and hence bridging the old to the new world in the so-called role of a "360° parking provider": John also created familiarity by underlining the project's emphasis of the corporate values of safety, quality, and societal impact e.g., in his project slogan of "improving quality of life by simplifying parking".

*Catalyzing corporate aspirations.* John aimed to ensure that stakeholders continuously perceived his idea as a catalyst for the corporate strategic goals. With that he could create a dominant consistent frame anchoring in foundational corporate thrusts—in our case digitalization, IoT, and business model innovation. His project framing corresponded to the CEO's envisioned strategic transformation. As digitalization was seen as a corporate strategic task, it was also associated with a long-term and an industry-wide change of high certainty. As a result, it was of unquestioned importance for the corporation. Furthermore, John positioned his project to become a keystone project for the company in e.g., building an "automotive cloud" or by providing "data-driven business models as pilot application of the [company] IoT cloud". Moreover, he linked to corporate aspirations like a more collaborative spirit within the organization by emphasizing his mantra to "create new products, combine [company] products, combine [company] competences". With that, John reminded the company to utilize its unique competences, and created complements from his project to the core business and linked to the corporate ideals.

### 3.4.2 Leveraging Hype Excitement

*Leveraging hype excitement* enabled John to distantly add hypes—the ones which became the strategic focus intra-corporately—to aggrandize the project's idea but also

flexibly move on if the inflated expectations of such hype would lead to disappointment that could also negatively impact his project. We found three foundational mechanisms—the *aggrandizing the idea*, *distant positioning* to the hype, and *proactive distinction* to the prevailing hype approach— which John used to leverage the upward hype turn.

***Aggrandizing the idea.*** Next to the project’s dominant frame and anchor in IoT, John made first indications towards another hype of AD by adding the automated vehicle market to the overall market potential of the digital parking. John also positioned the technology approach agnostically to the applications whether in parking garages or logistic fields. With this technology-focused frame and his flexible portfolio building based on his digital and automated sub-projects, he could dynamically reconfigure his frame focus and show additional value contributions by e.g., in whole mobility ecosystem or in real estate use cases.

***Distant positioning.*** As the CEO of our focal firm claimed the AD technology to be “on the horizon” but pointed at the uncertainty of the timeline, framing the project tightly into AD indicated a risk to be terminated as a project in case of a downward hype turn. John respectively navigated the hype excitement around AD for his project loosely as an option first in outlining the technology roadmap ambiguously: John positioned his sub-projects sequentially focusing on digital services first and then being able to subsidize the autonomous parking solution. He thus hedged corporate investments and raised stakeholder interest by including the hyped option. John created hereby some flexibility to navigate towards AD if this would gain strategic relevance for the company in the long run. He navigated only loosely to the hype of AD since his initial technology frame of digitalization still dominated, his target customer pain and value proposition focused on rather digitizing than automating the parking market.

***Proactive distinction.*** To leverage the hype and avoiding being scrutinized too early, John made a clear market and technology distinction to the prevailing approach of the hype early on. The hype of AD was overinflated by use cases on public roads in the city or on the highway. As John targeted the parking market instead of the open road driving his project was not seen as key player in the emerging AD ecosystem among the internal stakeholders. While the main path of the AD ecosystem actors aimed to provide mobility or transport services, our focal project aimed to provide an autonomous parking service. In addition, John made an unambiguous technical distinction by following an infrastructure-centric technology approach, meaning that vehicles with limited intelligence could drive autonomously. On the contrary, the main group followed the vehicle-centric technology approach which foresaw the full intelligence in the vehicle. This distinct project framing helped John to build a protective barrier in case of hype disappointment.

### 3.4.3 Leveraging Hype Disappointment

The previously leverage of hype excitement and preparations of being distinct to others helped John to make use of the mechanism *leveraging hype disappointment*. Creating now close relations to the hype facilitated the project positioning as a savior of disappointments. Our data shows that John could leverage disappointment from either external or internal circumstances.

*Savior of hype disappointments.* Externally, disappointment can refer to problems on industry, ecosystem, and hype level such as the slowness of technology development as well as disillusionment of a hype. Different to the so far dominant frame in digitalization, the parking project emphasized in particular the autonomous sub-project when the AD hype moved downwards. For instance, John challenged the slowness of the AD ecosystem actors and positioned his project as ‘savior’ of the legal doubts by being the “worldwide first certified level 4 system in automotive with [a] driverless and autonomous car”. In addition, his previously distinct framing allowed now to challenge the postponement of vehicle-centric technology by the external AD ecosystem actors and put his project in a superior position.

*Savior of internal disappointments.* Internally, disappointment can refer to the underperformance of other innovation projects. In fact, AD projects were partly set on hold or needed to pivot their market or partnering strategy. John used this momentum to position the parking project as a catalyst of the company’s AD strategy. With his earlier project distinction from others on market and technology level, he could better position the project’s—for the rest of the organization an exotic—approach. In the phase of the uncertain AD ecosystem developments, long investment timeline and little technical proof, the technology distinction helped him to build a more compelling ‘savior’ frame. John used the firm’s disappointment of other AD projects to distinctly elevate his own project’s performance. He emphasized key legitimation drivers (e.g., being the first certified autonomous technology) in a referential form, i.e., not only in their own right but in comparison to the other projects. This allowed him to single out his project as ‘the last man standing’ amongst several other corporate projects that had failed to deliver on the set corporate KPIs and expectations.

### 3.4.4 Leveraging Material Proof

Beyond cultural practices, we also find that in the corporate context the creation of material proofs appears a crucial complement and enabler for continued resource mobilization. We find that our corporate entrepreneur successfully orchestrated repeatedly three forms of material proof tactics: *the strategic use of demonstrations*, *regulatory approval*, and *user-centric broadcasting*.

We find that John's cultural practices required material proof creation as a complement to tell the story of an over-performing internal venture. Stakeholders believed John's changing hype frames because he provided consistent material proof. He did so across three stakeholder groups: key internal stakeholders, other industry players, and end-users. Specifically, John was strategic about the use of demonstrations increasing the media reach with each demonstration. He invested time and effort in rallying broad-scale third-party and regulatory approval around crucial concerns of technological integrity and use. Finally, he involved the end-users in highly publicized demonstration projects that amplified user excitement and helped the positive company image, another key impetus for continued resource mobilization. Overall, the three material mechanisms allowed John to provide short-term artefacts that triggered stakeholder interest and commitment—a foundational counterpart to the changing hype frames while cushioning the hype dynamics.

*Strategic use of demos.* John was strategic about conducting demonstrations that grew in size and impact, e.g., by the number of corporate partners, use cases, and their regional reach. Public demonstrations with direct involvement of key internal stakeholders can create important effects not only around excitement but also around the moral buy-in of the stakeholder. Especially, when delivered together with strategic partner organizations, this stakeholder commitment becomes reinforced and basically coerces strategic decision-makers. The coercive power of such demonstration can thus mitigate the risk of a project cancellation despite the changing frames of the corporate entrepreneur. Our data shows that the concrete customer requests leading to direct calls on the board of management level can influence the resource providers' decision.

*Regulatory approval.* Our case shows that technology agreements by legal institutions increased confidence in the project. Analogous to the company's core business, technology developments according to legal requirements and standards were usual business routines. Especially in safety-critical innovations, a regulatory approval of the technology provides certainty for the market launch and customer acceptance. The parking project saw the legal approval for the emerging technology as an enabling factor to reduce market risks and pursued the standardization of its technical start from the project start. This also de-risks the investment for the focal firm and thus generates trust for resource providers when corporate entrepreneurs change their hype frames.

*User-centric broadcasting.* Involving the end-users in public and performing highly publicized demonstration projects helped John to integrate emotional narratives and support the broad mobilization of collective agreement. John's focus on creating these demonstrations in public spaces foreshadowed how users as key constituents would engage with the ultimate solution in their daily lives. This amplified public excitement which created positive impact on the company's image in the hyped environment. In



addition, this also de-risks the focal company's resource allocation as the innovation project can show tangible progress on the market side.

### 3.4.5 Phase 1: Corporate Vision and the Digital Parking Idea (late 2013 - 2014)

This phase outlines the initial situation of our corporate entrepreneur at the automotive incumbent firm amidst its strategic transformation towards an IoT (Internet of Things) company. In line with the corporate vision, the CEO encouraged towards more collaboration across organizational units to provide customer-oriented solutions:

*The world is becoming increasingly interconnected, which means we at [the company] also must work together more closely and concern ourselves systematically with connected solutions. This is where [the company] has a huge advantage. If our divisions work together more closely, we can come up with completely new solutions for our customers – solutions that are out of reach for companies working on their own.*

In this context, the CEO initiated a structured corporate innovation process and allocated 500 million USD in corporate funds to such projects. Corporate entrepreneurs could apply for corporate funding and undergo an idea assessment based on 129 predefined questions. Several stakeholders decided on the resource allocation namely the CEO, CTO, president of corporate research, head of corporate strategy, a venture capitalist expert, and corporate strategists. The group of decision makers evaluated the ideas based on the corporate innovation KPI: strategic fit, customer focus, market and competitors, feasibility, and scalability.

Apart from the digital industry change, AD was emerging as a hyped technology. Until now, our focal firm had been holding market leading positions in driver assistance systems, a technical antecedent of AD. In the emerging field of AD, the automotive tier-1 supplier faced new market entrants such as Waymo, the Alphabet spin-off, interested in the development of the AD software, in other words the virtual driver. Our focal incumbent did not see AD technologies to materialize in the next decade but started to experiment in automating private vehicles and showcased fully autonomous vehicles at industry fairs in 2013.

At this initial stage, John operated with two foundational cultural practices. Material practices could not yet be used as the idea was evolving.

**Corporate vision anchoring.** Late 2013, John pitched his idea of digitizing the parking and framed it under the umbrella of IoT:

*Since the invention of the parking meter in 1935, drivers worldwide have been waiting for a better consumer experience around the issue of parking. The lack of flexibility and*

*paying with cash make parking an untimely act. In addition, finding free parking accounts for about 30% of urban traffic leads to about 10% of the automotive world's CO2 emissions. New technologies, e.g., cloud-based services and automated low-speed driving, currently offer a unique opportunity for reorientation [...].*

John proposed three sub-projects, with two focusing on digital parking services and one dedicated to the autonomous parking service. The latter, in particular, drew the interest of the CEO.

We observed this corporate vision anchor in IoT constant in all phases. The corporate vision anchor in IoT provided a strategic foothold for the parking project—especially in later phases when the innovation project was not able to meet short-term financial targets or the promised business plan. This anchor later facilitated John to link his framing to multiples hypes to form a more convincing story and meet stakeholder strategic foci as well as expectations. In addition, John also hooked in temporal corporate sub-foci resulting from IoT which emerged over time such as the automotive cloud, later replaced by the mobility cloud or data-driven business models.

*Leveraging hype excitement.* Although the hype around AD was already present in our focal firm, it was still associated with uncertainty. John thus added this hyped technology as a possible option to his dominant positioning towards IoT and digitalization. In his AD framing, he also made sure to distinct his project from others. By rethinking the concept of vehicle maneuvering based on the CEO's impetus, John and his colleagues defined an infrastructure-centric technology approach—meaning that off-board infrastructure sensors would steer the vehicle. With this unfamiliar approach in a vehicle-centric company as well as being on double-track of the corporate vision and AD hype, John was able to predict an earlier market entry and thus attract resource providers for corporate funds.

### **3.4.6 Phase 2: Corporate Innovation Program and Corporate Expectations (2015 -2017)**

From 2015 to 2017, our focal project was centrally funded and allocated to a board member distant from the typical short-term business pressure. After the initial funding in 2015, John needed to apply for corporate funds every year. In each assessment, the same group of decision makers evaluated John's idea based on the corporate innovation performance criteria (*see Appendix A*). Furthermore, the CEO posed the request to the project team to think big, i.e., how to scale the idea globally. He sought for a pioneering position in automated technologies, new business models apart from the hardware-centric product business and announced publicly to showcase the autonomous parking technology in 2018.

At firm-level of the automotive supplier, the CEO emphasized to “rethink mobility”. In his words, mobility should become “emission-free, stress-free, and accident-free”. For this reason, the automotive board members envisioned their role as “the leading provider of systems solutions for the entire mobility ecosystem”. There were business opportunities in electric, automated, and connected driving, but the company had a foothold in automation as a board member outlined:

*We’re also very pleased with how well our driver assistance systems are doing. [...]. We are very confident that we will break the one-billion-euro sales threshold with driver assistance systems in the coming year. [...]. It’s important because assistance systems form the basis for automated driving, which is coming step by step. We already see highly automated driving on the horizon, where drivers no longer need to constantly monitor their vehicle.*

While IoT, seen as corporate vision, and automation, through the firm’s success in driver assistance systems, received high managerial attention, board members neglected electromobility as one stated that this “is still a niche market. For that to change, vehicles will have to become considerably more affordable”.

So, the focal firm continued to experiment in AD applications like robotaxis and autonomous shuttles. However, after the rise of the AD hype through startup acquisitions in billion-ranges the hype around AD flattened from 2016 when investors called for returns after intense investments. Main AD ecosystem actors like the pioneer Waymo changed its strategic focus from passenger cars to trucking applications. Overall, the hype of AD was dynamic and also the stakeholder expectations in this field.

In this phase, John continued with the corporate vision anchor, and made additional use of one cultural practice and all three identified material practices.

***Leveraging hype excitement.*** John continued with the distant framing towards the AD hype as the corporate research of our focal firm was experimenting in developing an AD shuttle without yet a clear path towards commercialization. John also ambiguously labelled the project portfolio to address connectivity and automation in a holistic way which provided him flexibility to navigate between the strategic directions. He reinforced his technical distinction from the prevailing path of automation on public road by putting high emphasis on the high value creation of his project in digitalization rather than automation. Even though not being regarded at the time as a core AD project, the introduction of this distant link to the superimposed hype created interest and attention from key resource providers as one of the corporate strategists stated:

*As a project manager for such a growth phase, I have not often experienced how you fight so tenaciously for your project and make everything possible. That was one thing.*

*The other is the attachment to AD, which had a lot of hype at the time. [...] That is, the topic had a hype with [a strategic partner] [...]. And all the other American West Coast customers that wanted to get into AD, all the products from us related to sensors and that's where you link to that and say, it all belongs together one day, and it always had a bit of a tailwind from the AD scene even though they weren't really participating in road traffic themselves. Well, sure, they could use that in the parking garage, and in the stationary secure environment, but they could always ride that hype wave, I think.*

**Strategic use of demos.** With the kick-off of the official project, John used the direct involvement of key stakeholders internally and externally. Forming a strategic partnership with the leading car manufacturing company helped John to leverage the external stakeholder commitment and create a market pull for the parking project. Untypical for a corporate venture at our focal firm, the project advertised early on its collaborations and field tests. The media visibility granted the project the protection of not being cancelled since relevant partners relied on the innovation. At the CES 2016 in January, the parking project could display its sub-projects under the company theme "Simply. Connected." In the CEO's keynote speech, the parking project was also mentioned as part of the moving trends of smart cities, connected cars, and AD. This announcement belonged to the early public statements of the key stakeholders about the parking project and indicated interest and commitment of the resource providers to consider this as portfolio element. In 2017, the project team built their own test garage that supported the continuous display of technical progress in the project framing.

**Regulatory approval.** As the parking project followed an exotic technology approach in the automotive domain, John sought for a legitimating proof of the technology concept which may de-risk the company's investment. John widened the internal project organization by establishing local offices in overseas regions with whom he sought for a first third-party approval, i.e., setting industry-wide standards for the project's technology approach. This would reduce uncertainties about e.g., technical interfaces and communication within the emerging ecosystem. Mutual opinions were needed such as other technology providers, car manufacturers, and legal authorities that could support the technology development.

**User-centric broadcasting.** From the beginning, the parking project published videos showing their technology readiness and use cases on YouTube. This created the first interaction with the public community. The award-winning journey of the project especially celebrated by the automotive journal helped the project to gain more visibility among potential customers. In addition, the corporate strategist analyzing the project during the central funding program emphasized the value proposition of the project with which many people could resonate:

*Everyone knows that [parking], especially in big cities. It's just annoying. It sucks. Parking in Berlin, you drive around the block for a quarter of an hour in the evening to put your car somewhere, and the next morning you wake up and can't remember where you put it. Because you put it somewhere else every night. [...]. But that's just a topic where everyone says yes, actually, if that would run automatically one day and you would no longer have any worries. [...]. Exactly, because everyone could also have a say. It's different when you think about medical products [...]. Such an idea simply sparks more euphoria in the average [company] person.*

In combination of the cultural and material practices, one could observe that John was building material proof that could serve the corporate strategic focus on the AD hype. By winning industry partners, legal parties, and users the parking project helped to build reputation for the company in the AD field—not to mention the catalyzing effect for the company towards the vision of becoming a leading IoT company.

### **3.4.7 Phase 3: Short-term Business Unit Targets (2018 - Q2 2019)**

After three years of central allocation of the project, this phase embodies the re-allocation of the parking project to a business unit and thus the change of stakeholder expectations. The newly formed business unit for software and services set its foci on customer acquisitions and financial targets when evaluating innovation projects. Resource acquisition became more difficult for our focal project since John lost his direct reporting line to a board member and thus had less impact on navigating stakeholder expectations. He needed to compete with other innovation projects in the business unit which all targeted new software and service business. The high fluctuation of resource providers also increased the complexity to build sustainable managerial support. As the software and service business unit faced a negative cash flow problem, the president of the business unit demanded John to improve the project's financial results as the project had not yet reached its break-even and still relied on pre-investments.

The firm's strategic focus in the automotive sector was still on AD. The automotive supplier announced to invest 4 billion euros in AD until 2022. It strengthened its co-development partnership with a premium car manufacturer as well as revealed its first AD shuttle and mobility concept at the CES (Consumer Electronics Show) in 2019. At industry-level, however, the hype of AD received increasingly negative press when the Tesla Autopilot system led to a fatal crash (Chokshi, 2020). Although it was highly debated whether this could be claimed as an AD system, it led high uncertainty in the ecosystem. AD actors continued to postpone the go-to-market estimates and AD as a technology was solidly seen as past its high point on the hype curve (Costello & van der Meulen, 2018).

In this phase, John again repeated the corporate vision anchor, but leveraged not only the hype excitement but also disappointment. In parallel to this, he increased the effectiveness of all three material practices.

*Leveraging hype excitement.* Within our focal firm, the willingness to shape the AD ecosystem became clearer as also corporate investments in this field were increased. The distant project positioning to the hype changed towards a tight positioning. John leveraged this to aggrandize his project's market potential and expanded his value propositions to additional use cases. Consequently, as AD applications in trucking was perceived as a business case with an earlier return, John also reconfigured his portfolio to trucking use cases.

*Leveraging hype disappointment.* As the overall AD ecosystem faced another disillusionment due to the fatal crashes of semi-autonomous technology systems, John could leverage this disappointment. This mechanism became an effective strategy John deployed to better position his project vis-a-vis underperforming peers in different strategic spaces of interest. John used this mechanism repetitively from this phase on to position the project in a distinct positive way as a 'savior' to disappointments by external or internal stakeholders. Positioning the project as a savior was actively supported by John's leverage of material proof.

*Strategic use of demos.* Increasing the impact of the first field experiment in phase one, the parking project created a celebrity effect in its demonstration. The sub-projects were not only presented as part of the corporate portfolio, but also became the focus of the company's own conference. There, the CEOs of the own and partnering company showcased the autonomous use case and raised in particular publicity on a public conference in 2018. One of the corporate strategists highlighted the celebrity effect of the demonstration:

*There was the [company owned conference] where at the time [the partner organization] CEO and [the focal company CEO] drove into together, with a livestream and 3,000 people sitting in the room with a purely autonomous [vehicle].*

This underlined the stakeholder commitment since public audience would now associate the autonomous use case with the company and partnering company, and also the parking project as manifested part of the company. Furthermore, the additional demonstration in China created high visibility in the organization and demonstrated the global applicability of the idea as the head of corporate research in China emphasized this project as "an important milestone on the road towards AD". In our case, the regional interest embraced again the initial call of the CEO to strengthen collaboration among the business units, topping this with the cross-regional

collaboration. Such stakeholder affiliations support innovation projects in their resource mobilization process.

**Regulatory approval.** This third-party approval especially from the legal side would increase the belief and acceptance for the project. Especially in the AD field where safety acceptance levels were unclear and legal authorities started to introduce safety assessment to learn from the technical state of the art, the project team could set an industry-wide standard for their technology approach.

The parking project additionally ran a demonstration with a Chinese car manufacturer. Having a successful demonstration overseas helped John to reduce uncertainty about the project's scalability. The showcases and legal milestone underlined a big leap forward contrarily to other innovation projects in the AD field at our focal company which struggled with external downward trend of the AD hype.

**User-centric broadcasting.** With its legal approval of operations, private users could experiment or take a look on the technology in a public parking garage. The easy access and broad press across social media and other channels enabled the parking project to stick in stakeholders' heads and further strengthen the moral lock-in.

In this phase, especially when leveraging hype disappointment, material proof becomes a foundational part of the project's framing. Our data shows how the constant material proof building and exploitation can help corporate entrepreneurs to distinct from the hype downward turn and take advantage from the underperformance of the external and internal ventures. As one of the corporate strategists outlined, we observed how the project's material proof resulted in the project framing:

*They then also drove forward standardization with the ISO [International Standard Organization] standard in 2019 and then of course tried to say, hey, the market is coming, and the technology is needed and has also been tested in this way.*

John emphasized the project's "performance [...] recognized as 'de facto' base standard for all future [autonomous parking] realization". Based on these case examples, the project framing showed how the evolution of material proof could create the change from a distant to a tight positioning towards the AD hype.

#### **3.4.8 Phase 4: Stakeholder Disappointment and Hype Disillusionment (Q3 2019 - 2021)**

In this phase, the parking project was still allocated to the business unit but faced critical scrutiny among the resource providers. It was the most challenging phase for the project as John described:

*This [business unit] phase is a very special phase because as I said in 2019, we were strongly scrutinized. That was our most critical point in our whole [project] time, 2019 there. Then, when we got into 2020, where there was a [CEO] appointment in the summer, July, that was very critical.*

As the company had not yet analyzed the parking business in general, a board member instructed corporate strategists to perform an independent business field analysis of the digital parking market. After five years of investments in the parking project, the board member aimed to understand how promising the market would be. However, corporate strategists described the market being “hyperlocal” with “intense competition” as well as “project-based business”, in other words the business field was not scalable. One of their final key statements was the following:

*Regional & digital use-case specific scalability with upper limit – orchestration difficult. Holistic leading position hard to achieve due to the existence of fragmented regional ecosystems and the presence of a large number of industry players.*

These results were disillusioning to the CEO and board members. Additionally, the business unit was loss making and in need to streamline its innovation portfolio. The decision committee consisting of the business unit president, head of commercials, engineering, sales, and solution clusters, as well as the portfolio manager introduced another formalized resource acquisition process and evaluated the innovation projects based on the criteria “voice of the customer”, “financials”, “chance to succeed”, and “strategy”, as well as their strategy pitch.

At firm-level, the automotive incumbent faced a stagnating automotive market which meant that the core business struggled in continuously financing innovation fields—like AD which was investment intense. Few internal AD projects were thus put on hold or pivoted as the AD partnership among our focal automotive supplier and car manufacturer received high strategic attention. In addition, the CEO pointed at another possible innovation path next to AD:

*Because we as an innovation leader, we have endless opportunities. For example, in the [automotive sector] we want to shape the electric future, the transformation to electric mobility. AD is a huge opportunity that gives us the opportunity for us to build a new powertrain business. 20 billion euro is feasible for AD.*

Electromobility hence gained traction within the company. The executive vice president of powertrain outlined this hype more in detail:

*Electric mobility globally is clearly under rise. This is associated with three cities. That's Paris, that's London, and that's Beijing. Because these three cities are paradigmatically*



*associated to a couple of megatrends. [The CEO] has mentioned the Paris Declaration already. So, the Paris Declaration as a consequence leads to the fact that emission regulations for road traffic are getting tighter year by year all over the globe. The second is London. In many cities all over the world like in London, people are discussing driving bans or driving restrictions for vehicles going into the inner cities. This has the clear consequence that consumers think whether vehicles with a conventional combustion engine are sustainable means to address their sustainability needs in the future. These two effects clearly call electric mobility up on this stage.*

Throughout 2020, both AD and electromobility had been on the strategic map of the company. Electromobility gained even higher importance within the company when the key AD partnership of our focal firm was stopped, and the continuation of the investment-intensive technology was questioned. Overall automotive incumbents were pressured by tighter legal EU laws to provide more CO<sub>2</sub>-friendly mobility solutions.

In this phase, John did not actively use the corporate vision anchoring by emphasizing the IoT frame verbally, instead he showed the IoT frame via material proof. He actively used the two hype leveraging practices and exploited continuously the three material practices.

***Leveraging hype excitement.*** John continued leveraging the AD hype by aggrandizing the market potential and presenting his distinct approach. However, as the corporate strategic focus turned towards electromobility due to legal pressures and corporate social responsibility of lowering CO<sub>2</sub> emissions, this focus dominated the investment-heavy AD field where its short-term profitability was still internally debated. As the hype of electromobility was of high certainty due to the legal obligations John aggrandized the future role of the project from “360° parking provider” to “mobility enabler”. In addition, he used again his technology-focused frame which enabled the navigation towards a broad variety of greener mobility topics such as electromobility or improving urban space. Our data indicates how navigating hype excitement can support to solve essential stakeholder expectations e.g., fulfilling the promised business plan as corporate entrepreneurs can again aggrandize the business potential. He did not make use of the distant positioning to the electromobility hype but deployed the following savior frame in leveraging the hype disappointment.

***Leveraging hype disappointment.*** Similar to the previous phase, John continued the savior frame in the AD field. Special to this phase was his opportunity to leverage the disappointment of the electromobility hype. With the rise of electromobility as a crucial corporate strategic focus, John pointed at hype challenges by directing the attention to the bottlenecks in the charging infrastructure, hindering the advancement of societal goals of electromobility:

*[...] that's now a kind of killer use case. Because there's such strong need and the most critical problems in the whole electromobility transformation is the lack of charging infrastructure and we can at least improve the situation with our technology.*

This altering of hype frame was accepted among the resource providers as the parking project continued to build a constant basis of material proof and show technical and progress as well as their partnership and building capabilities.

**Strategic use of demos.** Underlying the reconfigured framing, the project pursued a media-rich communication strategy involving the first electromobility showcase, another overseas demonstration in North America, and another public partnership with an airport operator. On top of that, in 2021 the parking project hosted a joint demonstration with the autonomous parking but also automated charging service with leading car manufacturers and tier-1 suppliers.

These media-rich years backed the parking project in creating excitement among resource providers and distracted them from doubts regarding the underperformance in formal corporate innovation criteria. John outlined the reach of the project's latest demonstrations:

*If you are looking to our [North American use case], the release of the [city] airport, both of the events we have reached from the marketing perspective 1 billion people. That is impossible to imagine what problems you solve with media.*

By engaging car manufacturers and tier-1 suppliers, the parking project could create a joint demonstration at the one of the leading international automotive fairs with key car manufacturer companies, tier-1 suppliers, and software companies.

*It was possible [...] to spread the passion over even the whole automotive industry so that you can see the results in the [automotive fair], where suddenly all automotive players are saying a cooperative approach for [project] is the right one.*

John called this event a "breakthrough of the market". According to him it was until then highly debated whether the exotic infrastructure-centric technology approach would hold true. Based on the market entry of competitors and car manufacturers, the probability to stop the project, exit the market, and lose the market advantage could be mitigated.

**Regulatory approval.** The project team with the partner company jointly achieved to set an ISO standard for the exotic technical approach and received operational approval after four years of testing, as the corporate entrepreneur outlined:

*We were in 2019 the first project on the whole world with an official level four release for driving. That's a clear kind of success, it was a milestone for the whole automotive world*

*at that point. It was reached not by Waymo, and not by anybody else, but by the [parking project] team together with [the car manufacturer].*

Again, the John emphasized the unique technology approach and the resulting possibility to gain advantage in the AD field:

*This is really if you see a car driving automatically without a driver in it, and you see people are jumping in front of the car and you know, you cannot do anything. You have no switch to turn off in your hands, but you know the system works properly. And that's exciting and that is that we have created automatization really by safety as design. You have designed the whole system and that was very disruptive because we have understood the typical approach towards automatization, we cannot manage it in an easy way. So, we have to reinvent all elements of automatization to create it and we were successful because we have created the system, the safety as design. And so, we could convince all the authorities that our system is safe, so that they can release it.*

**User-centric broadcasting.** The parking project shot a public commercial video with the brand representative of the corporate IoT campaign. In an entertaining way, this character advertised the driverless parking use case and thus increased project's visibility in the consumer sector. Also in this case, the tight representation of the IoT campaign and parking project generated high stakeholder commitment—a technology with which the company would like to be associated. Our data shows how John extended the user-closeness by conducting the showcases in known user-accessible environments such as the airport, hotels, and residential. This mechanism again attracted the resource providers as they could personally relate to the situation.

Overall, in this stage we identified changing hype frames and how these were supported by prior generated material proof. For instance, the material practice 'regulatory approval' fortified the 'hype disappointment leveraging' practice and became a significant part in the project framing. Positioning the project as the "worldwide first" approved AD system indicated a close link to the hype and required material proof to offer a compelling story and navigate towards that hype. On the contrary, the electromobility hype was of high certainty so John could tightly frame the project to the hype by being the savior and provide material proof subsequently.

The corporate entrepreneur's cultural and material practices, all summarized in Table 10, helped the project to fall under the top three of the innovation project assessment at the business unit. Based on a corporate strategic decision, innovation projects of that business unit should now be integrated in core business units with series business. The successful innovation path and promising prospects of the parking project led to full integration into a core automotive business unit.



**Table 10 (continued)**

	Phase 1	Phase 2	Phase 3	Phase 4
<b>Project framing</b> (representative quotes or images described)	<p>“In terms of digitalization: Having applicable products today that are paving the way to future. Physical and digital [company] products to create crucial parking information: Where are the free parking spaces, how to come there and how to manage them.”</p> <p><i>Project portfolio building of three sub-projects – two digital services and one autonomous service.</i></p>	<p>“Entering the market via the [company] brand facilitates the entry in all relevant customer segments with the arguments of high-quality standards, engineering excellence, and good business foundation. The worldwide sales network via [our organization] facilitates the access to a large part of the customer landscape.”</p> <p>“The [project’s] vision of ‘improving quality of life by simplifying parking’ and the associated potential of reducing CO2 emissions are an excellent fit with the [company’s] value foundation.”</p>		
<b>Familiarity-building</b>	<p>Bridge building to hardware-centric business side such as enabling and sellable components in the vehicle.</p> <p>Emphasis on the company’s value in road safety.</p>		<p>Extending contribution to the company’s value of safety by mobility ambitions.</p>	
<b>Catalyzing corporate aspirations</b>	<p>Repetitive emphasis on contribution to corporate thrusts of IoT, connectivity, new business models.</p> <p>Additional emphasis on automotive cloud, cross-organizational collaboration.</p>	<p>Additional emphasis on cross-organizational collaboration.</p>	<p>Additional emphasis on automotive first data-driven business model, worldwide first in SAE level 4 automation.</p>	<p>Additional emphasis on mobility cloud, worldwide first in SAE level 4 automation.</p>

Table 10 (continued)

	Phase 1	Phase 2	Phase 3	Phase 4
<b>Leveraging hype excitement</b>				
<b>Project framing</b> (representative quotes or images described)	<i>John shows a gradually evolving technical roadmap along the SAE automation levels which shows autonomous parking as a possible outcome.</i>	<i>John presents in an image the market entry timeline with different product generations of parking systems which will be introduced in 2017. This underlines the earlier market entry with an infrastructure-centric technology approach for AD.</i>	<i>John presents the automation of logistics as additional use cases and links them to the extant portfolio by stating "1 to 1 technology transfer" and "synergetic business models for OEM".</i>	<i>"[Project] as 'mobility' enabler", "interface between inner-city shared electrified mobility and suburb individual traffic", "seamless interface – no time consumption in huge parking area for commuter"</i>
			<i>"[The project] brings together the megatrends 'automated' and 'connected'."</i>	
			<i>"The two regulatory aspects of 'data protection' and 'automation in road traffic' are comparatively unproblematic in the parking environment."</i>	
<b>Aggrandizing the idea</b>	Market potential consists of smart and connected parking market.	Aggrandizing by AD market.	Aggrandizing by AD market.	Aggrandizing by electromobility market.
		Project portfolio enlarged by AD use cases in logistics or plant use cases.	Project portfolio enlarged by AD use cases in logistics or plant use cases.	Project portfolio enlarged by new real estate, automated charging use cases.
<b>Distant positioning</b>	AD presented as potential outcome of the project roadmap. Focus on digital services first.		AD Logistics use cases presented as possible extension to the project portfolio.	
<b>Proactive distinction</b>	Exotic approach with infrastructure-centric vehicle maneuvering concept instead of vehicle-centric intelligence. Focus on autonomous technology in gated areas instead on public roads. Focus on value creation for car park operator as target customer instead of the car manufacturer, the core business customer group.			

**Table 10 (continued)**

	Phase 1	Phase 2	Phase 3	Phase 4
	<b>Leveraging hype disappointment</b>			
<b>Project framing</b> (representative quotes or images described)			<p>“One positive aspect to be emphasized is that in 2018, for the first time, [the project] is completely removing humans from the safety chain in the vehicle. [The project]’s pioneering role for autonomous driving in the topics of legislation, liability, certification and societal change is documented, among other things.”</p> <p>“OEM are moving now (one of the reasons: vehicle centric L5 &amp; L4 function are massively delayed).”</p> <p><i>Sub-projects adapted logistics use cases according to the hype of autonomous trucking.</i></p>	<p>“The [project] becomes core asset of the [company]’s automated driving strategy.”</p> <p>“Use the predictable environment of a parking garage as well-defined area. First comprehensive solution on functional safety, regulation and legal matters. Create innovative ideas and business models with ecosystem partners. Early learning and shaping of customer behavior with worldwide first driverless car.”</p>
<b>Savior of hype disappointments</b>			<p>Project as the worldwide first approved SAE level 4 system without human intervention.</p> <p>Elaborated safety-concept for AD technology.</p>	
<b>Savior of other internal disappointments</b>				<p>Project solves the charging bottleneck with its automated charging solution.</p> <p>Emphasis on importance of project for corporate AD strategy.</p> <p>Earlier market entry than other internal AD vehicle-centric solutions.</p> <p>Early learning effects of reduced complexity in AD application.</p> <p>Emphasis of customer pull and pilot projects</p>

Table 10 (continued)

	Phase 1	Phase 2	Phase 3	Phase 4
<b>MATERIAL PRACTICES</b>				
<b>Project actions</b> (representative actions described)	<i>Pivot of technology concept from vehicle-centric to infrastructure-centric vehicle maneuvering.</i>	<i>Presentation of sub-projects at CES.</i>	<i>Joint presentation with strategic partner at public conference.</i>	<i>Two overseas demos in North America with automotive and non-automotive partners.</i>
	<i>First field experiment with strategic partner.</i>	<i>First overseas demo in China.</i>	<i>First overseas demo in China.</i>	<i>First presentation of charging use case.</i>
	<i>Opened local offices to understand local markets.</i>	<i>Joint efforts with strategic partner to drive standardization that support the own technical concept.</i>	<i>Joint efforts with strategic partner to drive standardization that support the own technical concept.</i>	<i>Received three additional innovation awards.</i>
	<i>Built own parking test parking garage.</i>	<i>Published articles on project's safety concept in automotive user journals.</i>	<i>Published articles on project's safety concept in automotive user journals.</i>	<i>Technology demo in company's TV spot for IoT campaign.</i>
	<i>Received four innovation awards.</i>			<i>Gained worldwide first system approval for SAE level 4 AD.</i>
	<i>Published videos of technical concepts on YouTube.</i>			<i>Celebration of technical implementation in vehicle series production.</i>
<b>Strategic use of demonstrations</b>		First demonstration in local environment and known partner.	Created celebrity effect by having both CEOs presenting the idea.	First built-up of ecosystem demonstration with cross-industry partners.
			Expansion to international environment.	
<b>Regulatory approval</b>		Validation of technology design with car manufacturers.	Increased exchange on technical design with automotive players.	Achieved legal approval.
		Started standardization efforts.		
<b>User-centric broadcasting</b>		First touchpoints with consumers.	Socializing technology approach to gain trust and build positive company reputation.	Increase of user-accessible locations like airports, hotels, residences to build complete end-user journeys.





### 3.5 The Interplay of Cultural and Material Practices: An Emergent Framework

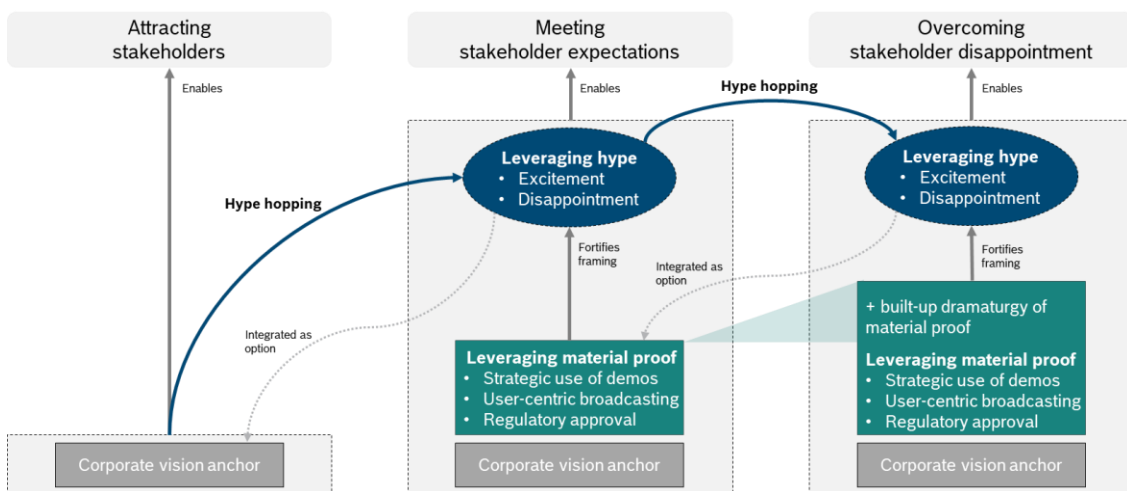
Our longitudinal analysis of how John orchestrated the different cultural and material practices over time brings up an important insight into how he was able to buffer expectations and create flexibility for himself and the project to change and adapt his project positioning to the changing circumstances without losing credibility. The skillful use of the framing tactics as outlined above, and the overlay of material practices becomes as crucial enabler for a project positioning strategy that we call 'hype hopping'. Hype hopping depicts a repeated leveraging of collective excitement and resource mobilization potential of multiple successive hypes.

Over time, a crucial dynamic was that John skillfully superimposed different hypes. For example, he leveraged his savior approach during the declining enthusiasm about AD just long enough until a repositioning of the project could take a foothold as a savior of the electromobility hype and catalyst for the company's move into electromobility. Such jump from one to the next hype was largely enabled by his originally distant positioning at the beginning of a hype, i.e., framing his project just as a potential catalyst or product extension of the hyped technology allowed John to later elevate his project over others that were more tightly linked as a core hype project. This led to the effect that his venture did not suffer as much from the blow-back of imploding expectations. We call this dynamic as we observed this over time the practice of hype hopping, which is a skillful orchestration of hype frames that allowed a switch of reference frames in the corporate audience, and thus granted John time to fulfill corporate key performance criteria at a later stage.

Our findings suggest how corporate entrepreneurs can leverage hypes as temporal and dynamic cultural resource to convince stakeholders and mobilize resources for long-time horizon innovation. We identified a process, outlined in Figure 2, of hype connections and a flexible switching between them that our corporate entrepreneur was able to use for repeatedly legitimizing his project's motivations and achievements, all without losing credibility vis-à-vis missed corporate innovation KPIs. To leverage several hypes and hop between them, the corporate entrepreneur would need a corporate vision anchor that then later enables the linkage to multiple hypes. The evolving hypes can be entertained differently to maintain optionality as long as the corporate environment has not yet manifested its willingness to sustain in the hyped innovation field. Making use of the hype excitement, corporate entrepreneurs can flexibly build the project portfolio, distinct their technology and market from the prevailing path of the hype. This enables corporate entrepreneurs to carefully and

distantly integrate another hype to attract attention and aggrandize the idea without losing credibility.

Making use of the hype disappointment, corporate entrepreneurs can tighten their frame towards the hype if they can counteract against the hype disappointment among the industry or internally against the underperformance of other internal ventures. Here, material proof leveraging practices provide the foundation of the hype hopping. The purposeful built-up of the dramaturgy in material proof ensures the continuous stakeholder attention and trust in the project team's capabilities. To conclude, the interplay of cultural and material practices creates the corporate entrepreneur's ability to navigate stakeholder expectations and overcome disappointment induced by the hype.



**Figure 2: Process Model of the Interplay of Cultural and Material Practices**

### 3.6 Discussion and Implications

Leveraging hypes has become a relevant cultural practice in entrepreneurship when ventures fail to deliver material proof but aim for social proof to gain flexibility and acquire resources (Logue & Grimes, 2022). In contrast to that, corporate environments that are focused on short-term deliverables tend not to neglect material proof. We even show how material proof was perceived as another key performance criterion overweighing the pre-defined ones since it fortifies the strategic framing of the innovation project. This speaks to the research of defining own success criteria and finding the right corporate unit that acknowledges that (Vinokurova & Kapoor, 2020). However, in our case the innovation project was externally controlled to which unit it was allocated. Still, it managed to define its own success criteria such as setting the legal standard in the technology as key enabler of their business. Our research underlines prior studies on pivoting (McDonald & Gao, 2019) how ventures may leave ambiguity to strategically reorient. We found evidence in our case how this can be achieved on

framing, technology, and market level. Moreover, our proposed mechanisms foresee a dynamic hype leveraging process which may end as soon as the innovation project found its crucial argument to convince the stakeholders.

By showing how corporate entrepreneurs can use hypes strategically through hype-leveraging and material proof-leveraging practices, we contribute to the larger research on entrepreneurial resource mobilization. Specifically, we add to the emerging literature on hypes and expectation management in innovation and entrepreneurship. We show how predictable disappointments in timing and performance of innovation projects can be mitigated by strategically leveraging different hypes. We connect the hype literature with the corporate entrepreneurship literature by demonstrating how corporate entrepreneurs can use several hypes successfully and thus increase the chances of survival of long-horizon projects in an environment that is often geared toward short-term innovation performance. In addition, we aim to offer an in-depth study of dynamic framing mechanisms which the corporate entrepreneur can change over time to maintain legitimacy among resource providers. Our research emphasizes how corporate entrepreneur can dynamically recreate a grand picture of the future to incite again fresh stakeholder enthusiasm and thus secure survival of the project.

### **3.7 Limitations**

In our study we face the typical limitations of a single case study, namely the generalizability of our findings. We thus limit the application of our process model and the displayed mechanisms of leveraging hypes and material proof based on three arguments. First of all, the 'who' is in particular essential. The corporate entrepreneur takes a decisive role in framing the project idea and winning resource providers. This corporate entrepreneur needs to be on the spot to make sense of hypes outside the company as well as evaluate which hypes may become corporate foci that can steer stakeholders' attentions. To benefit from the corporate vision anchor, corporate entrepreneurs need to keep their fingers on the company's pulse by deploying their antennas and exchanging with influencers on the technology and strategy side who are close to the board of management. It reveals a critical component as emerging strategic foci may not be easy to predict and requires a well-embedded network within the company. In addition, this means that the corporate entrepreneur may need to share similar cognitive models as the resource providers built from on e.g., similar academic background or past business experiences. In our case, the corporate entrepreneur showed historical success in driving safety-critical vehicle technology forward, which also represents the firm's affiliation.

Second, the 'where' points at the corporate environment in our case. The unique character of our automotive incumbent firm reveals the strong influence on corporate

strategy from middle management. The limited top-down impact on corporate innovation enabled the corporate entrepreneur to shape the corporate strategy in e.g., AD. In addition, the innovation project was allocated to two different organizational units, first directly to a board member and second to a business unit. The change of organizational allocation of our case could provide advantages for the corporate entrepreneur in resource mobilization if the audience was confronted with historical amnesia due to the frequently changing decision makers.

Third, the 'when' of the ability to leverage cultural and material practices depends on the timing of the growing and diminishing hype. It requires the corporate entrepreneur's sense of not only which hype, as mentioned in point one, but also when the hype might lead to stakeholder disappointment to either benefit or disconnect from the hype. In addition, our identified practices could be used since the corporate was undergoing a strategic transformation—representing thus a clear possible corporate vision anchor for innovation projects to start with. One could also argue that the usage of hype hopping is limited. We observed in total two predominant hypes that were translated in the company to strategic foci for a longer term with an impact of at least three years.

# Mobilizing Corporate Resources for a Strategic Innovation Project: The Case of Connected Parking at the Bosch Group

## 4.1 Teaching Case

STUTTGART, GERMANY, SEPTEMBER 2019. It was one of these warm late summer evenings when Paul Schmidt left the Bosch Headquarters building. He declined the invitation from colleagues for after-work drinks; too heavy were his concerns about the future of his Connected Parking project he had led from just an idea pitch in late 2013 to becoming a key project in a business unit—a major accomplishment for any corporate innovator.

As he walked to his car, his mind swirled back to the meeting with the executive board he had just attended for the past two hours. Corporate strategists had presented their business field analysis of the parking market to the company’s CEO, CTO, head of corporate strategy, head of Mobility Solutions, the head of the business unit Connected Mobility Solutions, and Schmidt himself. Because Schmidt’s project had received high publicity in the last years through numerous industry partnerships and the first-of-its-kind AD demonstrations in parking garages, the executive board had raised the question about the overall strategic outlook. After having provided their run down of key opportunities, the strategists began their concluding part with the following statement:

*Regional & digital use-case specific scalability with upper limit – orchestration difficult. Holistic leading position hard to achieve due to the existence of fragmented regional ecosystems and the presence of many industry players.*

Without even waiting for the team to finish the presentation, the CEO had stepped in to summarize poignantly, “so, this is only a lukewarm market.” Schmidt relived the pinch in his stomach this statement had made. Obviously, after years of corporate investment, terms like scaling limitations and market fragmentation were not what the top management expected to hear, and Schmidt knew instinctively that this could be the end. Once strongly supported by the CEO, the project was now hanging on to a thread.

The executive board had ended the meeting by giving him a month to revise his project strategy and a last chance to convince the business unit stakeholders about the project's viability. The concerns Schmidt faced were substantial:

- The business field analysis left the **scalability of the corporate venture** looking questionable vis-à-vis typical business expectations in a company like Bosch. At the same time, Schmidt felt that the analysis had failed to account for the huge potential of the digital parking component that was currently a foundational part of his project.
- **Autonomous driving**, as complementary and to-date highly successful part of his project, was seen as a potentially trillion-dollar business down the road but had recently suffered from negative press. Other corporate ventures in this field were set on hold or were terminated due to the **high burn rate** and currently unpredictable return. Schmidt had to justify his exposure and strategy forward.
- At industry-level, the automotive incumbents were more and more **pressured to lower CO2 emissions**—re-directing resources to this challenge. Bosch needed to restructure around 50,000 engineers in diesel technologies. This meant a shift in strategic focus, and Bosch was set to prioritize greener mobility.

As Schmidt was driving home, the burden of his project's survival was weighing heavily on him. Several years of company resources invested, but importantly also tremendous personal efforts he and his team had put into his vision of building a full solution parking provider with digital and automated technologies—all potentially for nothing now. The pressure was on. How could he convince everyone that this project deserved to continue?

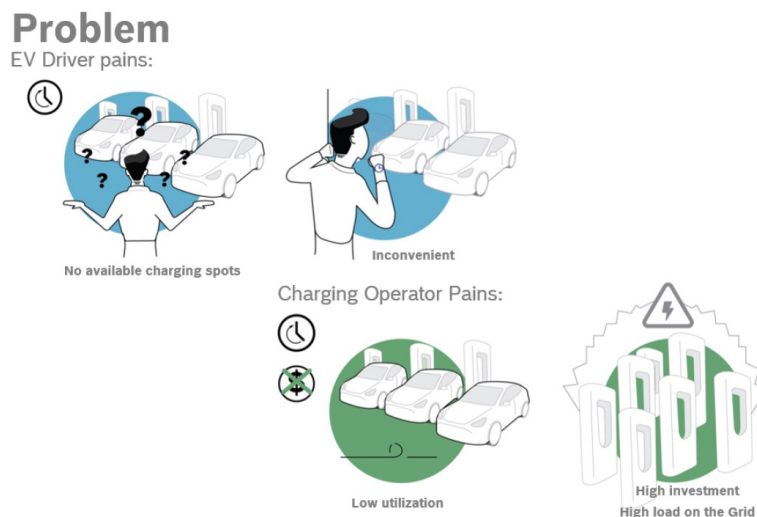
#### 4.1.1 Shifting Paradigms in the Automotive Industry

Traditional automotive incumbents with roots going back for more than a century were used to developing high performing systems and mass-producing privately-owned vehicles. Yet, by 2019, incumbent automotive suppliers such as Bosch, Continental, or ZF felt sharply the decline of their bread-and-butter business as connectivity-based and user-oriented services became the differentiating factors in the mobility sector (Oliver Wyman, 2019). Old capabilities and business models were threatened by newly emerging themes of digitalization and AI.

In fact, over the past two decades, sector visionaries, policy makers, and technology pioneers had driven multiple technical and societal shifts in the automotive sector, which required every industry player to rethink how mobility ecosystems would work, how the innovations would reshuffle the industry structure, and where future business opportunities would be found.

### 4.1.2 Ramp-up of Electrification

With early pioneers like Tesla paving the way, the move toward the electric powertrain was unstoppable. However, despite all technical progress, by 2019, the economic case for electric vehicles was still questionable. The redesign of the vehicle from internal combustion engines to electric drives and the sourcing of battery cells as the new heart of the car came with tremendous costs. In addition, electric vehicles could still not beat the range of conventional cars, and the availability and efficient use of the electric charging infrastructure remained as a persistent problem and a critical bottleneck for the day-to-day operability of electric vehicles at broad scale (see Figure 3).



**Figure 3: Pains on Supplier and Demand Side of Electromobility** (Photo: Bosch)

Early analyses of this trend that had guided Bosch’s positioning strategy had outlined that electric vehicles would remain a niche between 2014 and 2019 (Bosch, 2014). With only 144,000 charging points across EU instead of the requested 2.8 million, the net-zero emission vision through electric cars remained a rather high-aspirational target (ACEA, 2019). This view had been widely shared in the industry and, as a result, many automotive players and, in particular, suppliers had not felt much urgency to jump fully on the bandwagon during that time.

However, in April 2019, the council of the EU—a crucial body for the negotiation and adoption of EU laws—had tightened CO<sub>2</sub> emission targets and requested automotive firms to lower CO<sub>2</sub> emissions for new cars by 37.5% from 2030 onward. Otherwise, firms were faced with high penalties (Council of the EU, 2019). Subsequently, the sector was fully waking up and more and more companies like Bosch began to emphasize their commitments towards CO<sub>2</sub> neutrality. Electrification appeared to be inevitable, with substantial implications for the traditional component business of a supplier like Bosch, as leading consulting reports (PwC, n.d.) were ready to confirm:



*[Electric vehicles (EVs)] will have a profound impact on the automotive supply chain. [...]. EVs are radically simpler in mechanical terms [...] but the share of a car's value attributable to the powertrain and electronics will rise significantly by 2025, to a combined 52% from 44% in 2015, at the expense of the chassis, body, and interior components, driven in part by a shift toward EVs (increasing in-car connectivity and advancements in driver-assist technology are also factors).*

### 4.1.3 The Rise of Autonomous Driving

In parallel to the change of the powertrain, industry incumbents also needed to grapple with the technical advances around the drivetrain evolution toward autonomous vehicles.

Since the early 2000s, when the U.S. Department of Defense had launched the DARPA Grand Challenge to foster experimentation with unmanned vehicle technology, many prestigious universities, visionary municipalities, and established companies had entered that space. A lasting arc of excitement for autonomous vehicles had begun, and especially since 2010, new players with advanced technical capabilities had entered the scene and began to work on automizing privately-owned vehicles and experimenting with robotaxis.

Industry pioneers like Waymo—generously funded by its well-endowed parent company Alphabet—had paved the way. By 2016, the race was on when General Motors made a staggering 1 billion USD investment in the robotaxi startup Cruise. AD had gained the ultimate public momentum and a flurry of news hit the space about multiple new market entries from the high technology space, with deals in the three-digit million ranges, as well as numerous partnerships between those new upstarts and traditional automotive OEMs<sup>2</sup> like General Motors, Mercedes-Benz, Toyota, and co.

These digitally savvy entrants were increasingly signaling to be ready to step into new supplier positions, putting pressure on the traditional business model of incumbent suppliers. New platform offers like digital driver systems formed an entirely new value chain component with promising business models attached (Roemer, 2020) and it was unclear how these new and the old models would fit together.

However, by 2019, dark clouds were gathering over the autonomous space. A number of crucial incidents had begun to dampen the expectations. In March 2018, the first pedestrian was killed by an Uber autonomous car. Another fatal crash had involved the Tesla Model X while being on Tesla's autopilot—a system that industry insiders

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<sup>2</sup> OEM: Original Equipment Manufacturer.

debated highly as not being designed for driverless operations (McGee, 2019). And as with any hype, disillusionment seemed to be setting in (*see Exhibit 1*).

The technical challenge of moving up from lower levels of driver assistance to higher levels of full automation (*see Exhibit 2*) was presenting itself as more difficult than envisioned. Moving the space forward with high-end sensor technology and AI-supported driving tasks, ready for open-road AD and fully compliant with public safety regulations, would require substantially more investments. Only the most optimistic autonomous pioneers forecasted fully autonomous vehicles for early 2020 (CNBC, 2017; Nissan, 2017). Anyone else was more cautiously mentioning the end of that decade, maybe even later.

These timelines and further investment needs were challenging the pockets of everyone and especially the incumbent suppliers. Many of them traditionally self-financed their R&D activities and did not have readily access to external capital markets. Yet, even the tech startups were beginning to feel a slow-down in investment appetite. Their investors started to become more impatient, pushing away from trying to revolutionize everyday mobility and asked to rather focus on business spaces with a faster pay-off like in the logistics sector (McGee, 2020). By 2019, everyone needed to carefully review how much and into what autonomous opportunity spaces they wanted to invest.

#### **4.1.4 Digital Competencies and New Competitive Advantages**

Both innovation trajectories around electrification and automation were fueled by the megatrend of digitalization, which had also begun to fundamentally transform how people and vehicles interact. The growing integration of connectivity in vehicles, in other words the “smartphone on wheels”, had facilitated the entry of newcomers and diversifying players—the likes of Tesla, Mobileye, and Nvidia (Roland Berger/Lazard, 2019).

These new entrants managed to break up the encrusted industry structures and gain fast industry buy-in from users and incumbent OEMs. Not only were they unencumbered with prior technological and value chain commitments, but they were also advantaged in their access to tech talent. That placed particular pressure on the traditional supplier sector in their approaches to adapting to the new environments.

Faced with multiple parallel changes and an unstoppable process of industry renewal, Bosch was under strategic pressure to ensure that it would stay relevant.

#### 4.1.5 Bosch's Path Toward becoming an IoT Company

Of course, in 2012, when Volkmar Denner had taken over the helm of Bosch, none of these developments had been foreseeable in all details. Yet, at the time, it was clear for him that the company would need to undergo a transformational renewal process in order to stay competitive. Sooner or later, the changes in technology and business models around the combustion engine would change and CEO Denner was intent on Bosch being ready when that time came:

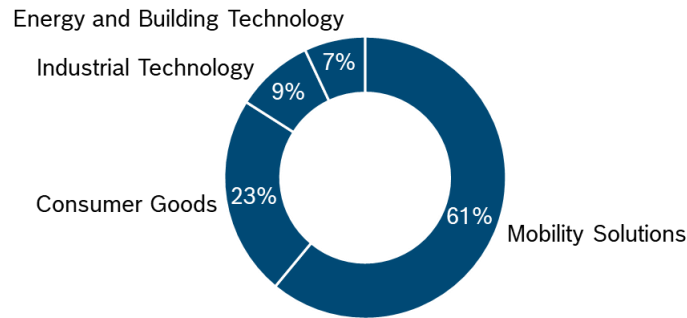
*[...] when we remind ourselves that the future will be ever more difficult to predict and plan for. One major task will be to master the linking of the virtual and physical worlds, the internet of things and services.*

He planted the vision of becoming a leading IoT company. Between 2012 and 2019, the IoT vision had spread across the entire portfolio of the traditionally hardware-centric company. Bosch built new research campuses for IoT and AI as well as new software units, for example targeting smart home products and services. The company even started to produce its own cloud solution and its own semiconductors. Notably, connected products and services had become the strategic focus and received strategic investments.

*The world is becoming increasingly interconnected, which means we at Bosch also must work together more closely and concern ourselves systematically with connected solutions. This is where Bosch has a huge advantage. If our divisions work together more closely, we can come up with completely new solutions for our customers – solutions that are out of reach for companies working on their own.*

To drive transformation, Denner had set up a strategic growth fund initiative for new projects with a focus on IoT, connected services and new business models. He allocated about half a billion euros per year to selected initiatives, which could be anything from exploring new business models with a handful of employees to strategic innovation projects with the goal of developing new technologies and new organizational units growing beyond 100 employees.

Although still recognized predominantly as a leading supplier for major automotive OEMs, the new strategy successfully permeated the business portfolio of Bosch. By 2019, Bosch had successfully increased volume in other business sectors such as Industrial Technology, Energy and Building Technologies as well as Consumer Goods (see Figure 4). Overall, the company generated 79 billion of revenue, employing 410,000 employees.



**Figure 4: Bosch's Sales by Business Sector in 2018** (Bosch, 2018)

#### 4.1.6 Putting Autonomous Driving on the Strategic Map

The foundational shift in mission and strategy was no small feat for a company of Bosch's tradition. Since its early days in the late nineteenth century, Bosch had been a pioneering inventor in the automotive industry. Following its true north "invented for life," Bosch was particularly known for its breakthrough inventions such as the high-voltage magneto spark plug that ensured the engine's reliability and the ABS antilock braking system that kept vehicles under control when braking. Its innovation power had foundationally improved the performance and reliability of the automobile.

Naturally, Bosch was eager to shape also the rising AD field. Coinciding with the autonomous hype, several key projects had been kicked off, either within Denner's strategic growth fund initiative or as individual projects started by the different mobility business units. Projects were betting on different use cases, ranging from passenger car to robotaxis, to trucks. A common denominator was the goal to ultimately offer integrated digital services around intelligent sensor technology that would enable the fully autonomous maneuvering of the vehicles within a specific use case.

Projects were typically run as a joint investment with an incumbent OEM. Collaborative innovation had been Bosch's foundational R&D model. It followed the same tradition for its autonomous projects, with one crucial addition: The OEMs also very much liked working with the new tech startups that had entered the space. Their strategic freedom, agility, and deep pockets filled by private venture capital or public capital markets as well as their access to the best talent made them a welcome partner, pushing traditional suppliers like Bosch into complementary roles instead of being the lead.

However, the incidents of 2018 and the overall slowdown of excitement about the AD timeline had begun to cast shadows onto Bosch's autonomous project portfolio. The industry-wide reorientation toward autonomous trucking as likely first commercially

viable use case impacted the strategic investments of its traditional partners, putting pressure on many of the running projects.

By 2019, amidst a general economic crunch with sales figures down in all business sectors, calls from the non-automotive sectors at Bosch became louder that the investments in its new software and service unit and in AD needed to be revised. Cash could be used for other innovation fields with a faster return. A ripple effect of those calls was the strategic review Paul Schmidt now faced for his Connected Parking project.

#### **4.1.7 The Journey of the Connected Parking Project**

As Schmidt worked on his strategic review ‘homework’, his mind was replaying the eventful history he and his project have had at Bosch. He had led and grown ‘his baby’ since the early ideas in 2013, he had received substantial financial support for almost five years now from the corporate, and he was intent on ensuring the project’s continued survival. His team had accomplished so much since the early beginnings—from winning key stakeholders, getting strategic funds from the CEO, to running successful demonstrators with public traction, to becoming fully integrated into a business unit. Few of Bosch’s strategic innovation projects during that time had made it so far along and had generated so much attention.

Schmidt, a musician, and a physicist by background, was no amateur when it came to innovating at Bosch. He joined the company in 1998. A key project he drove early on was the further development of ESP, the electronic stability program, which stabilized the vehicle in critical situations, and thus reduced 80% of skidding accidents. This innovation had meanwhile become a globally mandated standard for new vehicles and belonged to one of Bosch’s most groundbreaking technology contributions to human safety.

##### ***Phase 1: The Idea Gets Born (late 2013 - end of 2014)***

The strategic growth fund program, initiated by then-CEO Denner, was open to applications from all employees as long as the projects furthered Bosch’s IoT strategy and car connectivity, in particular.

Schmidt, at that time part of a strategic unit generally focused on business exploration around connected services, began to scrutinize different business fields in the automotive sector and analyzed options that could be part of Bosch’s future digital business. The business field of parking raised his interest. Parking holistically had not received much attention previously in the company and thus involved less politics—pretty good conditions to start a new idea, Schmidt thought.

The next step then was a formalized application process. For each project, applicants had to complete a large Excel spreadsheet with ca. 130 questions and additionally submit a project proposal. Corporate strategists would then evaluate the ideas based on the pre-defined key performance criteria: customer focus, market & competitors, scalability, strategic fit, and feasibility (*see Figure 5*).

Customer focus	What is the project's value proposition? How does the customer benefit?
	Have user research methods been conducted to understand unmet need?
Market & Competitors	What is the target market in billion euros?
	Who else is addressing the customer problem?
Scalability	How does the project want to scale from revenue perspective?
	Is the revenue model tested and validated?
Strategic fit	Does the business idea fit the Bosch strategy?
	Why should Bosch solve this problem?
Feasibility	Is it feasible to build the potential solution within a reasonable timeframe?
	How does the current MVP look like and how can the MVP develop over time?

**Figure 5: Exemplary Questions of the Corporate Innovation Assessment**

By fall 2013, Schmidt presented his plan of revolutionizing the parking industry. Parking lot management and the efficient use of space would all benefit from new digital services. In Schmidt's view, digitalization would help upgrade the outdated parking technology and a player like Bosch would be able to drive foundational change better than the many startups that had previously failed to commercialize digital services for that sector.

Yet, having different parties in the decision committee with diverse expectations was a challenging setup. Everyone, from the CEO, to CTO, to head of corporate research, head of intellectual property, head of corporate strategy and analysts at the strategy unit, all had their say. Schmidt's first pitch did not raise immediately broad interest.

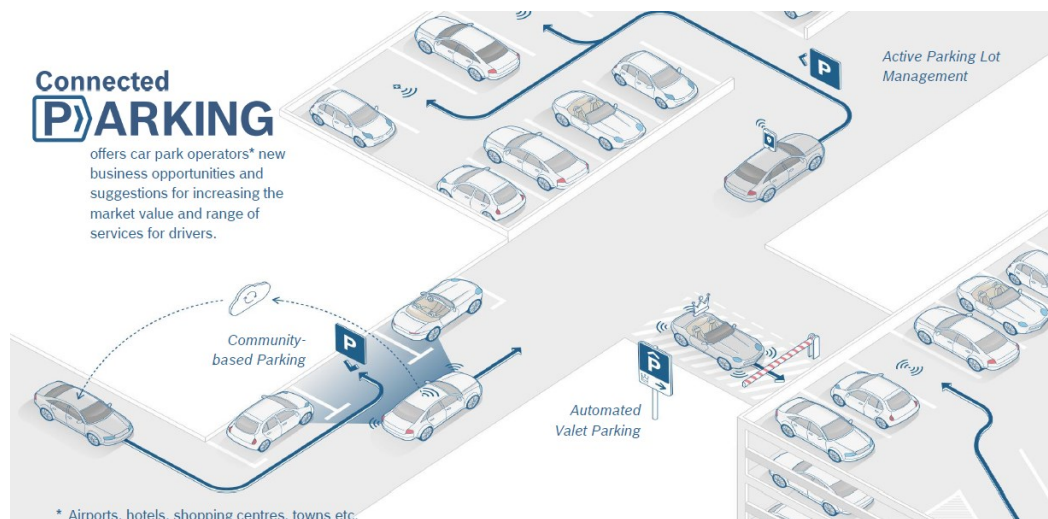
However, the CEO had taken a liking to an idea Schmidt had mentioned more as a potential far-out future option—the idea of fully autonomous parking. Schmidt got invited back for a second round a few months later to outline a broader vision that would put autonomous parking more centrally into the project—an opportunity he gladly seized.

He presented a revised proposal in February 2014 with a vision of Bosch becoming an end-to-end parking solution—or a 360° parking providers as Schmidt liked to position it—through the combination of digital and automated technologies:

*If you think about digitalization in the sense that you create the hardware-driven technology on the one hand—the first 180 degree, and on the other, the other 180 degree—the digital side. It comes from every usage level. This is not about putting a bit of connectivity to a hardware but about covering the whole cycle... and you continuously improve your products because you get data how the products are used. We have called it 360-degree parking and one part was automated valet parking. It was created out of thinking in connectivity and not thinking out of automatization.*

For Schmidt, Connected Parking would be a steppingstone toward a future of Bosch as an IoT company. Subsequently, his updated presentation built around three key sub-projects, all representing a set of digital and autonomous services (see Figure 6):

- **Active Parking Lot Management:** Novel ground-based sensor technology for acquiring real-time information about space occupancy
- **Community-based Parking:** Map creation of free parking spaces by aggregating real-time data of multiple connected vehicles
- **Automated Valet Parking:** Autonomous maneuvering of vehicles into parking spaces based on an infrastructure-centric concept and communication to the vehicle

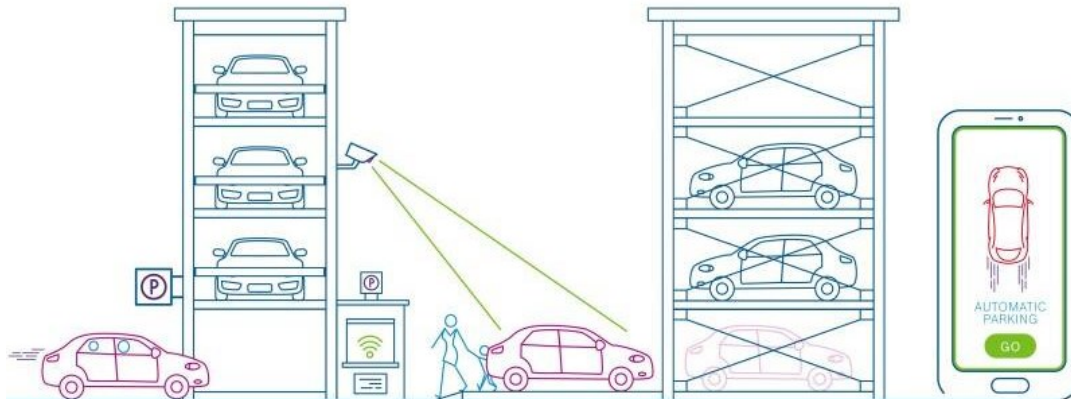


**Figure 6: Portfolio of Connected Parking (Bosch, 2016)**

Although, this revised pitch generally excited the CEO, the long lead time of the automated valet component was not met with enthusiasm. Following the typical life cycle of automotive innovation—on average every five years based on vehicle generations—Schmidt had estimated a market realization for 2020. CEO Denner had other thoughts. He pushed Schmidt to think about creative solutions to shorten this time-to-market.

Schmidt, together with a few enthusiastic colleagues, took up that challenge. They rethought the entire concept and instead of solving the complexity through the vehicle's

own intelligence, they changed their idea towards the then more exotic approach – the infrastructure-centric maneuvering of the vehicle (see Figure 7).



**Figure 7: Concept of Automated Valet Parking (Bosch, n.d.)**

This justified an earlier market launch of the automated valet service and sealed the deal. The initial funding within the strategic growth fund scheme kicked off in 2015 and enabled Schmidt to build a small team with a handful of employees and to gear up for developing the parking sensors, investigating system architectures, and delivering on a first pilot. By the end of the year, he needed to show results to renew the funding. He was excited.

### *Phase 2: Creating Traction and Visibility (2015 - end of 2017)*

During 2015, with the hype around AD on the rise, Schmidt was able to open many doors and, together with his team, he made fast progress.

#### **Finding early recognition**

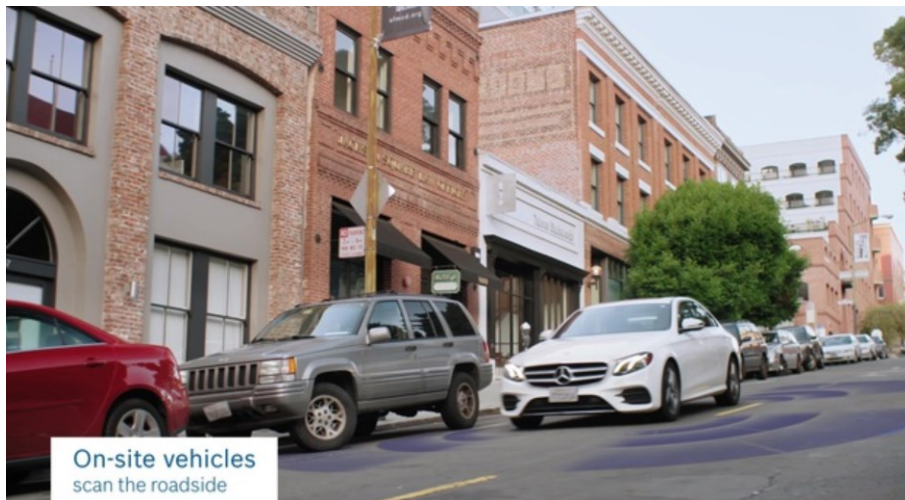
A few months after the official start of the project, thanks to being well-connected, Schmidt won a leading automotive OEM as a strategic partner for the automated valet parking (AVP) component of the project. This collaboration was crucial to figure out the connections between infrastructure and existing onboard technologies in high-end passenger vehicles. A first proof of concept project was set up at the parking garage of Stuttgart's prestigious Mercedes-Benz Museum. This checked off a number of potential concerns as it was a first step toward de-risking this novel technology.

Likewise on the community-based parking side, Schmidt's hard-working team made great progress. Multiple OEMs showed interest in the digital services, paving the way for a highly successful public presentation of their multiple sub-projects at the



January 2016 CES<sup>3</sup> trade show. Those early successes made Schmidt’s first annual project review a walk in the park. Everything was on track.

Over the course of the next 12 months, the project continued to enjoy positive press and repeated its well-received public presentations at important industry event (*see Figure 8*).



**Figure 8: Community-based Parking Presentation at CES in January 2017**  
(Bosch, 2017)

During that year, Schmidt’s team also built their own test parking garage to accelerate the technical development. In particular, the AVP component of his project received incredible recognition—three innovation awards: one Bosch-internal awards, one by a consulting firm, and one by an automotive journal (*see also Exhibit 3*).

### **Communicating an integrated project vision**

Schmidt began to transfer the company’s true north for innovation “invented for life” to his project’s vision. He emphasized the mission to “improve quality of life by simplifying parking”, something that the decision committee appreciated a lot. While collecting lots of accolades for the automated valet component, Schmidt made sure to keep true to his larger vision of digitalizing the entire parking sector. He drove forward all three sub-projects equally with due attention.

In his project renewal pitch for continued funding in 2017, he anchored his narrative clearly in the corporate vision, highlighting the strategic value of Connected Parking for Bosch’s IoT vision. He emphasized the project’s mantra to “create new products,

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<sup>3</sup> CES: Consumer Electronics Show, annually taking place in Las Vegas.

combine Bosch products, combine Bosch competences,” thus addressing recent calls from the CEO for more cross-divisional collaboration.

Schmidt was also able to distinguish his project from a range of new AD projects that had emerged within Bosch. Due to his infrastructure approach with a clearly defined use case and presumed lower complexity he was not exactly considered part of this new AD suite, as a corporate strategist summarized:

*They were not really participating in road traffic but still had a bit of tailwind from the autonomous driving scene. You could only use AVP in the parking garage or in a stationary safe environment, but they could always ride with that hype.*

Schmidt succeeded to renew his funding. However, CEO Denner also gave the team a friendly nudge to start thinking bigger in their strategy for creating impact. Schmidt and his team were elated—this was a welcome challenge and he intended to come back the following year with more in his hands.

### **First roadblocks and a critical review of strategy**

However, 2017 turned out as a year of mixed successes. The realization of promised business—customers and indications of revenue—was lagging. In addition, the parking lot management component hit a technical snag. The team had to pull the plug on it, which meant losing those revenue projections in the business plan. That was not a position Schmidt liked to be in. He knew the review committee would need to weigh his projects against other options in the strategic growth program that were also vying for IoT business and could likewise make use of the limited financial resources.

Schmidt decided to take the bull by its horns. After all, his team had been challenged to think big. By the end of 2017, the project would have been anyway on a special revision—after three years of central funding it would typically need to think toward integration into a business unit or even becoming its own business unit. He went right at it. His revised strategy proposed a range of options for the decision committee:

1. **Focused Implementation:** Keep the AVP and community-based parking components, reduce overall scale expectations based on cut elements and efficiently leverage Bosch infrastructure to build and implement both swiftly.
2. **Expanded Value Footprint:** Position Connected Parking as a central service for holistic digital solutions for parking management customers with option to move into B2C business. Ramp-up of international business through regional teams.
3. **Sector Disruptor:** Connected Parking would become the “Uber of Parking” with end-customer focused service business around every parking-related problem with immediate global rollout.

The discussion with the corporate strategist responsible for evaluating the Connected Parking project was not exactly going the way hoped. When looking at the key for evaluating innovation projects (*refer back to Figure 5*), the project kept underperforming on criteria like operational feasibility and scalability of the business. Highly visible pilot demonstrations did not immediately translate into business. Especially for the AVP component, safety approvals were needed to bring this into broad commercial production.

On the upside, Schmidt's team did show clear customer value, evidenced by OEMs who were knocking on Bosch's door, and the overall size of business in the parking sector was gigantic. Schmidt's solutions were technically competitive, and the project showed strong strategic fit with the corporate focus topics at the time—automation and connectivity. In fact, there was large agreement that this project was a strategic pillar for digital innovation in the company's core, the automotive business.

The project got renewed with the first option, a focused implementation mandate, not an own business unit at Schmidt's team had secretly hoped for. There was a bit of disappointment but in the context of a larger restructuring around connected mobility services a workable outcome.

*From 2017 on, we established regional offices in Japan as well as China and saw the potential to grow globally. We therefore requested a higher investment than usual for 2018. However, the financial situation of the company did not allow to go all in for our disruptive ideas.*

### **Bosch's organizational restructuring**

Along with the AD frenzy in the industry, Bosch was centrally exploring two different use cases of autonomous vehicle-centric technology on public road, and a number of other AD projects were funded from within existing business units, all leading to a sizable global investment and spread of competencies across different units. The setup called for a more centralized bundling.

From January 2018 on, Bosch would combine all its connected mobility service projects together in a new Connected Mobility Solutions division. The goal was to operate with one face to the customer and build a service landscape beyond the manufacturing-centric automotive business. New digital mobility services in car connectivity, ride sharing, or fleet operations should be addressed (Bosch, 2018).

Schmidt's Connected Parking—so far anchored at the CEO-level growth fund level—was set to be transferred to this new division, something he looked at with mixed feelings. After three years of being directly allocated to a board member, this transfer to the new division would mean that he lost the direct one-to-one relationship with that board member. He would be facing new stakeholders and decision-makers who did not

know the history and agreements around his project, and who would potentially have their own ideas about the project's strategy. There could be opportunity in this but certainly also challenge.

*We were just transferred to this club of software and services. For us, we faced another new reality check. It was clear that we would lose our independent status as a project in a real entrepreneurial environment. That means our freedom to act.*

### ***Phase 3: The Honeymoon Is Over—Getting Down to Business (2018 - late 2019)***

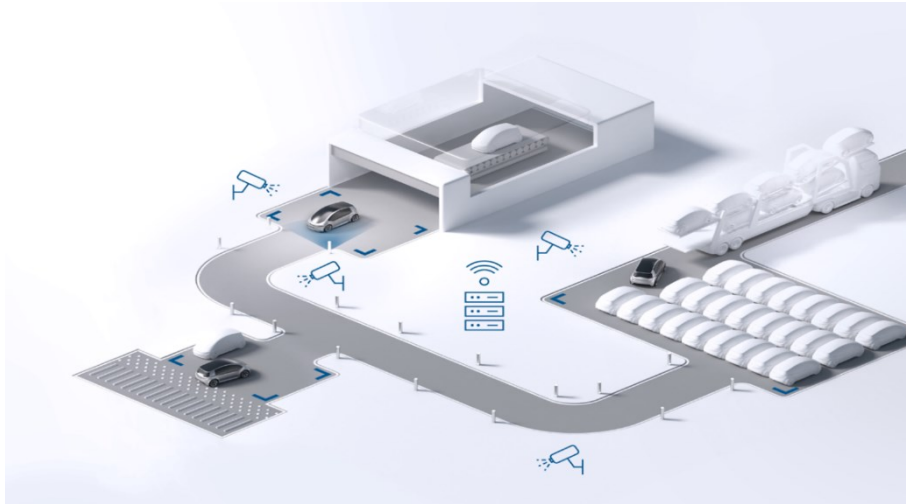
With that move to the Connected Mobility Solutions division, Schmidt's project became part of an entire suite of ambitious corporate ventures in automotive software and service. In this new division, everyone was targeting, for example, connected services to manage vehicle fleets, to offer micro-mobility services, or monitoring services for electric cars—every single hyped topic one could possibly imagine in the mobility space, and everyone was working on highly attractive SaaS business models with the typical hockey stick.

Schmidt knew immediately, his project needed to stand out from all those other projects that would compete for resources and attention. He focused his team on working toward a high-profile parking showcase, to be revealed at the 2018 Bosch ConnectedWorld Conference—a keynote event Bosch had established to broadcast its commitment to IoT and present its newest and finest to outside guests. Schmidt came up with a highlight: he managed to have the Bosch CEO together with the CEO of the partner OEM proudly present their joint efforts—a high-end passenger vehicle parking itself autonomously.

#### **Focused expansion of the project's vision**

Despite the well-received public recognition, the internal competition in the new division was strong—everyone was working hard. Schmidt had to proffer up his cases to remain as a viable contender in the larger portfolio of his division.

Over the course of 2018, Schmidt began to review what he was able to achieve with the autonomous parking technology. In alignment with the overall shift in the AD space toward logistics applications that promised a faster route to market, Schmidt began to look at the use case of automation in OEM plant facilities (*see Figure 9*).



**Figure 9: Use Case Extension of Automated Valet Parking** (Photo: Bosch)

While staying in line with the focus on the two remaining applications of AVP and community-based parking, his revised strategic ambitions emphasized the high leveraging capacity of the autonomous parking technology. Apart from municipal parking lots, the same technology would also enable other attractive applications in, for example, yard logistics or other gated areas like airports or private residential buildings.

#### **Achieving major milestones**

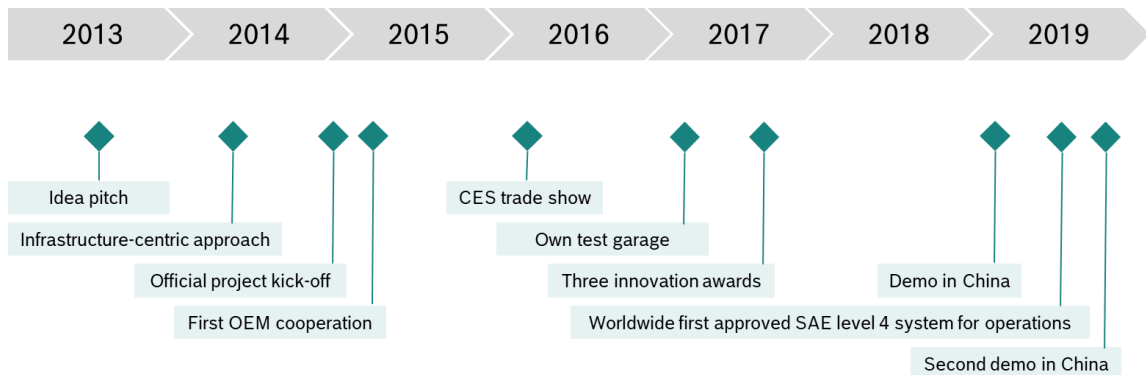
To address the lingering concerns on scalability, the next carefully planned public showcase for Connected Parking went to one of Bosch's strategic markets. In September 2018 Schmidt's team held its first demonstration of AVP in China (*see Figure 10*), which was followed in 2019 by the successful setup of a collaboration with a Chinese OEM.



**Figure 10: Showcase of Bosch and Daimler in Beijing** (Photo: Bosch, Daimler)

In summer 2019, the most crucial milestone yet was achieved. AVP became the worldwide first approved SAE level 4<sup>4</sup> system and was subsequently granted full permission of operation at its original pilot site at the Mercedes-Benz Museum.

With all its technical and regulatory achievements, the Connected Parking project and especially AVP had shown great follow-through and steady progress (*see Figure 11*).



**Figure 11: Timeline of the Sub-project Automated Valet Parking**

### Getting scrutinized

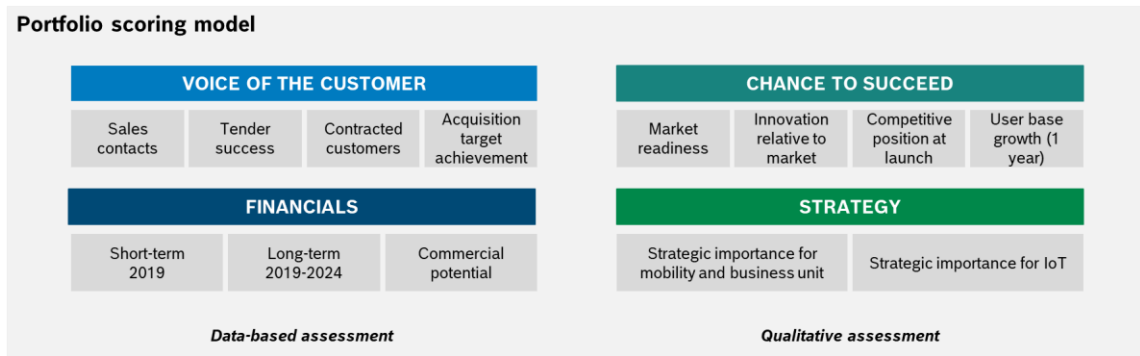
Schmidt's team, however, was not granted long to relish in their successes. The ripple effects of the 2018 AD incidents and an overall economic slow-down loomed large over Schmidt's division, naturally also implicating his project.

Bosch was facing a crisis due to a stagnating automotive market. And Connected Mobility Solutions was one of the business divisions that was put under the microscope. Its setup and the recruitment of digital talent had incurred high upfront investments. Yet, by mid-2019, the division's sales were still at neglectable impact for the company's bottom line. As a result, it was asked to streamline its portfolio to cut costs.

All of the unit's 23 projects—among them all of the Connected Parking sub-projects—were reviewed. In striving for a realistic assessment, the decision committee rated the projects along four key performance criteria, using a 9-point scale from low to exceptionally high: the voice of the customer, chance to succeed, financials, and strategy (*see Figure 12*). Additionally, all internal ventures were also asked to pitch their strategy.

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<sup>4</sup> SAE levels have become an industry-wide standard with SAE level 4 being a crucial automation achievement (see also Exhibit 2).



**Figure 12: Business Unit Portfolio Scoring**

Schmidt managed to pass his review. Although the committee found the business case once more lacking, it acknowledged the substantial technical progress and importantly the strategic relevance:

*Connected Parking [...] is still seen as a relevant topic with IoT potential, despite a planned downsizing in sales. Validation of the business model for Automated Valet Parking to be proven beyond the pilot through demonstrating concrete 'use-cases'.*

However, Schmidt and his team were not yet safe. An executive board member—likely inspired by the growing concerns about AD—had asked for a strategic business field analysis for the parking project specifically. This analysis, typically led by corporate strategists, was part of Bosch's special toolkit that supported strategic alignment and helped create decision baselines for global entry or expansion in new markets.

For Schmidt, this meant that just shortly after the division's portfolio assessment and meanwhile being in its fifth year of corporate investments, he was yet another time asked to justify: What is the real business potential of the Connected Parking project? Can it really scale and turn into a promising IoT business?

After months of market research and expert interviews, the moment of truth had arrived. Everyone, from CEO to CTO, to the heads of the division and business unit, and of course Schmidt himself had rallied to hear the corporate strategists presenting their verdict—an event which one of them later summarized:

*I remember quite clearly [the CEO] sat across from me [...] and I didn't even have to finish the presentation. He just flipped through the presentation. Then he comes along and says, lukewarm market, because we have written hyper-local, and not very high margin, the value chains are very strongly hardware-driven, and the value chain is also occupied. We see little potential for innovation in digital parking management through technology.*



#### 4.1.8 Making a Case for the Project's Survival

A few days after the crushing event, Schmidt was sitting up in his gallery at home, looking at his grand black piano. Maybe a bit of play would get the ideas flowing how to solve the predicament. After years of double-digit million investments, he seemed not able to signal the promising three-digit million business, a Bosch was hoping for. Luckily, he had been given yet another chance.

The parameters for his next move were clear. Scalability was the major concern. No one believed in a hockey stick business. And based on the strategist's assessment of the opportunities in the parking market, the project would no longer survive on the previously successful positioning in IoT and digitalization. Something more needed to come.

Schmidt ran different options and scenarios in his head:

- For one, he needed to find a credible way to argue concrete scaling opportunities, which would also contribute positive cash flow to his business unit. How could Schmidt refine his project portfolio, which consisted of the digital community-based parking service and automated valet parking service? Arguably, he had achieved most traction and repeated positive press with the AVP project, and not to forget the pioneering achievements of being the worldwide first Level 4 approved system. But could he make that case big enough? And if so, how? Partnering with large parking providers should drive the business. Alternatively, he could also go with the trend and refocus the project entirely on automation use cases in the logistics sector, which seemed the new darling of the industry.
- Yet, zeroing in on the autonomous space was not a straightforward choice. So far, Schmidt had always included AVP as just one of the service options within the Connected Parking journey. However, AD had taken a hard blow; open road feasibility with full legal approval seemed further away now than it was two years ago. Amidst the disillusion with AD and a likely down-sizing of current company investments, hitching himself to autonomous was a risky play. On the upside, though, his project was comparatively successful among all the autonomous projects. After all, he constantly delivered results, made technical progress, and attracted high-profile partners. That should be worth something and in a phase of hype disillusionment? Maybe showing some success was exactly what Bosch could leverage right now? In Schmidt's view, automated valet parking should be seen as a core asset for Bosch in AD.

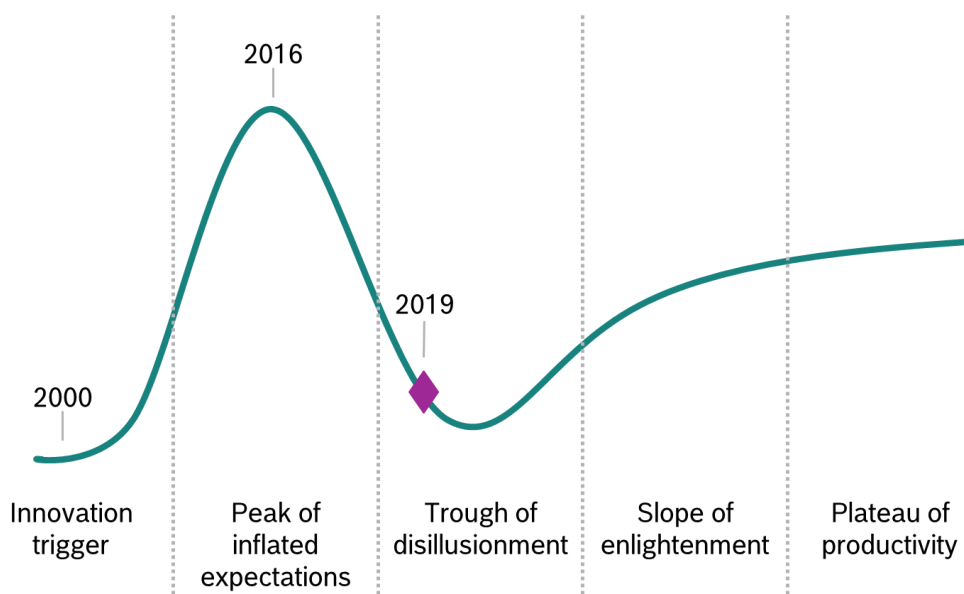


- Much of the industry’s attention and investments were currently channeled into achieving newly mandated electromobility targets. If partners did not continue investing in AD but rather in electrification, that would not bode well for his project either. Yet it may also bring new opportunities? The efficient use of charging infrastructure was a looming problem. Would it not be great, if he could drop off his car, for example, when visiting the car museum and collecting it afterwards with the car meanwhile having charged up without human intervention?

Schmidt felt he was running in circles. In just a month, he would need to deliver a compelling story. How could he secure the project’s survival? Where would short-term revenue come from? And how could he rebuild the project’s legitimacy if the stakeholders were questioning several foundations at once?

#### 4.1.9 Teaching Case Exhibits

*Exhibit 1: Hype Cycle of Autonomous Driving with Key Events*



**Figure 13: Autonomous Driving based on Gartner Hype Cycle Model**

Triggered by the DARPA Grand Challenge and especially Google’s entry, the hype of AD began (see Figure 13). Early on, Google had secretly investigated AD under the project “Chauffeur,” which got spun out as Waymo in 2009. Subsequently, numerous startups were founded, from Argo.ai to the Zoox. Over the next six years, private investors and automotive incumbents were readily showering startups with three digit million investments, and consulting firms claimed that AD would become a trillion-dollar market.

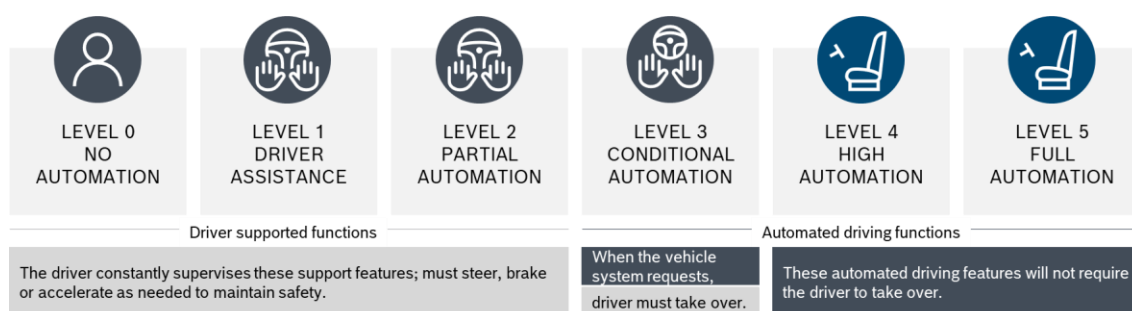
Yet, after more than a decade of experimentation, the peak of the hype was reached in 2016. At that time, investors became impatient about the technological complexity and the long commercialization cycles, and entrants were pressured to deliver returns and to look for less complex, faster-to-market business. Furthermore, after a couple of fatal crashes in 2018 with semi-autonomous passenger cars, autonomous mobility was foundationally in question. The U.S. Government asked the firms for more transparency in their safety approaches, and doubts were raised whether autonomous technologies would ever become fully safe and reliable systems. Firms were postponing their time-to-market predictions.

By 2019, an ongoing challenge for AD players were industry-standards, full safety specifications, and the legal approval to operate on open road. AD represented a huge bet which no one could predict when the investment would pay off.

For Bosch, these market dynamics meant that several of its internal corporate ventures in the AD field struggled to sustain their partnerships. Parts were set on hold, others pivoted.

### *Exhibit 2: SAE Levels of Automation*

The SAE (Society of Automotive Engineers) International is a dedicated organization for research in mobility technology that has set a standard in defining automation. Figure 14 classifies the six levels of automation starting from 0 to 5.



**Figure 14: SAE Levels of Automation**

Different levels relate to different forms of engagement and necessity of a human driver (SAE International, 2021).

- **Level 0:** That is the traditional stage, prescribing the human driver as sole entity that performs the driving tasks.
- **Levels 1 to 3:** Here, the driver is able to partially delegate certain driving tasks. For instance, driver assistance systems involve lane keeping assistants

and traffic jam pilots, where the driver is allowed to take the hands off for several seconds.

- **Level 4:** Only from this level onwards, the industry is actually talking about *autonomous driving*. Level 4 describes a highly automated vehicle, able to perform driving tasks by itself in a well-defined environment. This can be on specific routes, in specific urban or gated areas.
- **Level 5:** This outlines the vision of full automation under all environmental conditions.

Not only automotive incumbents, but also many new market entrants guard Levels 4 and 5, in particular, and use them to differentiate themselves from value propositions in lower automation levels that still require human interaction. A broadly discussed example in the industry is the Tesla Autopilot, which most AD firms and engineers are eager to clarify that this system is not on their eye-level, and rather a Level 2 system.

With Level 4, the main challenges are in the technology—the vehicle architecture and safety concept of the system. Eliminating the driver means to be fully safe in performing the driving tasks—specifically also under extreme conditions—such as in the case of failed braking systems, faulty software, or conflicting information from installed sensors. For this reason, redundant technology systems are a must to provide functional safety in higher automation level—in other words a fallback solution, if the vehicle fails to operate.

The introduction of the so-called virtual driver—a central AI unit that replaces steering and control functions formerly performed by humans—opens a host of new potential business models and hence attracted the entry of new and diversifying market entrants.

*Exhibit 3: Publicity and Award Highlights of the Connected Parking Project*

Connected Parking – Publicity & Awards	
2015	<ul style="list-style-type: none"> <li>• <b>Automated Valet Parking:</b> Co-development start with Mercedes-Benz</li> <li>• <b>Community-based Parking:</b> Pilot project with Mercedes-Benz</li> </ul>
2016	<ul style="list-style-type: none"> <li>• <b>Connected Parking:</b> Presentation of all sub-projects at the CES in Las Vegas</li> <li>• <b>Community-based Parking:</b> Winner of Robert Bosch Innovation Award</li> </ul>
2017	<ul style="list-style-type: none"> <li>• <b>Connected Parking:</b> Presentation of all sub-projects at the CES in Las Vegas as well as at the IAA (International Automotive Fair) in Frankfurt</li> <li>• <b>Automated Valet Parking:</b> Joint demonstration with Mercedes-Benz in Mercedes-Benz Museum, Stuttgart</li> <li>• <b>Automated Valet Parking:</b> Winner of Robert Bosch Innovation Award, Frost &amp; Sullivan Technology Innovation Award, and AUTO BILD &amp; COMPUTER BILD Connected Car Award</li> </ul>
2018	<ul style="list-style-type: none"> <li>• <b>Connected Parking:</b> Presentation of all sub-projects at the CES in Las Vegas</li> <li>• <b>Automated Valet Parking:</b> Showcase at Bosch Connected World with Bosch CEO and Mercedes-Benz CEO</li> <li>• <b>Automated Valet Parking:</b> First demonstration with Mercedes-Benz in China</li> </ul>
2019	<ul style="list-style-type: none"> <li>• <b>Automated Valet Parking:</b> Winner of Wuxi World IoT Expo Award</li> <li>• <b>Automated Valet Parking:</b> Worldwide first approved SAE Level 4 system for operation at Mercedes-Benz Museum</li> <li>• <b>Automated Valet Parking:</b> Demonstration with Chinese OEM GAC in China</li> <li>• <b>Automated Valet Parking:</b> Shawn, as the IoT face of Bosch, presents the innovation in TV commercial</li> </ul>

**Figure 15: Connected Parking Publicity and Awards**

## 4.2 Teaching Notes

### 4.2.1 Brief Summary of the Case

In 2019, the automotive industry was undergoing shifting paradigms triggered by breakthrough technologies, and the focus on mobility software and services. New disruptive market entrants such as Tesla, Nvidia and Alphabet redefined the vehicle by either changing the foundational powertrain technology towards electromobility or increasing the vehicle intelligence by connectivity, computing power, and AI.

Confronted with the major industry changes, our focal firm, the automotive supplier Bosch, redefined its vision to become a leading IoT company. Mainly driven by the Bosch-CEO, a corporate innovation program was set up to accelerate his IoT ambitions. A decision committee evaluated novel ideas based on an extensive assessment of about 130 questions and pre-defined innovation performance criteria. Corporate entrepreneurs needed to address stakeholder expectations to receive funds.

From 2013, our focal corporate entrepreneur, Paul Schmidt, raised the idea of Connected Parking—a vision of digitizing the parking market as a holistic parking solution provider. The parking project consists of three sub-projects: The first addressing the digital parking lot management, the second a crowdsourced map of free

parking spaces to support the driver in the search process, and the third the autonomous parking service executed by infrastructure-centric intelligence. Between 2013 and 2019, Schmidt navigated the project from the initial idea development to the full establishment of an official project to the unexpected transfer to a business unit. During this time, he met different resource providers in the central as well as business unit with different expectations on innovation and evaluation patterns.

In 2019, Schmidt faced a major challenge in his project which concerned his project positioning in digitalization and automation. On the one side, corporate strategists found out that the digital parking management was highly fragmented and thus difficult to orchestrate and scale. On the other side, external negative hype dynamics in AD led to changing corporate strategy foci and careful resource allocation. As the hype of AD started to drop from 2016, AD firms postponed the actual commercialization of the technology. Internal stakeholders doubted their heavy investments in the AD technology. Besides, the hype around electromobility gained higher traction and became strategically relevant to our tier-1 supplier. Due to legal and societal pressure, Bosch started to prioritize innovation in electrification.

Schmidt who had benefitted from the rising AD hype when mobilizing resources, needed to reframe his project positioning and build a compelling as well as sustainable story with a clear target on short term revenues. A revised framing should support him in overcoming stakeholder disillusionment and securing his project survival.

#### **4.2.2 Case Structure**

The case hooks into the challenge of the corporate entrepreneur Schmidt who faces stakeholder disappointment and changing corporate strategic foci in the different business fields namely AD and electrification. To introduce the setting, the case draws the environment of the innovation project by outlining current trends in the automotive industry in particular the impact of AD and electrification and by presenting the company's renewed vision of becoming an IoT company. The main part of the case involves a short introduction of the corporate entrepreneur and the avenue of the innovation project, decomposed in three phases—starting from late 2013 to 2019. The case ends with proposed project repositioning options and with the question how Schmidt can convince the stakeholders and continuously mobilize resources.

#### **4.2.3 Immediate Issue**

Schmidt was confronted with disillusioning results of the business field analysis of the digital parking market. Resource providers became skeptical about the scalability of the project idea. In addition, Schmidt's project needed to better perform in financial

performance criteria for corporate innovation as the business unit where the project was allocated suffered from negative cash flow. Schmidt now needs to build a coherent story and rethink the positioning of his innovation project. He has different options, namely continuing in digitalization, in automation or starting with electrification. Each presents opportunities and risks and requires additional backing to avoid losing credibility as corporate entrepreneur.

#### **4.2.4 Basic Issue**

Corporate entrepreneurs face the challenge to mobilize resources if hype dynamics affect the stakeholder attention and the hype disillusionment put the innovation projects in this field under risk. The basic issue students will get familiar with is how do corporate entrepreneurs convince stakeholders for innovation which requires a commercialization period over a long time-horizon as these projects struggle to meet more short-term oriented corporate innovation KPIs.

#### **4.2.5 Suitability for Use (Audience)**

This teaching case suits very well to an executive MBA class as these students can benefit from their first work experience in corporate or venture setting. Students with prior experience may demonstrate an enhanced ability to relate to Schmidt's situation, particularly regarding the short-term nature of corporates and importance of expectation management. It is essential to recognize that corporate investment patterns can be influenced by technology hypes. It is thus the question how closely the project shall be positioned and framed into the hype. Building a coherent story for the innovation project is crucial to avoid losing credibility among resource providers and further attract resources.

#### **4.2.6 Data Collection**

The case is based on a combination of primary interviews, corporate archival data, and industry contextual data. Our data covered the run time of the Connected Parking project between 2013 and 2023. To ascertain the project's positioning and frames, we conducted 14 interviews with the project leader as well as with the evaluating parties such as corporate strategists and both the president and portfolio managers of the business unit. We mirrored the primary insights against internal resources such as project presentations, written proposals, annual reports, corporate blogposts, and internal newsletters. In terms of the industry context, we collected additional data from industry whitepapers and market reports and studied corporate communications about autonomous driving and electrification. Additionally, between 2019 and 2023, the primary case author has been able to engage in partial real-time observations of the

Connected Parking project, which allows us to offer insights in this teaching note into the outcomes after the case decision situation.

#### 4.2.7 Teaching Objectives

I summarized the three main teaching objectives.

- (1) **Driving corporate innovation with long-time horizon.** First of all, students should learn about the corporate structures when driving innovation. This also involves the understanding of the possibly changing strategic foci of corporates which can result from technology hypes and intra-corporate visions.
- (2) **Navigating stakeholder expectations along hypes.** Most importantly, students should learn how to navigate an innovation project when confronted with the challenge of being unable to fulfill corporate innovation performance criteria. Students should learn how they could leverage hypes to gain managerial support. In addition to that, students should also learn the typical avenue of a hype and how to overcome the possible hype disillusionment which might impact the project's survival.
- (3) **Maintaining credibility while changing project frames.** During the repositioning of the innovation project, students should learn how to build trust among resource providers. Students should learn about the impact of material proof to provide stakeholders short-term artifacts, a reason to believe in their innovation projects, and to generate value to the stakeholders such as supporting their vision of an IoT company.

#### 4.2.8 First Testing of the Case

The teaching case has been tested the first time at the Imperial College London within a class of MBA students. It was very well received due to the case setup in a corporate setting and hyped technology. The first testing provided us valuable insights to improve the teaching approach. To introduce the setting, it may be essential to provide additional background information about the AD hype. This can involve the positive and negative press in this field to offer students insights of the overall hype development. We also noticed that especially Executive MBA students can easily put themselves in the situation of the corporate entrepreneur as they have more likely acquired work experiences in corporate settings and may be more familiar with the process-oriented and short-term mindset in large organizations. We thus recommend the teaching of our case in Executive MBA classes.

### 4.2.9 Suggested Video Material

In the following I provide a list of optional video materials that can be integrated into the class discussion to support the teaching approach:

- **Introduction of Connected Parking, mentioning Active Parking Lot Management** (1:46 min). Available on YouTube:  
<https://www.youtube.com/watch?v=BxXRelffKWQ>
- **Introduction of Community-based Parking** (1:36 min). Available on YouTube:  
<https://www.youtube.com/watch?v=jKsw2RQszH0>
- **Introduction of Automated Valet Parking** (1:34 min). Available on YouTube:  
<https://www.youtube.com/watch?v=zxktEGs0NUA&t=1s>
- **Introduction of Automated Valet Parking and Charging Automation in China** (1:50 min). Available on YouTube:  
[https://www.youtube.com/watch?v=CzK44K8\\_4Mk](https://www.youtube.com/watch?v=CzK44K8_4Mk)
- **Premiere of Automated Valet Parking at IAA Mobility 2021** (1:43 min). Available on YouTube:  
<https://www.youtube.com/watch?v=O4dVpp9LR78&t=7s>
- **Adapted Value Proposition of Automated Valet Parking** (1:54 min). Available on YouTube: <https://www.youtube.com/watch?v=ThEDJtRphls>

### 4.2.10 Suggested Readings

The following literature can support in a better understanding of the challenges of corporate entrepreneurs regarding stakeholder expectations and corporate KPIs:

- Garud, R., Schildt, H. A., & Lant, T. K. (2014). Entrepreneurial storytelling, future expectations, and the paradox of legitimacy. *Organization Science*, 25(5), 1479–1492.
- Vinokurova, N., & Kapoor, R. (2020). Converting inventions into innovations in large firms: How inventors at Xerox navigated the innovation process to commercialize their ideas. *Strategic Management Journal*, 41(13), 2372–2399.

The following literature provides additional background to the context of hypes and the automotive industry:

- Gartner Research (2018, Aug 20). *Understanding Gartner's Hype Cycles*.  
<https://www.gartner.com/en/documents/3887767>
- Winkelhake, U. (2021). Vision digitised automotive industry 2030. *Springer eBooks*, 85–145.



# The Tough Bet on the First-to-Scale Autonomous Trucking Ecosystem

## 5.1 Introduction

Since 2015, logistics and trucking emerged as a compelling sector in which autonomous technology would find its first commercially viable use case. This has spawned substantial investments and a flurry of tech startup activity. However, current dynamics around strategic funding opportunities, technological developments, and the overall economic climate challenge the commercial breakthrough. While the business case looks still very promising, it is less clear who will be playing which role in the newly emerging autonomous trucking ecosystem and who will be able to get a piece of the pie. In this whitepaper, we take stock of the current maturity level of the AD industry and offer a systematic review of current ecosystem roles and configurations. We then present four different commercialization strategies that new industry entrants and their partners have bet on and highlight their opportunities and challenges towards commercialization at scale.

*It was in 2016 when the investors woke up and said, wait a minute, if we are working on passenger cars or robotaxis, that is going to take forever. And there are all these trucks running around; where there is a very clear business case and return on investment. It is business to business, not business to consumer; and a long list of reasons why you are going to succeed sooner. You have a more definitive use case in the trucking space.*

— Richard Bishop, Principal & AD Startup Advisor, Bishop Consulting, 2022

Over the past decade, different industry players have predicted that AD would be a reality by 2020. By Spring 2023, this picture seems far away, though. Narratives have become more cautious and the vision of the early 2000s for a world with personal autonomous vehicles and robotaxis has taken a backseat in favor of more industrial applications with narrower defined use cases.

This shift can be seen also in the landscape of the new entrants into the mobility sector. Since 2015, pioneers like Waymo have begun to expand their portfolio toward logistics automation and trucking, prioritizing now more the trucking sector than the original robotaxi business. The outlook on potential efficiency gains and solving an increasing driver shortage problem made logistics an attractive space that unlocked

staggering amounts of investment and brought a flurry of new entrants. The years 2020 and 2021 alone saw close to \$10 billion poured into different autonomous trucking companies (PitchBook, 2021). At this moment logistics looks to be the front-runner among the different commercial options, and thus autonomous trucking might be driving and directing the next step in AD commercialization (Gernant et al., 2023).

However, as of Spring 2023, on the back of a globally shared recession narrative, more cautious valuations of high-tech startups, and less gregarious private capital markets, we see an overall sobering influence on the expectations on AD. This appears to be an excellent vantage point to take stock of the more recent developments in the AD technology sector and offer a fresh perspective on the commercial strategies of key ecosystem actors and their likely opportunities over the next few years.

We will do so by using established industry evolution and innovation frameworks, which help explain important patterns and will allow us to reflect systematically on the opportunities and challenges of different commercialization strategies in the maturing ecosystem.

Our inquiry focused on autonomous trucking in the US and European markets. We owe much to our interview partners: viewpoints from different AD technology developers, logistics providers, industry veterans, a tier-1 supplier, and an OEM offered us first-hand insights, which we triangulated with information from conferences, press articles, investor presentations, industry reports, and podcasts.

## **5.2 Excursus: Current Industry Challenges**

The AD sector has safely settled into a less exuberant phase, with a more realistic assessment of its technical and regulatory challenges, possibly ready to move from disillusionment toward scaling on the famous Gartner Hype Cycle (Visnic, 2020). The current “trough of disillusionment” has been going on for a while now, yet, up to 2021, hot run capital markets had buffered that shock and kept enabling generously funded Silicon Valley upstarts to tango with well-capitalized incumbents.

However, in October 2022, everyone was forced to notice that the music had slowed down: Volkswagen and Ford announced to divest from Argo.ai. Despite this being a decision about the robotaxi field, the event had ripple effects into the AD trucking space. Founders of AD technology startups felt pressured to compose statements to calm down investors and reconfirm their timelines. For example, Aurora’s CEO made clear that the company is still on track to full commercial launch in 2024 (Aurora, 2022).

The road to scalable productivity has become fraught with fresh uncertainty, and after more than a decade of largely positive press and ambitious promises of AD at scale,

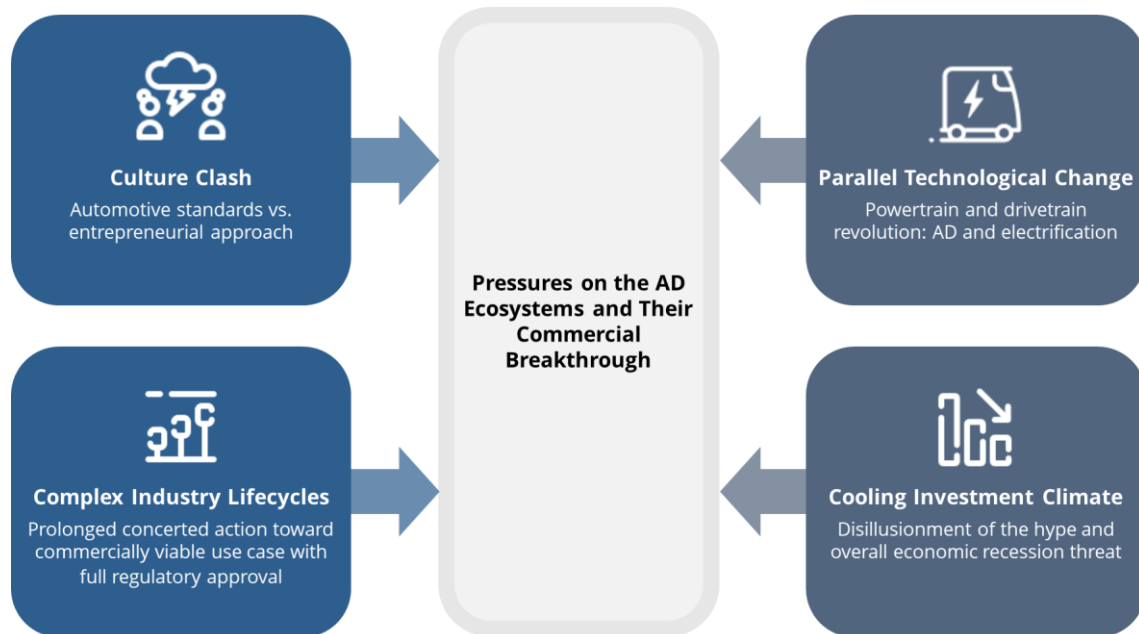
the sector is facing a moment of truth, evidenced most recently by the closure of Embark Trucks, a startup that had just gone public in 2021 (Embark, 2023).

Technology startups and investors alike recognized that the launch of reliable trucking platforms to full industry and regulatory safety standards would require higher investments and a longer time-to-market than anticipated. In addition, as AD trucking is a play for collective industry action and partnerships, the entrepreneurial logics, carefully cultivated in Silicon Valley, meet now corporate cultures and logics of incumbents in a highly regulated industry. This leads to challenges that slow down the journey towards the legal approval of full AD without a safety driver. Exemplary is the story of pioneer TuSimple and the class action lawsuit that cancelled its partnership with the OEM partner Navistar.

Despite some upheaval, the risk of a ‘winter’—a prolonged slowdown of interest in a technology space—is rather unlikely. The driver shortage in the logistics sector creates a strong market pull, which offers cautious hope for a targeted consolidation of the AD space that will enable focused efforts toward a first commercially viable use case in trucking.

However, one has to be realistic about the achievable scale over the next decade. The logistics sector can be difficult. A highly fragmented and low-margin industry faces the double burden of two parallel investment-heavy transformations: electrification and automation. Freight carriers battle with regulatory requirements to reduce CO<sub>2</sub> emissions and the looming penalties seem a more immediate pressure than the driver shortage. Pre-financing both innovations in parallel is nearly impossible. Consequently, the attention is currently more on electrification than on AD.

Collectively, reaching commercial scale in AD trucking has four immediate challenges (*refer to Figure 16*). While the two parallel transformations and the cooling investment climate mainly contribute to a current financing bottleneck, the technical and culture challenges contribute to a regulatory bottleneck.



**Figure 16: Current Pressures on the AD Ecosystem**

### 5.3 Taking Stock: Evolution & Maturity of the AD Industry

The introduction of AD technology is a radical change in technical competencies and value propositions. This comes with a significant upheaval of the established industry structures and the value networks or ecosystems that define different use cases in an industry. New players are entering the space, new technology concepts get introduced, new partnerships get tested out, new regulations have to emerge.

Uncertainties that are present when industries emerge do not get resolved overnight. The patterns are well-known: It takes easily 30 years from a technological breakthrough to a first commercialization event and another five to ten years until a multitude of firms populate this new industry (Agarwal & Bayur, 2002; Moeen et al., 2020). During that time, different parties come and go as they explore potential products, services, and business models. Such experimentation by parties willing to bear the risk is crucial for market and technology learning.

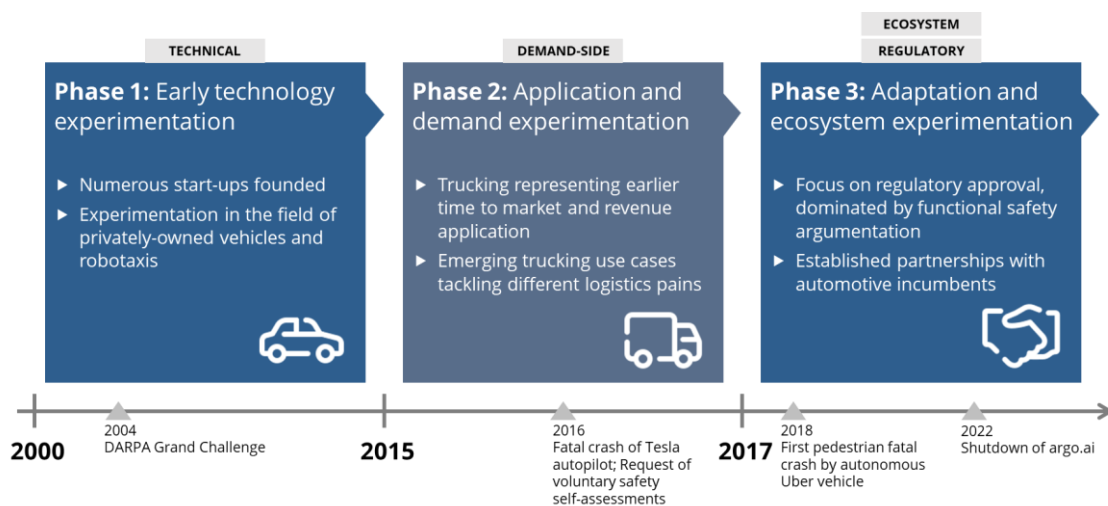
*Since we started testing in 2017, our Class 8 autonomous trucks have driven in a wide variety of cities and environment, from Arizona to Texas and through California and Georgia. Our trucks [...] leverage the over 20 million miles we've driven autonomously public roads, plus the over 15 billion miles we've driven in simulation.*

— Waymo, 2021

Typically, four different types of uncertainties need to be resolved: technical, demand, regulatory, and the structural configuration of the ecosystem with its different value partners (Moeen et al., 2020). Any one of those could pose a temporary bottleneck,

an agglomeration of low attention or difficulties to resolve problems, which can delay a move toward scalable production. Resolved uncertainties mark important industry milestones, which help unlock funds for the next phase and fix structures as a steppingstone.

As Figure 17 illustrates, with more than 20 years into its development, the AD industry has successfully passed important milestones around technical feasibility and promising applications. That does not mean that every question is resolved but that there is broad agreement amongst key players about foundational assumptions. By now, the industry has moved into a crucial phase that has all chances to culminate in a commercial breakthrough before the end of this decade, well in line with the typical timelines of industry emergence. The attention is now on use case-specific functional safety concepts, commercial technical designs, and regulatory approval to eliminate the safety driver.



**Figure 17: Evolution and Maturity of the AD Industry**

**Phase 1 – Early technology experimentation.** Triggered in 2004 by the DARPA Grand Challenge, leading research universities and pioneering regional authorities began to explore the technical frontiers of AD. The initial technology experimentation focused on a presumed demand for privately-owned vehicles and robotaxis, culminating in a high point of excitement in 2015, which could be seen the peak of inflated expectations along the hype cycle (Rivera, 2015). Hypes and their excitement phases are crucial to mobilize investment and speed up development by attracting entrepreneurial talent.

**Phase 2 – Application and demand experimentation.** Between 2015 and 2018, the disillusion with expectations sparked a reorientation. Early investors and automotive incumbents sought faster times to market and revenue streams. The new pilot collaborations around industrial use cases favored two types of players, those that had

deployable technology and those that had existing customer connections. Logistics emerged as a front runner use case: The looming driver shortage vis-à-vis an increasing demand for services posed a compelling value proposition for autonomous trucking. This opened fresh pockets in private capital markets, fueling a set of new tech startups that worked on trucking-related solutions, for example yard logistics in ports, mining, or middle-mile automation. This marked a crucial learning milestone and shifted the focus on to new bottlenecks that would need solving during the next and currently ongoing phase toward the first viable commercial offering.

**Phase 3 – Adaptation to industry norms and ecosystem experimentation.** With technical progress enabling AD with a safety driver, with large data collection under way to solve complex driving challenges, and with the main economic rationale found, the new challenges and milestones are regulatory approval and the structure of the ecosystem, i.e., who brings what to the table and gets what in return. At the moment, regulatory approval, driven by full functional safety, is still fraught with technical challenges. Collectively, all actors involved are tasked to create and adhere to traditional automotive process norms and performance levels.

Two events, in particular, put safety onto the map: The fatal Tesla crash in 2016 and the first killing of a pedestrian in 2018 during a test drive of an Uber car—the so-called “Uber moment”—shook up the industry and sparked debate about acceptable levels of casualties (McGee, 2019). Authorities such as the U.S. Department of Transportation approached AD firms to submit voluntary safety self-assessments. As early as 2017, startups like Waymo had begun to publish their safety frameworks to gain trust in the public space. Startups began to hire Chief Safety Officers to emphasize their focus on safety.

Apart from regulatory and safety concerns, ecosystem experimentation has gained momentum. That means, there is an ongoing competitive learning process about the structure of the value network that will deliver autonomous trucking offerings. This open discovery process will help crystallize central units of value customers will pay for and it will help settle positions and roles in this newly forming industry.

## 5.4 The Emergence of AD Trucking Ecosystems

With the current consolidation in the fledgling AD industry and with the narratives about focal value propositions crystallizing around a small set of options, new ecosystem roles and configurations emerge that did not exist in traditional automotives, pushing established players to look for their new foothold.

### 5.4.1 Current and New Ecosystem Roles

**AD technology developers.** There is a vibrant landscape of AD technology developers that drive the technological frontier in AD and successfully tackle the various challenges on the technology roadmap.

Supported by billions of dollars from eager private capital markets, their early experimentation in AI-supported decision-making and pilot projects in various AD use cases had put automotive incumbents under pressure: Multiple different consortia emerged around strategic partnerships between pioneering OEMs, logistics firms, and tech startups. Their surprisingly deep pockets, the access to top-notch talent and the ability to work with a speed available only to those unencumbered with industry history and organizational legacies, helped build significant legitimacy over time.

For some of the startups, the fast gained legitimacy and their externally financed growth led to options of occupying highly prominent ecosystem roles that few industry insiders would have predicted. Their ability to offer a new type of product—the driver-as-a-service component—makes them a potentially powerful industry partner. Torc, for example, serves OEMs as the primary supplier of this highly sought-after component, while others such as Waymo or Einride have moved even more upstream by extending their role to becoming the fleet operator. They achieve this by purchasing the L4-ready chassis, integrating their virtual driver, and offering a transport service to freight carriers. Both of these scenarios put pressure on the traditional tier-1 suppliers who risk being relegated to a second-level supplier for commodity sensors as the ecosystem structure for AD trucking matures.

**Tier-1 suppliers.** In the past, traditional tier-1 suppliers have been the closest technology partner to OEMs. As structures shift, they are now facing substantial pressure on their strategic maneuvering.

One challenge they meet is a multi-sided competition: On the one hand, pressure comes from the new AD startups. Since orchestrating multi-partner alliances in technology development is challenging, many OEMs began driving their AD thrusts together with the tech startups only instead of also including a tier-1. Daimler Truck's collaborations with Waymo and Torc—both for different ecosystem configurations and value propositions—are an example. On the other hand, pressure comes from vertically integrating system on chip suppliers like NVIDIA, which use their capabilities in highly performant computing system for partnering with the OEMs. Additionally, new tier-1s like Foxconn, are beginning to branch out from their consumer electronics origin, toward entry in automotive hardware and software business, thus further crowding the space. As a result, traditional tier-1s are getting sandwiched and challenged to develop their positions in AD.

Access to the end-customer and first-hand market learning becomes another challenge. For the longest time, the immediate customer had been the OEM that translated market demands into technical specifications. During dramatic industry transformations, this may be a potential liability. It is less easy for a tier-1 to go out like a startup and build partnerships with logistics firms.

Yet, not all is lost. One potentially successful strategy is to partner with or invest in technology firms. Tier-1 suppliers like ZF, for example, work with TuSimple and Embotech to establish a foothold in the market. Furthermore, industry players are well aware of the crucial capabilities of tier-1 suppliers when it comes to redundancy concepts relating to braking, steering, or computing. Clearly, tier-1s can play complementary roles, but they may need to be realistic about the remaining share of the profit pool.

*We expect that existing industry structures around the tier-1s will continue as really important partners. We work with a number of different tier-1s to develop and bring our open autonomy technology platform to market. All the tier-1s bring tremendous capabilities of broad system integration and homologation of different components and systems that I think will continue to be really important.*

—Shawn Kerrigan, Co-founder & COO, Plus, 2022

**Truck OEMs.** Truck OEMs occupy a prime position in the emerging AD trucking ecosystem. Their interface toward the end customer may be changing as new entrants like Waymo start orchestrating a “driver-as-a-service” ecosystem. Yet, the intelligently enabled chassis is a key asset and a strategically relevant OEM competence. As the industry progresses to its first commercialization breakthrough, the biggest risk for any player is better performing competition in terms of speed, safety, costs, and operations that outcompetes latecomers for market share.

However, to maintain technology leadership, truck OEMs have begun to invest in their own software developments or to strategically partner with AD tech developers. Such competency is highly fungible and could be deployed for adjacent business, such as AD fleet operations. This could create a lucrative new revenue stream for software and services but could also help address the issue that autonomous trucks will require about two to three times the investment in conventional trucks—a high fixed capital investment that could be an important adoption impediment in a low-margin industry.

Long-term focused OEMs might already want to prepare themselves for 10 to 15 years down the road. Completely new concepts for OEM products are emerging on the horizon. For example, Solo AVT and Einride are completely rethinking the truck design for a future without human drivers.



**Fleet owners.** While giant shippers like Walmart or Pepsi own and operate their private truck fleets, many other companies contract various types of for-hire carriers that either own or lease fleets to take care of the full transportation process. Yet, with cost forecasted to double or triple for AD trucks, the question arises who will be able to own the AD truck fleet. Carrying such heavy assets on the balance sheet in times of uncertain business take-off is a capability not clearly located with the current fleet owners. This could become a crucial bottleneck in the diffusion of AD trucking.

Logistics carriers might be needing to rethink their currently dominant leasing models and instead shift to in-house ownership of trucks: As the AD truck with the virtual driver becomes a key bundled asset amidst a steadily growing driver shortage, the competitive advantage in the logistics sector might be moving to owning this capacity. The current Waymo approach foreshadows that the carrier might indeed be the one in charge to purchase and own the level 4 ready truck.

**Logistics service providers.** Logistics service providers are directly impacted by the rising driver shortage, making them a key stakeholder for AD adoption. However, they are also the ones that are most closely pressured from the shift toward electrification. Operating with low-margin business models provides limited strategic investment resources. That means, many logistics providers choose to focus first on electrifying their fleet to meet legal requirements and avoid financial penalties. This leads to a wait-and-see mentality about AD, especially noticeable in the European trucking industry, coupled with a healthy skepticism around timelines and performance promises in AD.

*We see a significant shortage of truck drivers because people said, okay, this is a job without any hope. Autonomous driving is pretty complex as we all know, and that it takes longer than we probably predict. Because I say, we need 100% resilience, so we can't accept a truck which stops on the side of the freeway in the moment when there is a snowstorm. And if you have no people with the driver license what happens? Nothing happens [...]. We can't accept that on this moment, one truck stands still [...] We don't accept that for our pilots either, we redirect them [...] we find solution to keep the supply chain up and running.*

— Frank Appel, CEO, Deutsche Post DHL Group, 2022

At the same time, logistics service providers have to grapple with the risk that other rising ecosystem players might be vying for the position of a new fleet operator, be that OEMs or AD tech startups. For example, pioneers like Einride, the first autonomous electric fleet operator in Europe, and Amazon, the largest competitor for logistics firms, have begun to secure rare virtual driving capacity.

To not fall behind, a viable strategy of logistics pioneers can be to work with AD tech developers and use cases and operational data. Low-cost technology trials with tech startups can help develop trust but more importantly, the early exposure and in-field experimentation allows for valuable learning how to adapt process landscapes and supply chain networks to the integration of AD technology.

**Logistic customers.** Retailers as traditional logistics customers can accelerate the scaling progress of AD technologies. For example, Walmart represents an ideal case to illustrate such acceleration power. By being the largest retailer in the US, Walmart regulates consumer demands and economic growth of entire regions. This puts them into a powerful position when discussing with governmental authorities the release of new technologies that help solve supply chain bottlenecks. Large retailers as those most impacted by the driver pain and economic losses could hence play a crucial role in addressing the legal bottleneck through exercising influence on regulators to accelerate the technology implementation.

**Institutions.** Early on, non-governmental institutions initiated by automotive players such as PAVE (Partners of Automated Vehicle Education) took on crucial roles in the developing industry to help aggregate knowledge and build awareness among technology users. This role may slowly become less prominent as the collective knowledge creation makes way for more competitive approaches. New purposes might be found in taking more influence on regulation and governmental bodies.

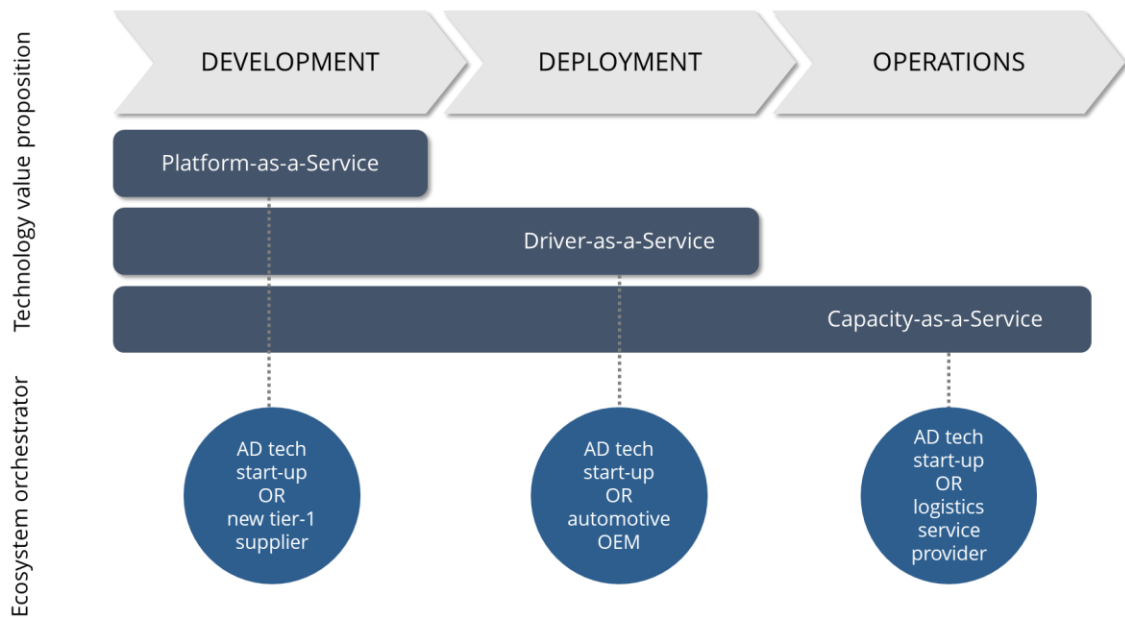
The role of institutions and governmental bodies cannot be underestimated. In that, the AD industry proves to be a somewhat special case compared to many other industries. Typically, the regulatory bar for a first commercial use case is less high. Yet, establishing safety programs for scaled-up AD operations and creating enough interest to learn from the field tests of AD tech developers seems to challenge many institutional bodies. Analog to pioneering regions like Singapore that promoted AD technology development in the 2000s, new rising stars could be born if emboldened public leaders take action.

#### 5.4.2 New Technology Value Propositions and Ecosystem Configurations

The current phase in the emergence of the AD industry and the AD trucking ecosystem is squarely focused on the competition between a small set of options how this ecosystem could be structured. The options differ mainly in their central value proposition to the customer and in who is the ultimate face to the customer, i.e., the orchestrator of the ecosystem.

**Focal value propositions and ecosystem orchestrators.** At the moment, there are three dominant technology plays around potential focal value propositions and

subsequent orchestrator roles in the AD trucking space (see Figure 18). Along all three, new entrants compete with incumbent players.



**Figure 18: Dominant Value Proposition and Ecosystem Orchestrators**

All options illustrate the fundamental business model innovation towards recurring revenues, rather than one-off products. The propositions also differ from the past in their configuration within the underlying ecosystem, where the value streams and related bargaining powers are located differently.

- *Platform-as-a-service* depicts the technology layer connecting different vehicle functions to a single system like the ones of NVIDIA and ZF. Here, prominent roles for traditional but also new tier-1s emerge as they leverage their high-performant vehicle computing position. These players benefit from building scalable solution across automation levels as well as for different customer bundling preferences of software features. For traditional suppliers such as ZF this would mean to get a foothold in the software business, but still staying true to their core competence in hardware business. Preparing such kind of modular underlying platform helps these actors to be agnostic to the debate on the automation levels whether to continue with Level 4 or improve the current Level 2+ as this could already serve the current automated technologies.
- *Driver-as-a-service* represents a radical departure from the past as it aims to replace human drivers. With propositions such as 24/7 availability and the full coverage of the sense-think-act technical competencies, this new technology directly addresses the driver shortage problem. Many AD tech developers having done groundbreaking work to anchor this new type of

technology component into the collective understanding. Such category-building efforts are costly and risky, as evidenced by recent shakeouts like the closure of Embark Trucks. Among the currently surviving startups, Aurora is making headlines, with Waymo, Plus, and others on their heels to deliver virtual driver components and finding their place between the traditional OEMs and the logistics providers. On the flipside, incumbents like Daimler Trucks, with their historically grown market power in logistics, also contribute to the competition. By leveraging their stake in technology developer Torc into an own tightly integrated virtual driver, they are a force to be reckoned with in this competitive space.

- *Capacity-as-a-service* relies on the virtual driver technology but integrates also fleet management services and the final transport operation. Startups like Embotech or Einride had expanded their offerings around their virtual driver to include fleet management or energy capacity management systems. As an add-on to a virtual driver package offered to shipping companies, this could be an interesting option for additional revenue and solve a temporal bottleneck in the integration of the highly fragmented logistic management systems. It may also accelerate the adoption rate of logistics customers who receive a fully integrated and user-friendly logistics service. Yet, this is also not the home play of an AD tech developer, not to mention potential goal conflicts between the deployment of the enabled trucks versus optimized truck load capacity. And an orchestration role that competes with traditional freight carriers would be a very different conversation. Large freight carriers such as Amazon and Maersk have a clear interest in their own ecosystems to secure transport capacity, with power to scale that tech developers do not have.

*OEMs have a real challenge because we are talking about transport 'pay-per-to'—like transport-as-a-service. And they say what do you mean? How many trucks? How many trucks am I selling through this service? That's a conflict because ideally, the least as possible, right? Because I want to optimize the service. So, in a company like ours that optimizes the fleet, that is a very opposite business goal as an OEM.*

—Giorgio Corbellini, Head of Commercial Vehicle Automation, Embotech, 2023

**Ecosystem experimentation.** Given the variety of use cases in AD trucking (Bishop, 2022), there might well be room for different ecosystem configurations and value propositions. For large retailers like Walmart, the virtual driver-enabled truck might be the core product while for smaller retailers a capacity-as-a-service offering may be desired. Variation in concepts is a feature of a market-based discovery of viable options.

The question is: Who will be the most legit orchestrator for their type of ecosystem? Incumbents may have advantages based on know-how and trusted customer relations in the capacity play while the technical complexity and the novelty of replacing the concept of a human driver may favor the AD tech developers in a “driver-as-a-service” proposition. Ultimately, the customer relation may define who will orchestrate an ecosystem, and that may indeed a fast-moving highly capitalized startup.

*Basically, the entity who sells the product must be a strong influence on forming the ecosystem. From my point of view, that’s our primary role as the developer and provider of the autonomous truck – to collaborate with the fleets who transport freight to build a low-cost, highly reliable system. The resulting ecosystem will provide better services to consumers, such as faster delivery times or less expensive delivery options.*

– Peter Vaughan Schmidt, CEO, Torc, 2022

Times of radical transformation are times for entrepreneurial thinking, possibly outside of incumbent notions of what worked in the past—if only to secure a seat at the table and keep building valuable in-the-market know-how. Industry emergence is a decades-long process with opportunities for agile and flexible players. In fact, as different ecosystem configurations crystallize around different use cases in the industry, the same actors may occupy different positions across cases. Especially for low-power actors, i.e., typically lower-capitalized companies, it may play out well to remain open and accept different positions vis-à-vis their partners. It is a long and collaborative game, which also means that relationships will want to be cultivated.

*We have had many discussions about the topic of who is the ‘face to the customer’ or who is the ‘general contractor’? We now have two models—either us or the tier-1 [...] we say, okay, we test both for a little while and we see where it can go. [...] they understand that. In fact, it’s very, very cool to see that a big corporation is also taking a bit of a risk. That’s the interesting thing.*

– Giorgio Corbellini, Head of Commercial Vehicle Automation, Embotech, 2023

## 5.5 Industry Entry: Business Theories & Commercial Strategy

Since 2015, numerous startups have entered the autonomous trucking field, either as a completely new player or as a diversifying firm, coming from the robotaxi or passenger car field. Major contestants have been, for example, TuSimple in 2015, Plus and Einride in 2016, Waymo, Aurora, and Gatik in 2017, Kodiak Robotics and Locomotion in 2018, Embotech, Solo AVT and Waabi in 2021. As much as they have been instrumental in driving AD technology toward its current maturity, they are now also increasingly under scrutiny as the industry must resolve uncertainty about who

can be a reliable and sustainable ecosystem partner amidst seeking full regulatory approval at traditional industry standards.

The importance of the startup entrants into the field cannot be overstated. They have played a dual role in pushing the first commercial application in AD trucking. On the one hand, the investments and talent they were able to amass helped to solve several technological bottlenecks at once when incumbents may not have been enabled to do so at the speed a startup can operate with. It was the entrepreneurial spirit and power that helped solve the critical financing bottleneck that often plagues new technology domains. On the other hand, due to being unencumbered with prior industry ties and alliancing needs, many startup entrants have also been able to form crucial customer interactions in the logistics sector that enabled the important phase of application and demand experimentation (*see Chapter 5.3*). In so doing, they have been the ones that experimented most with different alliances and ecosystem configurations, which overall helped the industry to diffuse knowledge.

However, as the industry is moving forward, it is less clear what role they will play and where many of the technology developers will ultimately land amidst struggles to achieve full regulatory approval, public acceptance, and building an economically viable ecosystem. As a result, for many startups a watershed period may arrive. They seem to be the ones most at risk for change among as the industry moves forward toward take-off and scale.

### 5.5.1 Value Creation Strategies

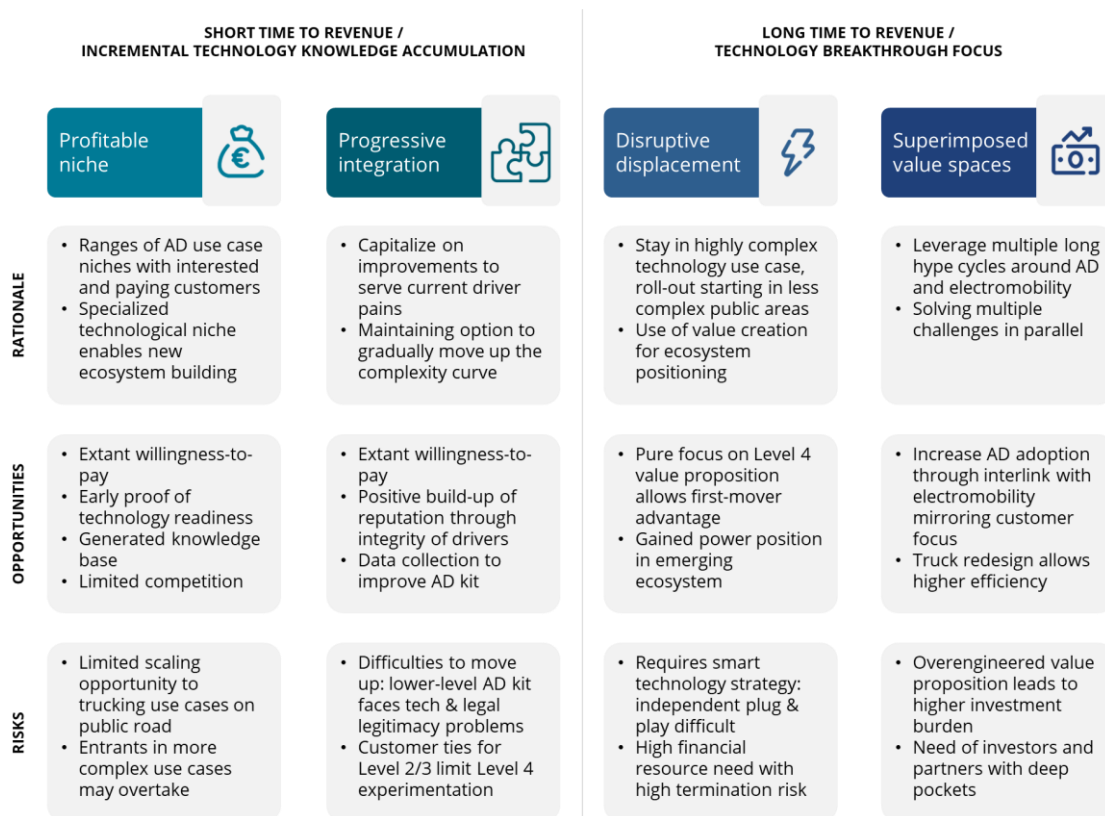
While by now most AD firms target the automation on public road, we observe different starting points in automizing the trucking industry. Some players have driven more focused strategies from the beginning while others have engaged more diversified use cases experimentation. This even involves the experimentation in lower automation levels when the driver is still on board distinct from the mainstream commercialization path towards the fully autonomous (SAE level 4) system.

These strategies seem to come down to different theories (or hypotheses) different startup entrants and their investors seem to have held about how value is created and captured. At the foundational level, an entrepreneurial strategy comes with hypotheses about a specific customer demand/value proposition, about an underlying commercial logic how money is flowing between different parties, and about the technology/resource position that enables the delivery of the value proposition (Gans et al., 2019).

Much of the entrepreneurial challenge is that in the beginning the focus has to be on proving the value creation hypothesis, i.e., proving that the technology can enable a

value proposition and that users or customers perceive such value. Only in later stages, the underlying full business model, and the ability to capture parts of the value created moves into focus. That’s where the current challenge for many of the startups is now. The story of Embark Trucks, for example, illustrates that not all startups can make a successful move from value creation to full independent creation and capture mode since they lack the OEM partnership which led now to the stop of their operations.

However, in order to understand the particular options and positions that the startups are occupying today, it merits to review where they are coming from. The early value creation strategies will determine levers how to capture value later on. Figure 19 illustrates four early entrepreneurial strategies we identified in terms of how ecosystem actors have been originally going about deploying technology in service of which foundational value creation theory: (1) profitable niche, (2) progressive integration, (3) disruptive displacement, (4) superimposed value spaces.



**Figure 19: Value Creation Models with Experimentation Activities**

**Profitable Niche.** Apart from the main path, AD firms that pursue the niche strategy target a less complex environment to learn fast and commercialize. Embotech, for example, follows this strategy by implementing AD technology in logistics yard, ports, or mining.

Ecosystem actors benefit from the exemption of traffic regulations within that area. The big upside is the extant high willingness-to-pay of the operators in these logistics

fields because of high idle times of drivers, leading to process inefficiencies, high personnel costs, and competitive disadvantages. In addition, the drivers need to possess precise driving skills for e.g., maneuvering swapping bodies on yards. Overall, those AD firms following this strategy can prove the technology-readiness early on a real use case, gain trust of the logistic firms, and potentially generate a knowledge base for more complex use cases.

The downside of this ecosystem strategy comprises the limited scaling possibility. Scaling from a gated area to public roads would require new testing, new configurations to include additional dynamic vulnerable road users, and new safety approval. The major risk represents the capability of other AD firms addressing public road use cases which could potentially take over the less complex environment.

**Progressive Integration.** Similar to (1) this strategy targets the value creation by addressing customer pain points that already exist. Whereas new market entrants like Plus build AD solutions retrofitted for logistics customers to support the driver, traditional tier-1 suppliers also develop lower-level automation (between SAE level 2 and 3) but address the classical OEM customer. Even though both approaches differ significantly on the technology and customer side, they have some parts in common.

The immediate customer-focused strategy bears little risk on the resource provider side—both external or corporate investors—since these firms generate revenues from current customer solutions and meet the resource provider’s financial expectations. Beyond that, a huge advantage of the retrofit solution is the firm’s ability to improve its own AD solution by e.g., collecting data to identify corner cases for AD. Most importantly, the time-in-the market enables the firm to build confidence and legitimacy among logistics customers.

*With our progressive approach, we have started releasing products much earlier. We started shipping products last year, thus putting this technology in customer hands as an advanced product. It is the same virtual driver in terms of the same advanced software that we work on for our Level 4. But it is a ‘driver-in’ system that improves fuel economy, safety, and driver comfort. We will continue to improve and expand the system’s capabilities over time to the point where it can be released as a fully driverless solution.*

—Shawn Kerrigan, Co-founder & COO, Plus, 2022

The possible risk of this entry strategy is that the actual AD commercialization may require a longer time to market for the Level 4 system since legal requirements and the overall technical vehicle setup differ significantly between a driver assistance and fully driverless system. Moreover, tied-up resources for launching Level 2 or 3 automation



may limit the resource capacity of the firm to achieve the ultimate goal of Level 4 and thus distract from the initial commercialization strategy.

**Disruptive Displacement.** This had been the main path of new market entrants during the early AD industry emergence (*see phase 1 of maturity of AD industry*). Firms that tackle the public road automation aim to create long-term value by solving the increasing driver shortage.

By having a unique value proposition that differ much from the traditional automotive industry, firms could establish new forms of ecosystem and power structures. The upside of this entry is the actual focus on the technology realization, not being distracted by adjacent business opportunities. But the upside also presents the downside.

By sticking to the long-term value creation, firms need to have a longer breadth than their competitors. During the hype emergence, startups received, one could say almost with certainty, huge investments, but in the phase of disillusionment it requires an interim approach to reduce the termination risk and continue to nurture their investors. First examples like Embark Trucks showed how this long-term strategy may have a predictable end. Automotive incumbents did not acknowledge much the new market entrants' plug and play technology approach which neither met legal requirements of an integrated and coherent solution nor the technology differentiation strategies of OEMs—serving primarily the logistics customer.

**Superimposed Value Spaces.** This avenue represents strategically the most radical approach. Ecosystem actors combine two megatrends of AD and electrification. AD clearly addresses logistic customer pain while electrification becomes a legally must-have technology for fleets in e.g., European countries. Firms like Einride and late follower Solo AVT pursue the redesign of the truck initially designed for humans.

The upside of this strategy is the early positioning in the long-term value for AD and electrification. Again, time-in-the-market already in the right automation level displays a huge market advantage. The knowledge and experience gained in this field help to achieve the first-to-scale ecosystem. It also leverages the willingness-to-pay of customers as those will allocate their investments to electric vehicles.

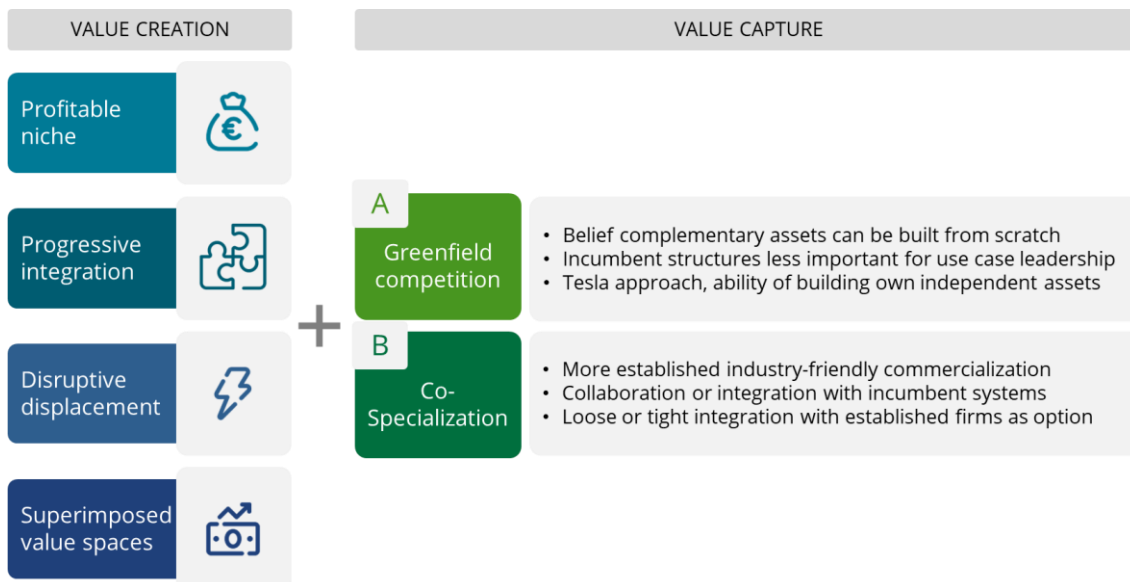
The downside represents the possibly higher investment burden on the customer side since the customer pays for the overengineered technology. Currently only leading and innovative logistics players such as Amazon and Maersk take the burden.

### 5.5.2 Value Capture Options

As the industry matures, those early strategic theories have paved the way for how current positionings in terms of continued value capture will be possible. The build-up of technological and customer knowledge, relationships, and the execution quality of the early strategy phases are now offering corridors for each player how to move forward and capitalize on their value created as the ecosystem options manifest. Different actors may be able to step up to take a more focal orchestrator role while others find profitable opportunities in complementor roles.

In reviewing the different foci placed on different value creation forms, startup actors reveal inherent view on the importance of what we call traditionally industry structure. Clearly, thanks to hypes and ample resources, there is several players that went the road of the often-seen Silicon Valley mantra of “let’s break it.” That would be more likely startups in the second value creation bucket in Figure 19. Their approaches signify less importance placed on what we call complementary assets availability i.e., the access to existing assets that help an innovation scale and reach mass markets (Teece, 1986; Gans & Stern, 2003).

However, those considerations around appropriability and complementary assets availability may come back now more to impact how the early value creation foci can be leveraged into sustainable value capture models.



**Figure 20: Value Capture Models with Industry Adoption Activities**

Because of the overall importance of appropriability in the automotive space, it is the complementary assets availability and the perception of their importance that drive two foundational options for the startup entrants (see *Figure 20*):

**Greenfield competition.** For those who believe that sufficient complementary assets can be easily built up from scratch and that incumbent structures are less important for leadership in an application space, greenfield competition is the path of choice. The dominant posterchild for greenfield competition executed well is certainly Tesla, which has proven to everyone that even in an industry with well-established dominant production and sales structures, new entrant may be able to build up their own independent assets.

**Co-specialization.** This approach describes a more industry-friendly commercialization in which new technology entrants bank on collaboration or integration with incumbent systems to reach the customer. New entrants build up co-specialization assets that operate together with established structures and incumbent platforms. For that, either a loose or tight integration with the established firm is an option, which may then determine whether the incumbent or the startup will try to lead the show.

### *Opportunities for Greenfield Competition Players*

This radical, if not to say disruptive, approach of building an ecosystem without emphasizing strong ties to industry incumbents, notably established truck OEMs, requires significant amounts of capital and a truly differentiating value proposition that is difficult to imitate by incumbent actors and value networks.

**Einride** may serve as an example that has garnered currently an extremely strong position in this regard. Its rather unique original value creation theory of tackling both the drivetrain and the powertrain revolution in parallel now offers options to position themselves as a high-end quality player. Thanks to a comparatively early start and frontrunner position in electrifying the logistics fleets the new market entrant could further meet open pockets due to their integrated value proposition around electrification and AD. They build crucial new complementary assets such as its freight mobility grids that help accelerate their business case by connecting charging infrastructure and its operational transport service performed with its own trucks. By that the firm is not competing with established industry incumbents since the overall value proposition differ from the solely transport-as-a-service AD business. The greenfield competition approach can be a promising path if the financial backing of the focal firm can be ensured as well as incumbent knowledge in functional safety is rapidly building up to achieve the final legal approval of driverless operations.

### *Opportunities for Co-specialization Players*

In this approach, new entrants focus on delivering what they came for and adding superior value to the platforms of incumbents. We see different approaches into the investment into building co-specialized “driver-as-a-service” platform. The verdict is still out as to whether tight versus loose configurations between entrants and incumbents will be the winning formula.

**Daimler Truck’s acquisition of Torc** is an example for where a tight co-specialized approach has ultimately propelled the overall industry development but has not helped establish independent new business or an independent new category of ecosystem player. The commercialization route now is a tightly coupled approach to fully integrate the new market entrant into the organizational and technology setup of the acquiring incumbent—an outcome that can but must not be a satisfying for those who invested in and built the original venture.

**Embotech**, on the other hand, is an example of more loosely coupled co-specialization across different niches. The corporate investor ZF still might be a prime support during the current phase of adaptation towards the automotive industry standards but the overall independence of Embotech through revenue-generating business across different AD niches also helps the company to find its place further upstream. In addition, occupying a key bottleneck perceived by the partner allows Embotech to leverage a loosely coupled co-specialization. In addition, as the company partners with a tier-1 supplier, it also underlines the typical supplier approach of positioning rather agnostic to truck manufacturers.

**Waymo and Aurora**, as an example of loosely coupled co-specialization in the mainstream path of heavy-duty truck automation. Their strengths in the core software stack allow them to attract incumbents to avoid missing out business opportunities. The Daimler Truck partnership with Waymo shows the partnership with the leading AD tech startup is much more worth than gaining insights into their software competences.

Ultimately, the capability to manufacture a truck is the currently agreed upon core competence that will push forward the first ecosystem at scale. That may be a difficult pill to swallow for those early market entrants that built their ecosystems around the theory that this kind of complementary asset may be more a commodity in the future. While during early application experimentations, one may have made great advances in a plug-and-play configuration, the scaling phase may favor tightly co-specialized configurations to achieve the desired regulatory approval of a fully integrated and safe vehicle system.

*I'm not sure how well understood this point is in the industry, but you simply cannot operate at large scale without a set of partners who know how to build those trucks.*

– Sterling Anderson, Aurora Co-founder & Chief Product Officer, 2022

## 5.6 Outlook

Given the usual industry evolution (*see evolution & maturity of AD industry*) and the long list of unsolved bottlenecks like the legal framework, functional safety, operational concepts, and societal acceptance, we expect few more years until we can experience fully autonomous trucks without a safety driver on public roads. According to Aurora's statement to launch its autonomous fleet in 2024, the commercialization of the ecosystem may soon to materialize (Aurora, 2023). However, we expect alternate short-term measures like increased attractiveness for women in trucking or partial truck automation to solve current driver shortages.

Safety stays as a highly debatable topic. Considering safety from the early beginnings would have hindered the experimentation of the emerging technology. However, to own the first-to-scale ecosystem requires now to build on the incumbent safety knowledge. We thus think that the AD tech startup or an automotive incumbent which can cope with both—the deep software competence and tenacious safety competence—can leverage a unique bottleneck position. For automotive incumbents which were not able to enter the ecosystem due to historically grown power structures with the OEM or lack of software knowledge, this would lead to the opportunity to offer the complementary asset of being the safety consultant. While customers perceive safety as a default requirement in the context of privately-owned vehicles, autonomous vehicles can put safety as a differentiating factor—deciding on the penetration rate of the logistic firm.

Investments in the AD field were underestimated. We can already observe now how ecosystem actors need to find alternate offerings on their path towards AD. This can be the pivot in their ecosystem strategy from disruptive displacement in Level 4 to profitable niches in gated areas. Others expand their Level 4 offerings in lower levels or in platform offerings becoming agnostic to the application in trucking or robotaxis. Independently whether it is a corporate firm or external investor short-term artefacts may represent the unneglectable backing.

## 5.7 Conclusion

Our ecosystem maturity assessment as well as discussions on the different ecosystem strategies consisting of the part of value creation and capture lead us to the following key messages:

- (1) **Early experimentation can put market entrants in a power position in the ecosystem.** For instance, the vehicle-miles-driven of pioneer Waymo may be highly debated among the incumbents whether this KPI may support in receiving legal approval for driverless operations. However, it offers the firm to first of all set a performance criterion in the emerging market, leverage its position in partnership negotiations, and also build social trust among potential users—which often has been overlooked.
- (2) **Selection of value creation strategy depends on the perseverance of the company.** Depending on the financial resources and business environment, firms with less financial backing may target niche or lower-level solutions, while others in particular from social groups of the Silicon Valley may be more successful in attracting resources and thus pursuing a disruptive displacement and superimposed value spaces strategy.
- (3) **Depending on the value capture strategy, different characteristics show winning potential.** Linked to the previous one, selecting the right partner is crucial for having a first-to-scale ecosystem. In case of greenfield competition, attracting the resources and having a vision offer the firm the freedom to build an almost independent ecosystem structure. In case of co-specialization, we propose that a strong and visionary incumbent is key: Strong in the sense of holding a market leadership position and visionary in the sense of having a dominant top-down steering in strategy management as well as being an opinion leader in the ecosystem.
- (4) **Ecosystem bottlenecks are favorable, but it is about the right timing.** The maturity assessment of the ecosystem shows that bottlenecks are of temporal nature. In particular, safety has emerged as a dominant industry narrative in phase three, almost 20 years after the first technology experimentation. Looking at this bottleneck from an automotive incumbent perspective, this bottleneck has been identified early on. However, if this perception does not match with the dominant peers in this field who are able to raise substantial financial resources, the firm may occupy a bottleneck position but not at the right time.
- (5) **Time in the market beats timing the market.** Ken Fisher's statement (2018) about investing strategies fits well to our AD setting. As AD is known to be an expensive bet, firms also discuss about when is the right time to enter the market

hoping to mitigate their high burn rate. However, our observations show how the time in the market allows the firm to experiment in the technology, attract others to join its self-defined ecosystem structures, and become influencing voices for technology education for legal and society.

An emerging industry and ecosystem privilege action and first-hand market learning advantages, paired with a clear vision and realism on strategic options. Having to bet on the first-to-scale architecture of an AD trucking ecosystem is a complex strategic challenge that is difficult to predict just by sitting in an office and trying to optimize relationships and investments, sprinkled across different time scenarios. It would appear a bit exuberant to expect a software startup built around Silicon Valley logic to make a substantial break into the industry and emerge as the leading figure head. Rather, traditional automotive and logistics players will likely lead the road to the first-to-scale architecture. However, they will need to bank on tight complementor relationships with some of the startup entrants. To this end, a traditional value chain logic may need to give way to a more integrated value network logic in which multiple partners co-deliver the core value proposition (Adner, 2017). Becoming a high-value partner requires the build-up of in-market competence and knowledge. However, firms who struggle to get a foothold in the market may follow the strategy of building a large war chest and investing in different startups tackling different AD applications which may enable some players to buy themselves into the industry once all the uncertainty is resolved.

As we observe the AD industry is further evolving and increasingly adopts to established automotive standards and norms, we see high potential in the first-to-scale ecosystem by equipping it with first an experimental AD tech developer startup, an automotive incumbent with a Level 4 ready chassis and a system supplier covering key vehicle systems like steering and braking, and functional safety as well as a key partner in applying the technology. This would be a logistics customer with a strong influence on government policy through lobbying. It can be a transport operator serving the government such as for road infrastructure developments. In addition, a value proposition around the AD technology but serving the government operations such as digital custom controls may gain higher interest to implement the technology sooner. All in all, the first-to-scale ecosystem structure comprises the development as well as deployment partnerships to create a value contribution with AD.

# Appendix

## Appendix A: Excerpt of the questionnaire of the central funding program

Category	Question
<i>Customer focus</i>	Have user research methods been used to understand unmet needs and context of use? Have the results been documented? Have top findings been derived? Are there opportunity areas?
	Has a collection of individual ideas covering all three innovation pillars (desirability, feasibility, viability) been generated?
	What is the project's value proposition? How does the customer benefit?
	Who are the customers? What are their characteristics? Which customer segments are prioritized?
<i>Market and competitors</i>	Could the business model scale to an attractive market size?
	Target market in t0 (in USD billion)
	Who else is addressing the customer problem? Who are the key competitors?
	What is the project's USP? How long does it last against competition?
<i>Scalability</i>	How does the project want to scale from revenue perspective? (e.g., regions, additional customer segments, portfolio extension)
	Revenue model tested and validated
	Have customer acquisition costs and customer lifetime value been calculated and validated?
	Absolute total net sales in t6 (in USD million)
<i>Strategic fit</i>	Does the business idea fit the [company's] strategy?
	Does the idea fit in an existing organization or is it foreseeable that a new organization can be created? Is there a commitment of the unit to integrate the innovation in its organization?
	Why should [the company] solve this problem?
	Which synergies with other [company's] activities exist (sales, supply-chain, technology)? How does the project want to utilize them?
<i>Feasibility</i>	Does [the company] have the competences to succeed in the search field, or is willing and able to develop or acquire them?
	Which noteworthy scenarios (chances/risks) been considered, and respective conclusions derived?
	Is it feasible to build the potential solution within a reasonable timeframe?
	Describe the current MVP and how the project is planning to develop it over time from a low to a high-fidelity MVP?



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