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Understanding Innovation Processes: A Multi-Stage Marketing Perspective in the Automotive Context

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Abstract

Successful innovation processes involve multiple actors with distinct objectives, resources, and competences across different stages of value creation. Close collaboration among relevant stakeholders is therefore essential, yet it also entails substantial coordination and alignment challenges. Drawing on a multi-method research design, this study examines the development and market introduction of an advanced driver assistance system (ADAS) for passenger vehicles across multiple market stages.

The findings conceptually and empirically demonstrate how stakeholders' heterogeneous goal structures and value assessments influence the innovation process across stages. In particular, the results reveal that the absence of a multi-stage marketing (MSM) perspective can lead to misalignments that adversely affect the progression and market success of the innovation. The study further provides insights into how innovation processes can be systematically designed across market stages to ensure end-user orientation and economic viability.

By integrating a multi-stage marketing perspective into innovation research, this paper contributes to a more comprehensive understanding of innovation processes in complex, multi-actor environments.

Keywords

Customer-perceived value; multi-method research; multi-stage marketing (MSM); new product development (NPD); value creation

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Ethics Declaration

All surveys were conducted on a voluntary basis and explicitly identified as academic research without any commercial intent. Participants were informed about the purpose of the study, and anonymity was guaranteed throughout the research process.

Declaration of Conflicting Interests

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1 Introduction

The development of innovations poses a significant challenge for companies. Despite extensive generation processes and efforts, many innovations fail, especially during adoption, or rarely become economically successful (Cooper, 2019). Accordingly, research on success factors in the field of *New Product Development* (NPD) and *New Service Development* (NSD) has always been of great importance (Cooper, 2017; de Brentani & Kleinschmidt, 2015; Di Benedetto, 1999). After all, companies want to know the distinguishing features of a successful innovation process and the strategies they should employ to enhance the prospects of their innovations thriving.

Hence, recent innovation research has focused on involving customers in open innovation processes (Chesbrough, 2006; von Hippel et al., 2011; Morgan et al., 2018; Randhawa et al., 2016) as well as on the formation and management of innovation networks (Corsaro et al., 2012; Möller & Halinen, 2017; Najafi-Tavani et al., 2018; Rampersad et al., 2010) or innovation ecosystems (Adner, 2017; Adner & Kapoor, 2010; Kapoor, 2018; Möller et al., 2020). While the prevailing innovation literature emphasizes firm-internal aspects like knowledge creation, technology development, and process optimization (Randhawa et al., 2016; Slater et al., 2014), academics increasingly adapt their research focus by analyzing how to deliberately engage all relevant stakeholders in the innovation process and how to manage these innovation networks/ecosystems properly (Adner & Kapoor, 2010; Möller & Halinen, 2017; Möller et al., 2020; Najafi-Tavani et al., 2018).

Despite substantial advances in innovation research, business practice continues to exhibit considerable shortcomings in the application of contemporary insights (Cooper, 2019). The persistent gap between academic concepts and their limited implementation in managerial practice suggests that innovation research still lacks a comprehensive understanding of the dynamics underlying innovation processes. Against this backdrop, this study focuses on innovation processes that span more than two market stages along the supply chain (Porter, 1985; Lambert & Cooper, 2000), thereby returning to a core characteristic of business markets—namely, their multi-stage structure (Anderson et al., 2008; Dahlquist & Griffith, 2014). Adopting this perspective allows for a more nuanced understanding of the behaviors and interactions of stakeholders across the supply chain.

Our conceptualization of innovation processes is grounded in a customer-centric perspective (Gummesson, 2008; Shah et al., 2006; Sheth et al., 2000) and builds on established insights into customer-perceived value creation (Eggert et al., 2019; Grönroos & Voima, 2013; Kumar & Reinartz, 2016; Nenonen et al., 2019; Vargo & Lusch, 2008, 2016). Furthermore, it reflects marketing scholars' growing recognition of the relevance of a multi-stage marketing (MSM)

perspective for understanding customer-perceived value creation in complex market settings (Anderson et al., 2008; Dahlquist & Griffith, 2014; Geiger et al., 2015; Homburg et al., 2014; Wengler & Kolk, 2023).

As a market-driving concept, MSM aims to identify and influence the requirements and needs of a supplier's subsequent market stages and their associated stakeholders (Jaworski et al., 2020). By aligning a supplier's products and services with these requirements, MSM seeks to create value for the ultimate end users (Kleinaltenkamp et al., 2012). Consequently, the MSM perspective facilitates an end-user-integrating, customer-perceived value creation process across multiple market stages of a value chain (Porter, 1985; Lambert & Cooper, 2000), while maintaining a significantly lower level of analytical complexity than network- or ecosystem-based approaches

Applying the MSM perspective holds particular significance because it acknowledges that innovation processes often span across multiple market-stages and that the stakeholders' individual goal structures, value assessments and thus their subsequent behaviors may differ (Eggert et al., 2019). These discrepancies among stakeholders can swiftly give rise to dysfunctional distortions along the supply chain – and thus the failure of an innovation's generation or adoption. Therefore, it seems sensible that companies proactively identify any self-reinforcing or conflicting effects occurring across multiple market stages to ensure their proper alignment and thus facilitate the innovations' market success (Kleinaltenkamp et al., 2022). Thereby, MSM's end-user priority (Homburg et al., 2020; Wengler & Kolk, 2023) might function as a unifying objective across all stakeholders to avoid any dysfunctional distortions and thus the failing of the innovations. Hence, we consider both the generation and adoption processes simultaneously as both phases are inseparably intertwined (Damanpour, 2020; Vargo et al., 2020) and the innovation's success is only truly validated by its successful adoption.

In this research paper, we examine innovation processes through the lens of the MSM perspective. Using the example of an automated parking assistant system (APAS), a specific advanced driver assistance system (ADAS) in the automotive industry, we analyze the innovation development processes of original equipment manufacturers (OEMs) and their suppliers and assess the successful market uptake of the innovation based on evaluations from subsequent market stages (i.e., dealers and end users).

Accordingly, the guiding research question of this study is to identify at which points along the different value-creation stages of the automotive industry specific opportunities for improving innovation processes exist. Addressing this question requires a multi-method research approach, as the various actors differ substantially in terms of number and accessibility. While data from end users can be collected through a large-scale quantitative survey, data collection from less accessible, selected industry experts in senior management positions is more suitably conducted through in-depth expert interviews.

The paper is structured as follows. The next section reviews the relevant literature on innovation, innovation processes, value and value creation, and multi-stage marketing. The third section outlines the research approach and design and presents the main exploratory findings from the four empirical studies. The final section discusses the results and derives theoretical contributions and some managerial implications, as well as outlines the study's limitations and directions for future research.

2 Theoretical Background

2.1 Innovation and the Innovation Process

The significance of *innovations* in dynamic and highly competitive business environments is widely acknowledged in the marketing literature (Möller, 2010; Ringberg et al, 2019; Nenonen et al., 2019; Sandberg & Aarikka-Stenroos, 2014; Story et al., 2011), as innovations promise improved international competitiveness, continuous growth and increasing firm value (Dotzel & Shankar, 2019; Rubera & Kirca, 2017; Slater et al., 2014; Story et al., 2011; Tellis et al., 2009).

Developing successful innovations represents a major challenge for companies. Despite extensive efforts, about 40% of innovations fail during adoption, and only a mere 10-15% prove to be economically viable (Cooper, 2019). Consequently, there is a pressing need for research focused on identifying the critical success factors within NPD and NSD (Cooper, 2017; de Brentani & Kleinschmidt, 2015; Di Benedetto, 1999).

Customers assume a pivotal role in the development of innovations (Cooper, 2017; La Rocca et al., 2016; von Hippel et al., 2011; Morgan et al., 2018; Shah et al., 2006; Ulaga, 2018). The idea of integrating customer needs into the development process is not new at all but has been constantly promoted by academia for several decades (Shah et al., 2006). However, business practice does not seem to apply innovation research insights properly (Cooper, 2019), despite such advanced customer-centric methods like agile stage-gate processes, which involve iterative discussions with customers/users, ensures that the innovation process evolves in the intended direction or can be flexibly adjusted as necessary (Cooper & Sommer, 2016; Grölund et al., 2010). Given that the innovation process primarily aims to create customer-perceived value (Zeithaml et al., 2020), it is not surprising that marketing assumes a prominent role in the identification of customer needs and their incorporation into the firm's innovation and value creation process (Drechsler et al., 2013; Griffin et al., 2013; Shulman et al., 2023; Verhoef & Leeflang, 2009).

Over the past decades, there has been a consistent increase in the complexity of the innovation process, primarily driven by the digitalization and smartification of products and services (Chowdhury et al., 2018). In many instances, traditional bilateral innovation processes that relied on close collaboration between suppliers and customers seem no longer adequate. Instead, the firm's development and value creation process now frequently extend across multiple market

stages (Anderson et al., 2008; Dahlquist & Griffith, 2014) to secure access to critical competencies and resources (Wengler et al., 2019). This necessitates active engagement with various stakeholders throughout the entire value chain (Homburg et al., 2020).

In response to these challenges, research into the innovation process has introduced concepts such as open innovation (Chesbrough, 2006; von Hippel et al., 2011; Randhawa et al., 2016), the formation of innovation networks (Corsaro et al., 2012; Möller & Halinen, 2017; Najafi-Tavani et al., 2018; Rampersad et al., 2010), and the development of innovation ecosystems (Adner, 2017; Adner & Kapoor, 2010; Kapoor, 2018; Möller et al., 2020). An examination of the existing literature reveals that this research has predominantly focused on internal aspects of the innovation process within organizations, such as knowledge creation and the development and application of new technologies (Randhawa et al., 2016). It has primarily drawn upon the resource-based view (Barney, 1991) to support its arguments. The deliberate involvement of all pertinent stakeholders or the management of these innovation ecosystems has only recently gained research attention (Adner & Kapoor, 2010; Möller & Halinen, 2017; Najafi-Tavani et al., 2018), with limited analysis of collaborations that span more than two market stages. Given that innovation processes often involve multiple market stages (Anderson et al., 2008; Dahlquist & Griffith, 2014), it seems sensible to broaden our perspective by adopting a multi-stage marketing approach (Homburg et al, 2014; Kleinaltenkamp et al., 2012). Moreover, scholars like Damanpour (2020) or Vargo et al. (2020) call on the research community to simultaneously consider both the generation and adoption processes due to their intertwined nature.

2.2 Customer-perceived Value, Value Creation and Innovation

In the past decades, interest in value creation research has resurged. Both managers and researchers have come to recognize that in times of intense global competition delivering value to all stakeholders has become more critical than ever before (Zeithaml et al., 2020). Accordingly, the concept of *customer-perceived value* has evolved as a key concept in consumer and business markets, but still lacks consensus due to various research perspectives (Zeithaml et al., 2020).

A comprehensive concept on customer-perceived value in interorganizational relationships was presented recently by Kleinaltenkamp et al. (2022). They define "*value* as a measure of goal achievement that reflects the perceived contributions of objects, processes, or behaviors to the goals of an individual, organizational, or some other entity." The extent of goal achievement can thus be recognized as the yardstick for measuring value. Value is to be assessed in a subjective (Woodruff, 1997; Zeithaml, 1988) and context-specific manner (Corsaro & Snehota, 2010; Vargo & Lusch, 2016). This holds true even when individual actors are part of an organization, where individual goals (e.g., well-being, social stability, recognition) and collective goals (e.g., increasing profits, sustainable competitive advantages, cost leadership) co-exist (Eggert et al., 2019; Macdonald et al., 2016).

Although individual and collective goals give rise to interaction effects that may either reinforce or undermine one another, it cannot be assumed that any commonly shared objective organizational goals for the firm exist (Eggert et al., 2019; Huber & Kleinaltenkamp, 2020), because both individual and collective goals are assessed entirely from a subjective perspective. Accordingly, the various actors operating in the same organization may pursue alternative collective goals and goal hierarchies, which can lead to self-enforcing or divergent goal structures (Epp & Price, 2011) and thus to dysfunctional distortions within business relationships.

Despite marketing's increasing focus on providing superior value to the customer (Woodruff, 1997), it is important to understand *value creation* of the firm as a 'dual/reciprocal concept' (Grönroos, 2011; Kumar & Reinartz, 2016), benefiting the customer and the supplier alike (Ritter & Walter, 2012). Accordingly, customers and suppliers will only engage in an exchange or business relationship, if (1) the expected benefits will exceed all associated costs on both sides and if (2) neither the supplier nor the customer recognizes any better alternatives (Eggert et al., 2019; Plinke & Wilkinson, 2015). Given these general expectations on both sides, the customer and the supplier will engage in a dynamic process of interactive value creation (Eichentopf et al., 2011; Grönroos, 2011), in which the supplier takes on the role of a value-creation facilitator by providing customers with value-supporting resources and by ensuring interactive processes (Grönroos & Voima, 2013). The success of customer integration efforts and the resulting value perceptions primarily depend on the quality of suppliers' and buyers' resources and on how effectively these resources are integrated (Macdonald et al., 2016).

Viewed from a value-creating perspective, the *innovation process* shares similarities with conventional exchange processes, primarily revolving around interactive relationships between suppliers and customers and the mutual integration of resources (Eichentopf et al., 2011; Nenonen et al., 2019). However, innovative solutions are typically developed within an adjusted value chain setting involving novel resources. Depending on the innovation's character, i.e., either more incremental or more radical, unique innovation capabilities (Bessant et al., 2014; Nenonen et al., 2019; Slater et al., 2014), distinct mindsets as well as varying abilities to overcome innovation barriers (Ringberg et al., 2019, Sandberg & Aarikka-Stenroos, 2014; Story et al., 2014) are required.

2.3 Value Creation in Multi-stage Markets

Research on customer-perceived value creation of the firm has been traditionally confined to the scope of dyadic transactional or relational exchanges (Day, 2000; Kothandaraman & Wilson, 2001; Lindgreen & Wynstra, 2005; Sheth & Parvatiyar, 1995). In recent years, marketing researchers have increasingly recognized the significance of adopting a *multi-stage marketing perspective* when considering value creation of the firm (Anderson et al., 2008; Dahlquist & Griffith, 2014; Geiger et al., 2015; Homburg et al, 2014). Firms in the automotive industry

increasingly shift their marketing perspective downstream, as their direct customers do not necessarily represent the primary source of market demand (Jaworski et al., 2020). Understanding the entire value chain and identifying the source of its primary demand thus becomes critical. As no universal source of primary demand exists and as it depends on the firms' specific offering (Wengler & Kolk, 2023), firms must determine their primary demand-driving market stage individually. For these primary demand-driving market stages, (1) the firm's products or services are still identifiable, (2) their customer-perceived value contribution is ultimately recognizable and (3) they are highly performance-relevant (Kleinaltenkamp et al., 2012). Hence, firms operating in multi-stage markets must extend their marketing efforts beyond their immediate customers by embracing an end-user orientation (Homburg et al., 2020).

MSM is thus a market-driving strategy (Jaworski et al., 2020) that seeks to identify and influence the needs of a supplier's subsequent market stages as well as those of its stakeholders. By adapting the supplier's products and services accordingly, MSM aims to create value for the supplier's ultimate end customers (Wengler & Kolk, 2023). The MSM perspective thereby ensures an end-user-integrative value-creation process across multiple market stages (Porter, 1985; Lambert & Cooper, 2000), which is crucial for the generation and adoption of innovations. Summarizing, it is postulated that, compared with working in bilateral ecosystems, the MSM approach generates substantially greater success contributions for the actors involved across the individual value-creation stages.

2.4 Conceptual Framework

Innovation processes are interactive and iterative procedures aimed at creating customer-perceived value through the integration of new and existing resources within adapted or novel value chain configurations. Increasing complexity often requires collaboration across industries and the involvement of multiple market stages. The MSM approach offers a conceptual framework for managing such complex innovation processes by emphasizing the roles of involved stakeholders and the transparency of their individual goal structures (Kleinaltenkamp et al., 2022). The multi-stage nature of innovation processes affects both innovation development - encompassing opportunity identification, concept development, commercialization and testing (Klein & Sorra, 1996; Aarikka-Stenroos & Lehtimäki, 2014) - and innovation adoption (Rogers, 2003; Damanpour, 2020). Innovation adoption includes activities such as problem recognition, solution evaluation, adoption decisions, planning, adaptation, and use (Rogers, 2003). As innovation development and adoption are inseparably intertwined, they should be conceptualized as complementary elements of a non-linear and iterative innovation journey (Vargo et al., 2020).

While innovation can occur within a single organization, it more frequently unfolds across multiple organizations and market stages (Damanpour, 2020). In the generation phase, stakeholders along the value chain face substantial technological challenges when developing

innovative solutions (Bessant et al., 2014). Managing integrated value chains is particularly complex because they span multiple market stages (Lambert & Cooper, 2000; Wengler & Kolk, 2023) and increasingly cross traditional industry boundaries to access critical resources. A prominent example is the development of ADAS, where formerly separate value chains and key actors from different industries (e.g., Intel and BMW) must align on value chain structure, leadership, and collaborative innovation processes (Wengler et al., 2019).

In the adoption phase, a different set of stakeholders becomes relevant. While innovation generation is often framed as a technological challenge, innovations ultimately need to address the needs of adopters and end-users (Homburg et al., 2020; Wengler & Kolk, 2023). This requires a shift toward a multi-stage marketing perspective that prioritizes end-users, ensuring that innovation is guided not only by technological feasibility but by user value. Such an approach depends on a deep understanding of individual and organizational goals across market stages, enabling coordinated innovation management and preventing a disconnect between innovation generation and adoption.

Innovation Phase	**Stage 1: Tier-1 Supplier**	**Stage 2: OEM**	**Stage 3: Dealer**	**Stage 4: End User**
Innovation Development	• Development of feature concepts • Testing and refinement of feature prototypes • (Series) production of features	• Identification of market opportunities • Definition of solution concepts • Co-development, testing, and refinement of prototypes • Integration of features into system solutions	• Collection of end-user feedback • Identification of offering gaps • Monitoring competitive offerings and end-user responses	• Testing of prototypes • Provision of usage-related feedback • Observable ordering and complaint behavior in comparable use cases
Innovation Adoption	• Awareness of feature characteristics facilitating or hindering adoption • Selective ingredient branding	• Strategically commercialization (pricing and bundling) • Disseminating solution • Preparation of the dealer organization	• Operational commercialization and regional market introduction • Customer consulting and support • Delivery and user instruction	• Perception of needs or problems • Search for solutions • Evaluation of available offerings • Adoption decision • Learning and use of features

Table 1: Exemplary Innovation Activities across Market Stages in the Automotive Industry

3 Empirical Studies

3.1 Overall Research Approach and Design

Innovation processes can be examined from a MSM perspective in two principal ways. First, researchers may conduct an integrated study covering all relevant market stages within a single value chain, which allows for the analysis of interaction effects and provides insights into the non-linear and iterative nature of innovation journeys. Alternatively, researchers may investigate individual market stages separately, an approach that is particularly suitable when access to integrated value chains is limited or when the objective is to derive more generalizable insights across multiple value chains.

This paper adopts the latter approach and examines the innovation processes of an APAS, which represented a state-of-the-art advanced driver assistance system in the automotive industry at the time of data collection (Wengler et al., 2019). The four empirical studies were not part of a preplanned comprehensive research design but evolved sequentially over time.

The research was initiated in response to concerns raised by a Tier-1 supplier regarding the market underperformance of its APAS. To better understand the innovation generation and adoption processes, four studies were conducted across the automotive value chain. The first two studies focus on innovation adoption and examine end users as the source of primary demand. Study 1 investigates end users' general attitudes toward ADAS and autonomous driving, while Study 2 analyzes user experiences with the most recent APAS available at the time. Study 3 addresses the commercialization stage by examining car dealers' sales processes as well as their attitudes and behaviors toward ADAS. Finally, Study 4 explores innovation development through expert interviews with representatives from OEMs and Tier-1 suppliers.

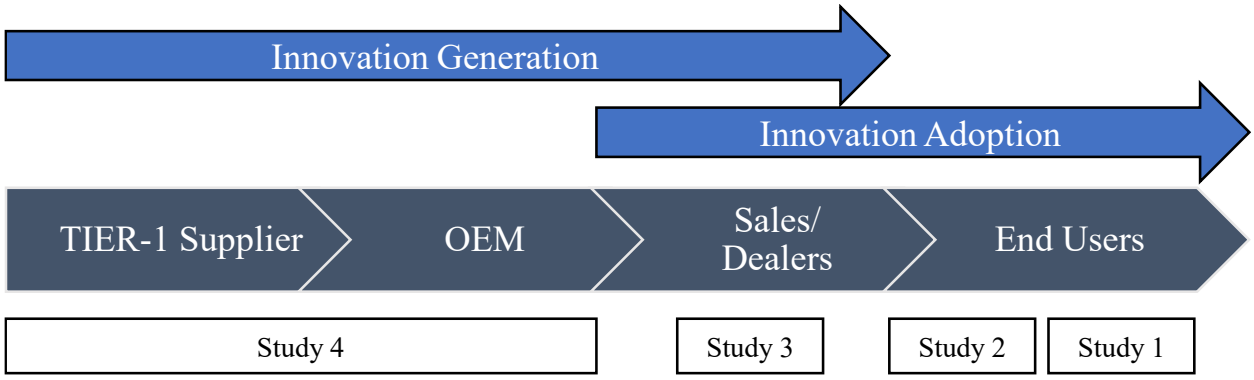

Figure 1: Covered Market Stages of the Automotive Value Chain by the Research Studies

Existing APAS already assume control over key components of the parking maneuver, fundamentally transforming the user–vehicle interaction, commonly referred to as the human–machine interface. Users are no longer solely responsible for parking; instead, they are required to entrust substantial parts of the parking process to the automated system. As a result, the adoption of APAS entails significant changes in users' driving routines and usage processes (Riedl & Wengler, 2023). In particular, users must relinquish direct control over the vehicle and place trust in the system's computational capabilities. From the user perspective, this shift represents a fundamental reconfiguration of the user's role, consistent with the characterization of APAS as a radical innovation in the literature (König & Neumayr, 2017).

3.2 End User Survey (Study1)

3.2.1 Method and Sampling

A face-to-face survey was conducted to capture German end users' expectations, concerns, and evaluations of existing ADAS. Prior research had indicated strong interest in ADAS and autonomous driving among German consumers, accompanied by persistent skepticism regarding system reliability (Wengler et al., 2019).

Data were collected in May 2019 through 10–20 minute interviews at more than 20 locations across Germany. The survey was administered by 37 trained interviewers with university degrees, supported by five senior researchers. Interviewers followed a standardized protocol and maintained a neutral stance throughout the interviews.

Respondents answered open-ended questions regarding their perceptions of ADAS and rated the personal relevance of vehicle features as well as their intention to use or purchase ADAS on a scale from 0 (not at all) to 100 (very high). This numeric scale, with only the endpoints labeled, was chosen to minimize scale-induced bias and has been shown to be well accepted in empirical research (Osman et al., 1994; Miles et al., 2011).

The final sample comprised 892 respondents and was quota-representative of the German population in terms of age, gender, and education, with one respondent per household. The sample included 443 women and 449 men, with participants aged 18 years and older (M = 44).

3.2.2 Results and Discussion

In Study 1, whose descriptive findings were previously reported by Riedl and Wengler (2019) with a different research focus, end users' attitudes toward ADAS were documented. That study primarily aimed to provide an overview of user perceptions and general interest in ADAS, rather than to investigate adoption behavior along multiple market stages.

We found that end users generally hold a positive attitude toward ADAS, anticipating increased driving comfort and safety, but simultaneously express concerns regarding system reliability, consistent with prior research. Preferences vary by ADAS type and intended application (see Table 1): on a 0–100 scale, adaptive cruise control (ACC), lane assist, and valet parking received mean scores of 66.0, 56.7, and 33.3, respectively.

Although users are generally willing to adopt ADAS, the wide variability in scores and the relatively low ratings for certain systems, such as valet parking, suggest limited adoption interest, likely reflecting lack of familiarity or experience with specific systems, as well as potential performance limitations. Consequently, we examined the impact of previous encounters with specific ADAS on end users' willingness to utilize these ADAS in the future. Using ACC as an illustration, we found that the user's prior experience boosts their inclination to continue using it by a substantial 32.7% (Riedl & Wengler, 2019). This statistically significant effect holds true for of other ADAS systems, as outlined in Table 2.

ADAS	Experience with ADAS	Desire to use ADAS (0…100)		Experience raises desire for ADAS by …%	Difference in desire with or without experience statistically significant?
Adaptive Cruise Control (ACC)	Yes (59.9%)	73	Ø 66.0	32.7	yes, p<.001
	No (40.1%)	55			
Lane Keeping Assist	Yes (55.4%)	61	Ø 66.0	19.6	yes, p<.001
	No (44.6%)	51			
Park Steering Assist	Yes (49.9%)	59	Ø 66.0	34.1	yes, p<.001
	No (50.6%)	44			
Traffic Jam Assist	Yes (33.6%)	70	Ø 66.0	34.6	yes, p<.001
	No (66.4%)	52			
Valet Parking	Yes (9.9%)	46	Ø 66.0	43.7	yes, p<.001
	No (90.1%)	32			

Table 2: End User's Experiences with and Desire for ADAS (Riedl & Wengler, 2019)

3.3 User-Experience Study (Study 2)

Building on the first quantitative study, which highlighted end users' substantial interest in and positive attitudes toward ADAS, we conducted a follow-up user-experience study with a specific APAS. Unlike the prior survey, this study focused on participants' hands-on interactions with the system, providing deeper insights into actual usage patterns, practical experiences, and adoption behavior.

3.3.1 Method and Sampling

The study involved real-world test drives using a current-generation APAS integrated into a contemporary vehicle. Five trained research assistants supervised the sessions, with at least two present at all times. Participants were recruited via social media and newspaper advertisements. The quota-controlled sample (n = 62) ensured diversity in gender, education, and prior ADAS experience and included 32 women and 30 men aged 20–64. Tests were conducted in autumn 2019 at three German locations representing rural, small-city, and metropolitan settings.

The procedure comprised four steps: (1) participants completed a pre-test survey on ADAS preferences and experience; (2) test drives were conducted in a 2019 Mercedes-Benz A-Class, during which drivers wore eye-tracking glasses and were recorded by dashcams while engaging the system four times across two parking spots; research assistants provided support if needed; (3) a post-test survey assessed user experience, evaluation, and usage intention; and (4) participants evaluated three future parking assistant concepts. Survey items were developed in cooperation with the APAS supplier, and eye-tracking data were analyzed to identify usage patterns and drivers' attentional focus

3.3.2 Results and Discussion

In the APAS field test, the time it takes to find the start button is the first major hurdle for the user. Figure 2 shows five key *Areas of Interest* (AOI) that subjects typically searched in the order of the red arrows when trying to find the start button.

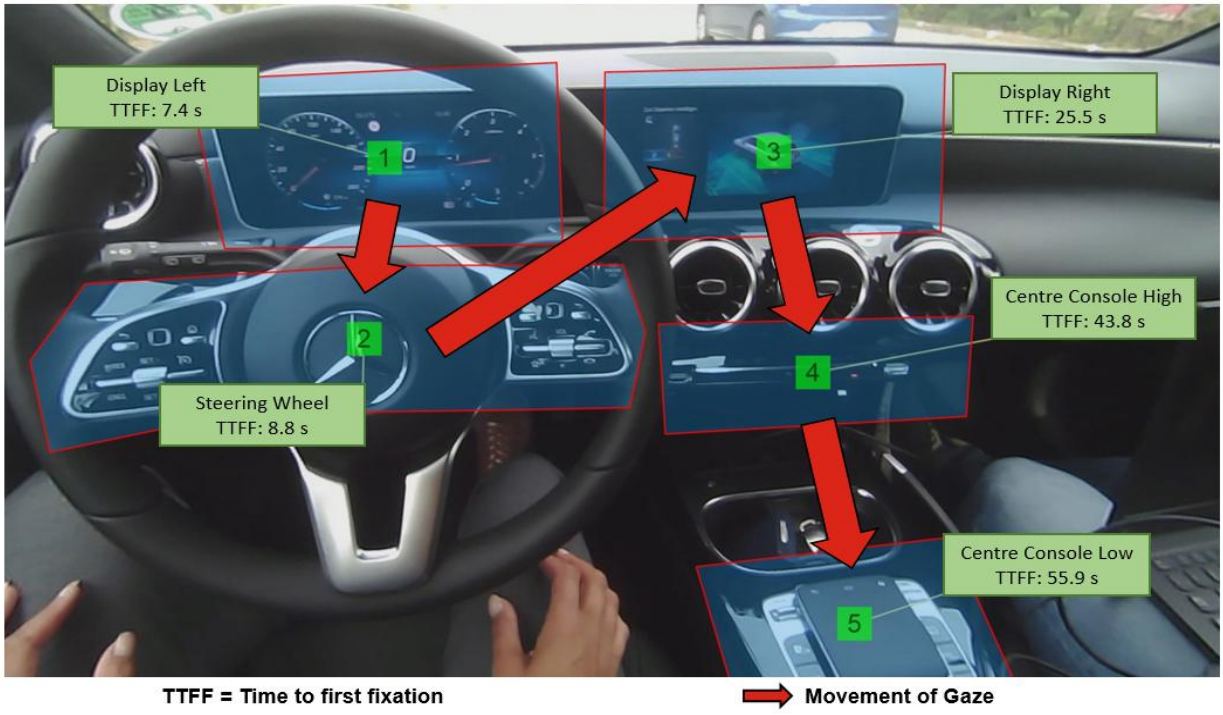

Figure 2: Aggregated Gaze Patterns

Overall, the search pattern of the subjects corresponds to the “from top left to bottom right” scheme found in many studies for different purposes. However, the aggregated representation of the typical gaze pattern should not obscure the fact that the individual search patterns of individual subjects show multiple jumping back and forth between the AOIs. The longer the search process, the more erratic the gaze pattern, reflecting the subjects' helplessness and overload.

Since the start button is located at the bottom right, in AOI 5, it was mostly found very late: Subjects took between 5 and 257 seconds to search, and the average search time was 58 seconds. Subjects without prior experience required 62.0 seconds, compared to 49.5 seconds for experienced subjects (−20.2%). The difference is not statistically significant ($t = 1.288$, $p = .207$), likely due to the limited sample size ($N = 62$).

Verbal comments made by the respondents and their behavior during the tests implied that using the system in a trial-and-error procedure without prior instruction can lead to considerable irritation or even frustration. A mean search time of almost one minute for a vehicle function is perceived as a considerable risk by the subjects in moving traffic (!). The simultaneous open comments, the parallel camera recording of facial expressions and the ex post open judgments of the users reflect the feeling of stress, overload, and perception of a hazardous situation. Depending on cognitive workload and the features of the system, this represents a challenge in the design of systems (Mendel & Pak, 2009, Sullivan et al., 2016).

In the context of the pre-post-test, we found that exposing end users to APAS for the first time under controlled circumstances leads to a drastic and highly significant ($T=-6.361$, $p<.001$) increase in their desire for APAS (Table 3), even though some candidates experienced minor malfunctions of the APAS during the test drives.

Measure	**Pre-test (0-100)**	**Post-Test (0-100)**
Mean	48.1	73.0
Median	50.0	80.0
Std.-Deviation	30.8	23.7
Minimum	0	0
Maximum	0	100

Table 3: End Users’ Desire to Use APAS Before and After the User Test, n= 62

Thus, managing the customer experience plays a critical role in subsequent buying decisions (Lemon and Verhoef, 2016; Müller, 2019). This illustrates the importance of interacting with the end customer for the adoption of the innovation. Creating customer-perceived value in the value chains is not defined exclusively by technological aspects but is significantly influenced by how the stakeholders interact with each other.

OEMs and suppliers have been reporting for years that the willingness of end users to order and use parking assistants falls short of expectations. Our study provides one explanation for this: an innovation that is supposed to be convincing from a technological point of view can have its commercial success impaired by failures in the interaction. Guiding end users in the introduction to new technologies or product features like APAS might be able to offset performance issues (Rogers, 2003) and mitigate feature fatigue (Marzi, 2022; Rust et al., 2006; Thompson et al., 2005) to a certain degree.

We can thus note two essential results from our user-experience study: (1) Introducing users to a new technology under controlled conditions and using assistance from the provider leads to an improved assessment and a significantly increased propensity to use such new features. This finding is consistent with the research results of the *mere exposure effect* (Montoya et al., 2017; Zajonc 1968). (2) Controlled user studies are a useful tool for gaining input that can be used to subsequently improve innovations.

While user requirements and the optimization of Human Machine Interfaces (HMIs) are discussed at all levels of the value chain in the automotive industry, development departments often fail to sufficiently consider customer expectations and behaviors (Riedl & Wengler, 2023). Engineering and IT specialists tend to assume that what they consider easy-to-use will also be intuitively understood by the end user. This proves to be a serious misjudgment, as the far too long search for the start button, the often-confused eye movements of the test subjects and their perceived stress impressively prove.

3.4 Dealer Survey (Study 3)

As indicated by the findings from our two end user studies, it is evident that the absence of demand for APAS does not stem from end users, as they largely exhibit a fundamental willingness to embrace positive experiences and an enthusiasm for innovation. Considering the multi-stage nature of the value chain in the automotive industry, the role of dealers in the ADAS innovation process was subsequently examined.

3.4.1. Method and Sampling

In the context of a real-life purchasing process of a private motor vehicle, the reactions of automobile salespeople were surveyed with regard to the benefits and possible disadvantages of ADAS currently on offer. The specifications for the purchase were: established manufacturer brand in Europe, internal combustion engine with the latest exhaust technology, 150-200 hp, base price 35,000€ - 49,000€, deliverable within 6 months. Our data collection of retailer opinions can be referred to as a kind of mystery shopping (Ford et al., 1997, Xu & He, 2014, Calvert, 2005; Morrison et al., 1997; Porter & Heyman, 2018) which is used in order to make the practiced

procedures in the provision of services transparent (Wilson, 1998a; Finn & Kayandé 1997; Wilson, 2001; Hair et al., 2003). Mystery shoppers document their experiences in the buying process, providing a unique perspective on the buying process due to the simultaneous buyer-observer role (Finn, 2001; Peterman & Young, 2015). Data generated in mystery shopping are less distorted than in classic consumer surveys and are characterized by a higher data quality (Finn & Kayandé, 1997; Finn, 2001; Porter & Heyman, 2018) when a structured approach of checklists and codes is used to collect performance and service information (Grove & Fisk, 1992). Mystery shopping is seen as an effective tool for building in-depth knowledge about the customer's perception of receiving the service (Finn, 2001) and as a diagnostic tool for identifying deficiencies in the company's internal processes (Guzman, 1992; Wilson, 1998b; Finn & Kayandé, 1997; Finn, 2001).

In recent years, concerns have occasionally been raised about mystery shopping as it is considered unethical to collect personal data without the knowledge of those being observed (Douglas, 2015). Particularly, the collection of individual data which could be misused and lead to negative personal consequences for those observed, must be classified as an unacceptable consequence of scientific research. Even though we fully recognize and concur with these legitimate concerns, they should not discredit the research methodology of mystery shopping per se. In order to avoid the so-called 'Hawthorne effect' (Adair, 1984), the research subject cannot simply be revealed before or within the research process as individuals change their behavior when they know they are being observed (Calvert, 2005). Accordingly, we ensured in our study that the collected data were not used to assess any individual performances by employers. The respondents were informed about the purpose of the scientific study following the simulated conversation and raised no objections. The data remained exclusively with the researchers and were analyzed only on an aggregated and anonymized basis (Kehagias et al., 2011).

Since the objective of this study was to assess the attitudes of dealers toward ADAS, the conversation was directed specifically toward which ADAS were available and whether they were recommended from a dealer's perspective. With regard to ADAS requiring explanation, it was inquired whether there was any introduction for customers on how to use them at the time of delivery. Without addressing the OEM-dealer relationship directly, all statements from the dealers were recorded, from which conclusions could be drawn about this relationship with regard to the introduction and distribution of ADAS. After the conversations, the interviewers carried out an expert ranking of the dealers' attitude towards ADAS using a scale from 0 (very low) to 10 (very high).

The study comprised a total of 17 car dealers across ten brands at five locations in Germany in September 2021 (see sample characteristics in Table 5). Incidentally, it can be reported that, following the study, one of the test leaders actually ordered a vehicle from one of the dealers.

Although this is a data collection study in the context of a real car purchase, we will continue to refer to it as mystery shopping for simplicity's sake. The following evaluations relate

exclusively to information about ADAS and the manufacturer-dealer relationship in this context (ignoring, e.g., any price negotiations or further ADAS-unrelated issues). Individual statements are not assigned on a regional, brand/dealer-specific or person-related basis, so that the aforementioned standards relating to the protection of the professional salespeople contacted have been fully taken into account.

3.4.2 Results and discussion

The interrogated dealers made a total of 74 topic-related statements during the interviews. The statements were grouped with respect to the six categories identified during the development of the semi-standardized mystery shopping guideline (i.e., dealer's perception of ADAS and HMI design, pricing and packaging, introduction and training to ADAS, dealer's attitude towards ADAS and OEM-dealer collaboration). All topic-related statements fit well into these pre-defined categories, but we had to make a further distinction between *non-intervening ADAS* (i.e., ADAS, which do not directly intervene in the driver's driving, such as a 'Park Distance Control') and *intervening ADAS* (i.e. a system, which can perform a complex intervention in the driver's driving, e.g., 'Lane Keeping Assistant' or 'Traffic Jam Assistant'). For each of these seven categories, the two most illustrative dealer statements are enclosed in Table 4.

The statements show that non-intervening ADAS were well received by the dealers and were seen as sensible features, which should unquestionably be built into a new car. Accordingly, these ADAS were highly recommended by all observed dealers. Besides ACC, most intervening ADAS tended to be seen as gimmicky or even unnecessary features. Some dealers actually opposed buying most of the intervening ADAS.

Aside from the intervening ADAS, the dealers also tended to evaluate the HMI design of their vehicles rather negatively. Thereby, they drew upon their experiences with existing customers who often complain about the design of the vehicles' interfaces, indicating that users are not very comfortable with the handling of the often complex and irritating HMIs: "Many customers complain that the radio no longer has buttons, the daily km counter is no longer there etc. Such information is not taken into account by the OEM. As a consequence, the dealers have to deal with dissatisfied customers, although they often have the same opinion" (Dealer 1).

As cars in Germany are initially offered only in a basic version, the dealers' and customers' main task is to customize the preferred car during the sales process. Afterwards, the dealers order the customized cars from their OEMs (make-to-order system) and the customers have to wait for 4-6 months for the delivery. The customization process at the dealers revealed that most ADAS cannot be bought individually. Instead, ADAS are mostly integrated within certain packages and are often combined with non-ADAS features (e.g., BMW's Innovation Package, which combines

LED headlights and navigation system with intervening ADAS in the form of a Driving Assistant): "Most ADAS are included in packages anyway, whether you like it or not" (Dealer 11).

Category	**Illustrative Quotes** [Interviewee Number]	Connotation		
		positive	negative	neutral
Non-intervening ADAS	• *The rear-view camera is an extremely good feature. [17]* • *I would highly recommend the park distance control and the rear-view camera as very helpful ADAS. [6]*	8	1	0
Intervening ADAS	• *ADAS like ACC increase comfort and safety, especially on longer journeys. [11]* • *Why don´t you buy some nice rims instead. [7]*	12	19	0
HMI Design	• *The distraction caused by the non-intuitive design of the HMI is a real source of danger for road traffic. [17]* • *Customers complain that the radio no longer has buttons, that the mileage counter is no longer there, etc. Such information is not taken into account by the OEM. Therefore, we have to deal with dissatisfied customers, although we often have the same opinion. [1]*	0	4	0
Pricing and Packaging	• *The blind spot warning costs 540€ extra; and the APAS only costs 350€ despite the considerably larger sensor packages required. That is inappropriate! [4]* • *Most ADAS are included in packages anyway, whether you like it or not. [11]*	3	7	3
Introduction to/ Training in ADAS	• *ADAS are almost never presented to customers. They can get info on YouTube. [8]* • *Instructions are available if customers request them. [1]*	2	6	0
Attitude of Dealer towards ADAS	• *I myself quite like to drive with ADAS. [11]* • *APAS are dispensable: You try it 2-3 times, maybe to impress others. But in the end, you are much faster at parking yourself, because the parking results of the APAS are still disappointing. [8]*	3	1	0
OEM-Dealer collaboration	• *Dealer feedback is not even taken into account by the OEM's R&D. They just do what they want. [10]* • *Honestly, our last training with the OEM was a very long time ago. [13]*	0	5	0

Table 4: Grouped Dealer Statements

Although OEMs' packaging strategies are not publicly disclosed, the impact of mixed packages is evident. By bundling ADAS with highly demanded non-ADAS features, OEMs promote market diffusion of specific systems. Consequently, prices are largely decoupled from the R&D and production costs of individual ADAS and follow a diffusion-oriented rather than a customer value–based pricing logic (Harris & Blair, 2006; Reinders et al., 2010; Stremersch &

Tellis, 2002; Kleinaltenkamp et al., 2022; Zeithaml et al., 2020). Some strategies are surprising even to dealers, such as complex ADAS being offered at low prices while simple rearview cameras are priced disproportionately high.

The dealer survey further revealed that customers are rarely introduced to or trained in the use of ADAS, consistent with prior research (Kaye et al., 2022). As a result, some customers are unaware of owning ADAS or do not know how to operate them. Our first study (Section 3.2.2) showed that introducing customers to ADAS positively affects both adoption and diffusion. Accordingly, system introduction should become standard in the vehicle handover process, which would require regular dealer training by OEMs—currently largely absent.

Of the 74 dealer statements, 58.1% were negative, 37.8% positive, and 4.1% neutral, indicating a predominantly negative dealer perception of ADAS. This aligns with expert ratings (Table 5), which ranged from 2 to 8 on a 0–10 scale (M = 5.9, SD = 1.59). Such a mediocre dealer attitude likely contributes to ADAS sales falling short of OEM expectations.

Sample characteristics of Informants			**Expert ranking of dealers' attitude to ADAS (0-10)**
Dealer 1	Location 1	Brand 01	5
Dealer 2		Brand 01	5
Dealer 3	Location 2	Brand 02	4
Dealer 4		Brand 03	7
Dealer 5		Brand 04	8
Dealer 6		Brand 01	8
Dealer 7	Location 3	Brand 05	7
Dealer 8		Brand 06	6
Dealer 9		Brand 01	2
Dealer 10	Location 4	Brand 01	7
Dealer 11		Brand 07	6
Dealer 12		Brand 08	7
Dealer 13		Brand 08	6
Dealer 14	Location 5	Brand 07	5
Dealer 15		Brand 09	6
Dealer 16		Brand 10	4
Dealer 17		Brand 01	8

Table 5: Sample characteristics and expert ranking of dealers' attitude to ADAS

As these negative dealer statements came by surprise, the interviewers wanted to learn more about the motivation behind these negative statements. Selected dealers opened up and complained about the low marketability of the newest ADAS generations. Some of these systems tend to

malfunction, feature user-unfriendly HMIs, and are significantly slower than an experienced driver is when parking:

"ADAS like APAS are really dispensable: You try it 2-3 times, may be to impress others. But in the end, you are much faster at parking yourself, because the parking results of the APAS are still disappointing." (Dealer 8)

The dealer survey thus shows an unambiguous dilemma of interests: While the dealers are not negatively disposed towards ADAS per se, but even recognize particularly the non-intervening ADAS as an enrichment, the dealers are highly frustrated because their reported customers' experiences and suggestions are largely ignored by the OEMs:

"What the dealers report back is not even taken into account by the OEM's R&D. They just do what they want." (Dealer 10)

Given the close collaboration of OEMs and their German authorized car dealers ("Vertragshändler"), who are the OEMs' exclusive 'face to the customer', it is surprising to disclose these severe communication problems between these relevant players in the value chain. Combined with the dealers' low regard for their own offerings, it is only logical that dealers play it safe, i.e., they only recommend features/ADAS that actually work. They are determined to reduce the number of complaints and thus ensure (long-term) customer satisfaction. This strategy of course contradicts the OEMs' as well as the TIER-1 suppliers' intention to push their newly developed ADAS into the market.

We found that such dealer behavior does not result from a lack of self-motivation of the dealers' salesforce, but from the fact that their customers' experiences and suggestions are largely ignored by the OEMs. However, it is imperative and a matter of priority to obtain the experiences of their employees with real customer contact, i.e., its own salespeople, in order to critically review the company's performance. Yet automakers seem to ignore this valuable information from dealers and end users and fail to incorporate it into their own development and innovation processes, even though it is so easy to obtain.

3.5 OEM and TIER-1 Survey (Study4)

Following the discovery of significant imbalances in the relationship between automobile OEMs and their dealers, we extended the analysis by including selected OEMs and TIER-1 suppliers. This expansion was aimed at gaining a comprehensive understanding of the innovation generation process and the dynamics at play between these two entities.

3.5.1 Method and sampling

Over a period of 5 years (2018-2022), a series of meetings and expert interviews were conducted with individuals representing TIER-1 suppliers, engineering service providers, and OEMs. The primary objective during these interactions was to gain a deeper understanding of the product development and innovation process of the APAS.

The experts interviewed comprised representatives from two TIER-1 suppliers, from one engineering service provider, and from two OEMs. Building on the insights garnered from the prior end user and dealer surveys, a total of 12 representatives from five distinct companies were interviewed. These representatives hailed from various departments, including Research and Development (R&D) [4], Testing Department [3], User Experience (UX) Department [3], Marketing & Sales [1], and Product Management [1]. Additionally, alongside the interviews, we were granted access to pertinent product development planning documents (table 6).

Representative	Department	Company
Director R&D PAS	Research & Development	TIER-1 I
Manager R&D PAS	Research & Development	TIER-1 I
Team Lead PAS Testing	Testing	TIER-1 I
Technical Project Manager	Testing	TIER-1 I
Director R&I	User Experience	TIER-1 I
UX Research Manager	User Experience	TIER-1 I
Parking End User Manager	Research & Development	TIER-1 II
Head of R&D	Research & Development	Engineering Service Provider
Head of UX	User Experience	Engineering Service Provider
Head of Test Locations	Testing	OEM I
Marketing Strategy Specialist	Marketing & Sales	OEM II
Product Manager	Product Management	OEM II

Table 6: Sample characteristics of OEM and TIER-1 Survey

3.5.2 Results and Discussion

The interviews unveiled that an ADAS primarily functions as a software platform with distinct features (e.g., Adaptive Cruise Control, APAS and Drive Pilot). These platforms are initially provided in a standardized form to individual OEMs, who, in turn, request specific customizations to seamlessly integrate the specific ADAS into their own systems/car. Accordingly, both the TIER-1 and OEM teams already engage in the early stages of their ADAS development projects to determine the specifications and various work packages.

Depending on the scale and complexity of the project, the TIER-1 supplier may deliver the entire ADAS system, encompassing the software platform, hardware components, and user interfaces, or alternatively, specific components as needed. Given that German OEMs still perceive themselves as the primary coordinators within the automotive value chain, they frequently opt for contracting solely the software platform. Consequently, the supplier must synchronize its software with ADAS hardware providers, various internal OEM systems, and the subsequent user interfaces. This collaborative product development and testing process unfolds as a challenging coordination effort across diverse departments and companies.

Furthermore, the development process follows a simultaneous engineering approach (Barius, 1994; Shenas & Derakhshan, 1994), meaning that the design of the product, the software specifications, and the components remain subject to continuous evolution over the course of months or even years. Consequently, no development collaborator has the opportunity to fully optimize their system in alignment with the constantly evolving final product. This poses a significant challenge for the engineers and IT specialists from various partners, as they must ensure their products meet all the specified requirements, keep up with ongoing changes initiated by their partners, and adjust their products and processes accordingly.

The interviews with TIER-1 suppliers and the engineering service provider confirmed that the development of an APAS primarily represents a technical endeavor in which engineers and IT specialists work diligently to ensure the creation of an operational system. From the perspective of TIER-1 suppliers, end users play a minimal role in the system specification process and are seldom engaged in the testing phase (with only a few employees chosen randomly for test drives). Throughout the entire product development process, both TIER-1 suppliers and the engineering service provider are solely focused on adhering to the test specifications provided by the OEMs. The exact methodology for establishing these test specifications is undisclosed to the suppliers. Nonetheless, the interviewees concurred that the OEMs' specifications do not always align with technological or user-oriented logic and often introduce unnecessary complexities and costs. Consequently, a more coordinated approach to determining both product and test specifications across all stages of the market would be highly beneficial and well received.

The interviews conducted with the OEM representatives validated the predominantly technical orientation of product development projects. Even though the OEMs boast an extensive UX department, its impact on vehicle design appears to be constrained. Instead, it is the OEMs' sales department that exerts the most significant influence by determining which features and ADAS are integrated into the cars, consequently shaping their packaging and pricing. The extent to which end user preferences and feedback from dealers factor into this decision-making process remains unclear. When addressing the question of why the end-user perspective is not sufficiently involved into the car development and testing phases, one of the respondents answered: "*Why do you think someone becomes an engineer or IT specialist…?*"

Regarding the development of ADAS, all the interviewed partners concurred that the innovation generation occurs in an evolutionary fashion. Each generation of ADAS introduces some new and innovative features, though the interviewees would describe these innovations as incremental, transitioning from one ADAS generation to the next one.

3.6 Discussion on Stakeholders' Goals and Goal Structures

Considering MSM's holistic view of innovation generation and adoption, it is crucial to explore the interdependencies of our four empirical studies. Using the value assessment framework (Kleinaltenkamp et al., 2022), encompassing individual and collective desires, we contextualize and evaluate stakeholders' goals and goal structures across the multiple market stages. While none of our studies explicitly aimed to uncover stakeholders' goals, our data offers nevertheless valuable insights.

Our findings reveal that suppliers prioritize shared objectives over their employees' individual goals. They focus on securing OEM contracts and meeting test criteria, sometimes irrespective of their economic or technological sensibleness. Even when disturbances like low APAS sales arise, suppliers still prioritize compliance with the OEMs' evaluation criteria over meeting the needs of end users due to their funding dependence. This limits the suppliers' marketing focus to their immediate clients, the OEMs, without challenging the OEMs' position in the automotive value chain by establishing or exerting any influence further down the value chain (e.g., in the form of involving dealers and end users more in their development process).

Interestingly, the collective goal structure of suppliers does not appear to clash with the individual aspirations of their employees, such as taking pride in their jobs or in the products they develop. Most engineers and IT specialists seem content with their roles, relishing the opportunity to work on cutting-edge technologies like APAS and collaborate with premium OEMs. Only the two most influential team leaders chose to depart their respective companies, moving on to new managerial positions at different OEMs.

OEMs position themselves as the key players in the automotive value chain, perceiving the development of ADAS primarily as a technological challenge. Their primary priorities include adhering to defined development timelines, ensuring the ADAS functions according to specified test criteria, and avoiding any additional complexities in their intricate passenger car products. Economic considerations, and particularly those related to end-users, appear to be of secondary importance. As the development of the APAS is viewed as an incremental innovation (from one APAS generation to the next), the dealers also do not receive any specific attention from the OEMs and are simply regarded as the OEMs' extended operational salesforce. They are just assumed to sell cars – no more and no less.

Dealers primarily focus on maximizing the sale of passenger cars, preferably with a rich set of car features to boost their revenues. While these collective goals often align with individual sales success, our study has revealed that dealers' individual goal structure is more diverse than anticipated, particularly in the context of selling ADAS.

Drawing from their personal experiences and customer interactions, dealers provide advice on car configurations. They aim to promote as many features as possible while mitigating potential risks of future complaints, even if it contradicts the product policy of the OEMs. Our empirical findings indicate that dealers generally lack strong conviction in the currently available ADAS solutions. Consequently, they actively discourage customers from purchasing these features, all without perceiving themselves to be in a loyalty conflict. This is further amplified by the perception that OEMs tend to disregard any suggestions or feedback from the dealers and their customers.

End users display a remarkable willingness to embrace new technologies, often for the sake of experimentation or to showcase the latest innovations, even though they harbor significant apprehensions regarding the reliability and safety of ADAS (Riedl & Wengler, 2019). According to the data from our first two studies, end users' individual desires for ADAS increase with mere exposure. Unfortunately, exposure of ADAS is hardly provided in the automobile value chain – due to the OEMs' myopic sales strategies and the dealers' reservations concerning the offered intervening ADAS.

The evaluation of stakeholders' goals and goal structures thus reveals that most goals are self-directed or, at best, oriented toward direct customers. Goals related to indirect customers or even end users, which is the central focus of MSM, were either absent or given lower priority. Dysfunctional distortions in the value chain are the consequence, stemming from an incomprehensive understanding of other stakeholders' goals and positions within the value chain, for instance, the role of dealers as both generators and adopters of an innovation. Hence, the absence of alignment among stakeholders' goals across the multiple market stages significantly impedes the diffusion process of the intended innovation. This could lead to a considerable slowdown in innovation adoption or even its ultimate failure, despite the end users' favorable attitude toward it.

4 Integrative Discussion

4.1 Theoretical Contributions

This paper extends research on customer-perceived value creation by advancing a MSM perspective that explicitly prioritizes end users (Homburg et al., 2014; Homburg et al., 2020; Möller et al., 2020; Wengler & Kolk, 2023). Building on established work on customer-perceived value (Eggert et al., 2019; Zeithaml et al., 2020) and value creation (Eggert et al., 2019; Eichentopf

et al., 2011; Grönroos, 2011), we argue that MSM is particularly consequential in complex value-creation settings where multiple stakeholders shape innovation outcomes across several market stages.

The APAS case illustrates this structure clearly: *innovation generation* is mainly shaped upstream by Tier-1 suppliers and OEMs, whereas *innovation adoption* is mainly determined downstream by dealers and end users. This separation increases the likelihood that innovation decisions optimized for upstream criteria yet fail to translate into downstream value assessments and adoption behavior—an effect that is difficult to capture with single-stage or purely dyadic lenses.

An MSM perspective makes stakeholder heterogeneity explicit—especially differences in value assessments and goal structures (Kleinaltenkamp et al., 2022). In the APAS context, upstream stakeholders may prioritize technical performance and integration, while downstream stakeholders emphasize usability, trust, learning effort, and complaint risk. In this manuscript, goal structures are not treated as directly measured constructs; rather, they serve as an interpretive mechanism to organize cross-stage patterns and motivate targeted future measurement.

Our reasoning also connects to *market innovation* and *market shaping*, where focal firms and value chains can influence preferences and structures (Jaworski et al., 2020; Nenonen et al., 2019; Sprong et al., 2021). From an MSM vantage point, market-shaping efforts are more sustainable when anchored in a value-creating innovation orientation, i.e., when end-user value creation precedes firm-centric value capture (Nenonen et al., 2019). This matters especially for sustainable innovations in mature industries, where market change may depend on indirect forces (e.g., dealers, regulators) that translate innovation into commercialization outcomes (Aarikka-Stenroos & Lehtimäki, 2014; Keränen et al., 2023; Varadarajan, 2017).

While research has long acknowledged the complexity of innovation generation and adoption (Bessant et al., 2014; Damanpour, 2020; Sandberg & Aarikka-Stenroos, 2014), our evidence is consistent with the view that upstream decision-making can remain overly oriented toward internal or direct-customer considerations at the expense of downstream market learning and end-user expectations—conditions under which goal misalignment can shape value assessments and behavior (Kleinaltenkamp et al., 2022).

In sum, this paper contributes by (1) offering MSM as a practical lens to diagnose cross-stage value creation by mapping stakeholders, roles, and stage-specific frictions; (2) highlighting a recurring risk in multi-stage systems—stage-decoupled value assessments and misaligned goal structures—that can impede diffusion; and (3) foregrounding dealers and end users as commercialization-critical actors for complex innovations.

4.2 Managerial Implications

Consistent with the view that innovation generation and adoption should be analyzed jointly (Damanpour, 2020; Vargo et al., 2020), two managerial implications follow.

First, manage innovation as a multi-stage adoption system, not a single-stage launch. Innovation increasingly spans multiple market stages and stakeholder groups beyond the direct customer. Effective commercialization therefore requires extending analysis and decision-making to indirect customers and third parties—up to the end user (Kleinaltenkamp et al., 2012). Our exploratory findings across four market stages illustrate that commercialization becomes particularly difficult when those driving innovation generation differ from those responsible for adoption and use. This risk increases when stakeholders diverge in perceived radicalness, because those perceptions shape managerial actions and downstream readiness. MSM mapping helps clarify (a) who is involved, (b) who generates versus adopts, and (c) where adoption frictions concentrate.

Second, treat goal alignment and feedback integration as commercialization capabilities. A multi-stage view must be complemented by systematic assessment of stakeholder goals and goal structures (Kleinaltenkamp et al., 2022). Because actors within and across firms may pursue different goal hierarchies, these differences should be surfaced and managed (Epp & Price, 2011) to reduce distortions in innovation generation and adoption.

Given the various distortions identified and shown in Fig. 3, three management priorities emerge from our studies:

1. *Institutionalize end-user integration and onboarding for complex features.* End users appear open to trying innovations but expect introduction, guidance, and support (Riedl & Wengler, 2023). Consistent with the mere exposure effect (Zajonc, 1968; Montoya et al., 2017), repeated exposure can increase desire for APAS even when performance issues persist. Structured onboarding should therefore be treated as a commercialization requirement and can mitigate feature fatigue (Marzi, 2022; Rust et al., 2006; Thompson et al., 2005).
2. *Align diffusion tactics with adoption barriers—not only with pricing logic.* OEMs have used price promotions and bundling to stimulate ADAS adoption, while customer-facing barriers often concern explanation, introduction, and training. This pattern is consistent with a gap in customer-centric market development mechanisms (Gummesson, 2008; Shah et al., 2006; Sheth et al., 2000). Combining financial levers with adoption enablement may also support acceptance of prerequisite technologies for higher levels of driving automation (Wengler et al., 2019).
3. *Operationalize the dealer's dual role and build structured market learning loops.* Evidence points to strained communication among OEM R&D, OEM sales, and dealers, consistent

with known collaboration challenges (Piercy, 2009; Storbacka et al., 2009; Kleinaltenkamp et al., 2022). Dealers represent OEMs to end users and end users to OEMs, and they function as early adopters. Partial dealer adoption—especially for intervening systems—encourages a rational emphasis on complaint avoidance and customer satisfaction, sometimes in tension with OEM push strategies. Managers should align incentives and guidance, invest in ADAS training, and implement feedback capture routines that translate dealer and customer experience into upstream decisions.

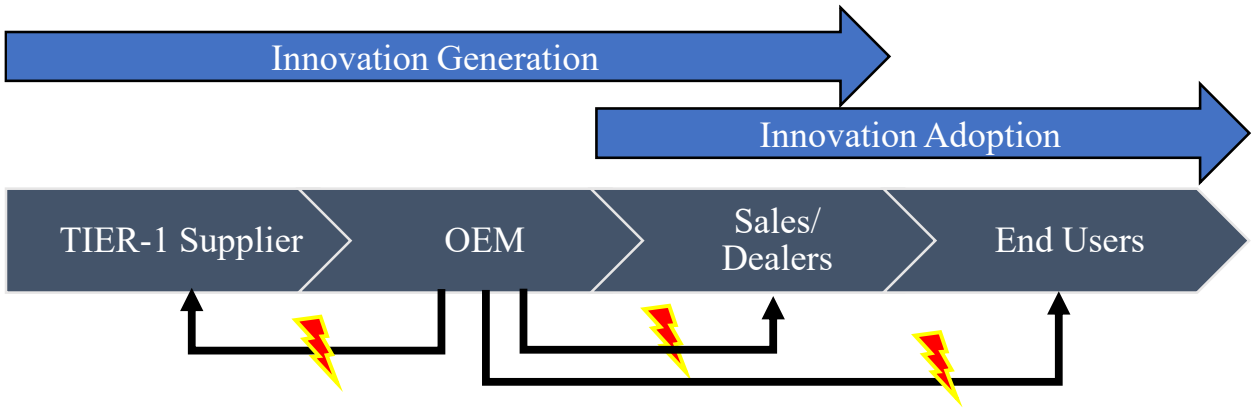

Figure 3: Distortions across the Multiple Market Stages along the Automotive Supply Chain

A related distortion can arise in OEM–supplier relationships when specifications and test criteria are set with limited dialogue, discouraging proactive supplier contributions despite relevant end-user insights. Strengthening cross-stage coordination in specification and test-definition processes can improve downstream readiness and reduce commercialization friction.

Overall, these patterns underscore the need for a deliberately managed multi-stage innovation journey (Coyne & Van de Ven, 2023; Garud et al., 2013; Van de Ven et al., 1999/2008) that systematically integrates feedback from end users and other stakeholders. MSM can also sharpen awareness of market-shaping responsibilities and identify cross-stage interventions, including—where appropriate—co-opetition to mobilize market-shaping forces (Keränen et al., 2023; Nenonen et al., 2019; Riedl & Wengler, 2023).

5 Limitations and future research directions

This paper is conceptual and draws on selective exploratory evidence to extend models of customer-perceived value creation through a multi-stage marketing dimension. The empirical insights originate from multiple independently designed studies conducted sequentially. While appropriate for a complex phenomenon, this approach constrains inference in several ways:

Design and integration. The studies were conducted sequentially rather than as one integrated design, which may introduce inconsistencies in measurement emphasis across stages.

Future work would benefit from a purpose-built multi-stage design linking constructs and outcomes consistently across stakeholders.

Inference and constructs. With the exception of the end-user survey, the studies are predominantly exploratory with comparatively small samples. Biases cannot be ruled out (e.g., self-selection in test-drive participation). Moreover, some mechanisms—particularly stakeholder goal structures—are inferred rather than directly measured. Future studies should elicit goal hierarchies explicitly and examine how goal alignment relates to adoption behaviors across stages.

Context. All studies were conducted in Germany, limiting generalizability. Comparative evidence across countries, regulatory regimes, and dealership governance models would strengthen understanding of which elements of the MSM logic transfer and which are context dependent.

We also anticipate that OEM and supplier representatives may contest some findings by pointing to existing end-user integration practices. We welcome concrete evidence and invite dialogue on what MSM-oriented value-creation processes look like in execution, including demonstrable practices and lessons learned.

Two research avenues appear particularly important:

1. *Conceptual integration with network and ecosystem perspectives.* To preserve clarity, we intentionally employ Porter's value-chain logic (Porter, 1985). Future work should clarify commonalities and distinctions between MSM and adjacent approaches—"strategic nets" (Möller & Halinen, 2017; Möller & Rajala, 2007), "supply (chain) networks" (Ellram & Murfield, 2019; Harland, 1996; Johnsen, 2018; Lambert & Cooper, 2000), "ecosystem-as-structure" (Adner, 2017; Adner & Kapoor, 2010; Kapoor, 2018), and "focal ecosystems" (Möller et al., 2020)—and connect them to customer-perceived value and value creation.
2. *Deep empirical work on goals and goal achievement across stages.* A focused study examining goals, goal structures, and goal achievement across an integrated value chain would provide richer insight into stakeholders' reasoning and the iterative innovation journey, sharpening understanding of how value assessments translate into behavior and how those behaviors shape diffusion outcomes.

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