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Business models in times of disruption: The connected and autonomous vehicles (uncertain) domino effect

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ABSTRACT

The ongoing digitalization of the economy is challenging the value creation process in traditional business. In the mobility-related industry, the disruptive potential of Connected and Autonomous Vehicles (CAV) has the capacity to transform business models. However, great uncertainty exists regarding the technological evolution and social trends that will condition businesses in the near future. This paper intends to use contingency theory to shed light on this topic and better understand the enhancers and barriers that managers should deal with to create, deliver, and capture value associated to CAV. With this aim, the paper adopts a qualitative approach based on in-depth interviews with high-level managers from different industries. The findings suggest the importance of data management to better understand the needs of the customer and vehicle requirements so that differential value can be provided. Two potential solutions that have emerged are, first, the establishment of alliances between companies competing in different areas and, second, digital platforms in order to enhance customer experience and the evolution from B2C to B2B markets associated with growing servitization.

1. Introduction

The business model refers to the logic that organizations follow to create and provide value to the market (Teece & Linden, 2017). It is thus essential to understand what potential customers consider as value to deliver it through different business processes (Spieth & Schneider, 2016). Nowadays, growing digitalization is affecting the essence of value creation and, consequently, the configuration of many business models, favoring the apparition of new players in different industries (Medina et al., 2022; Venkatesh et al., 2019). The greater competition to achieve a minimum efficient scale, together with the rapid increase of technology in business (Correljé & De Vries, 2008) and the reduction of entrance barriers, encourages technological companies to compete in traditional industries through alternative business models (Loebbecke & Picot, 2015).

However, this adaptation is not trivial, and managers are required to comprehend intrinsically both their technological possibilities and the characteristics of different environments (Foss & Saebi's, 2017). This happens because changes associated with digitalization are potentially disruptive in nature, as they have the capacity to alter the business environment, generating threats to traditional business models (de Groote et al. 2019; Medina et al., 2022). Disruptive innovations encompass technology and business models that modify previous markets creating new opportunities (Christensen & Raynor, 2003). In this regard, disruptive companies take advantage of these opportunities by offering products and services with greater functionality that cover needs ignored by companies established in the market and focused on traditional products (Christensen et al, 2015). Digitalization is largely considered the next disruptive event in global terms (Kraus et al., 2019). The ambiguity linked to digitalization creates a great deal of uncertainty for managers and is still poorly studied by scholars (Li, 2020).

Among those traditional businesses affected by digitalization and uncertainty it is possible to identify mobility, which is highly affected by automation and connectivity (Turienzo et al. 2022). Recent technological advances allowed the automation of complex and changing processes, favoring partial autonomous driving (Epting, 2019) and connectivity (Whittle et al., 2019). In this line, Connected and Automated Vehicles (CAV) become a disruptive technological innovation capable of replacing traditional mobility (Shergold, 2019) and creating a new business ecosystem favored by their technical capabilities (Nikitas et al., 2019). This disruption goes beyond the CAV itself and it will affect new mobility concepts, which will necessarily have to update their

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service portfolio to satisfy innovative market demands based on intensive data collection and management (Athanasopoulou et al., 2019).

The uncertainty associated with the disruptive potential of CAV and their eventual contingencies requires an in-depth analysis (Marletto, 2019), particularly from the business perspective, which is an issue not addressed in current literature (Nikitas et al., 2019; Alhajyaseen et al., 2020). For instance, due to the great potential interrelationship between CAV and mobility-related business models (mobility companies, service areas, logistics companies, workshops, or infrastructure managers), traditional companies should consider new strategies and business propositions to ensure their viability. Therefore, the paper aims to answer the following research question: *How can CAV affect mobility-related business models and their ecosystems?*

This question will help understand how CAV implementation for private car users can influence other businesses, technological developments, and regulations (Monios et al., 2019). Through the lens of the contingency theory (McAdam et al., 2016), this paper explores how mobility-related managers adapt their business activity to external changes (namely digitalization of vehicles) to take advantage of future business opportunities and reduce risks (Donaldson, 2006). As the paper discusses a very innovative topic, it follows an exploratory qualitative approach supported by Grounded Theory (Johnson, 2015). To that end, a series of in-depth interviews were held with senior strategists from different industries working in innovative solutions for mobility and then triangulated with literature review results and secondary sources. The sample captured a wide diversity of subjective viewpoints that allowed a holistic approach to address the complex and heterogeneous challenges related to the future of CAV. This research contributes to the literature, first, by providing a comprehensive analysis of the contingencies that will face mobility-related business models with the irruption of CAV and, second, by suggesting a series of potential managerial solutions that companies can consider in order to take advantage of the opportunities. Those potential solutions include the personalization of services and the need to establish alliances with technological and data management companies. In addition, those firms oriented to insurance, maintenance and care of vehicles may be required to move from Business-to-Consumers (B2C) to consider Business-to-Business (B2B) settings, as they will have to negotiate with companies instead of final customers, changing the traditional rules of the game.

The paper starts with the conceptual background in order to understand the contingencies of CAV in business, paying special attention to disruptive innovations and business models. Next, the methodology is described, including details of the sample, data collection and the analysis performed. There is then an explanation of the results and a discussion of the research question before a section providing conclusions.

2. Conceptual background

2.1. Disruptive innovations and business models in the digital era

Digitalization and its related innovations, jointly with the evolving nature of users' preferences, are becoming a challenge for many companies. The internet of things and machine learning offer new opportunities but also threats that both B2B and B2C companies cannot address with existing business models (Ehret & Wirtz, 2017). Lower entry barriers, greater competition and the growing digital culture of customers are the greatest threats and opportunities (Venkatesh et al., 2019). Managers should thus consider designing and implementing business models based on digital environments (Veit et al., 2014) and transform the logic of value creation, delivery, and capture according to users' demands (Spieth & Schneider, 2016; Teece & Linden, 2017). Among them, the co-creation practices and redesign of business models with clients allow companies to generate continuous and sustainable value (Chesbrough, 2011). This would favor the modification of the business ecosystem, that is, the structure of interdependences among stakeholders during the process of value creation of a certain business model (Ganco et al., 2020; de Vasconcelos Gomes et al., 2022). For instance, some specific software applied during decision-making may let companies reduce or eliminate their traditional operational restrictions and compete in unprecedented ways (Iansiti & Lakhami, 2020).

Digitalization enables the connection between the actors downstream and upstream of the value proposition (Pagani & Pardo, 2017). Data management linked to digital platforms will be particularly valuable, as it has the capacity to transform business models (Palos-Sánchez et al., 2021; Veile et al., 2022), the success of which in terms of market performance will be based on big data analytics (Olabode et al., 2022), Artificial Intelligence capabilities (Sjödin et al., 2021), and B2B buyer–seller interaction based on reputations (Mora Cortez et al., 2022). This capacity to manage data and transform it into knowledge becomes central in the interaction with customers and sales (Ritter & Pedersen, 2020). The adoption of digital tools (e.g., AI and platforms) thus has potential to disrupt traditional markets and business models, opening new scenarios (Christensen & Raynor, 2003), exponentially scaling-up the company's business model, enabling it to rapidly surpass traditional ones (Iansiti & Lakhami, 2020). Consequently, the disruptive potential allows companies with limited resources to challenge established companies in a market (Christensen et al, 2015).

At this crossroads, organizations must balance their internal capabilities and the need to adapt to the environment (Morgan, 1986), that is, how to adjust strategies to the future digital reality (Reim et al., 2019). The effectiveness of a business model will depend on how its characteristics are adapted to the changeable contingencies shaped, in this case, by growing digitalization (Donaldson, 2001) and the market turbulence associated with technological changes (Wang et al., 2022). For the constitution, design, and analysis of a business model it is essential to consider the dynamic relationships between actors, technology, and market considerations (Wieland et al., 2017). In such novel situations, where there is a lack of theoretical framework, the application of contingency theory allows the identification of strategic variables to be included in the analysis (De Clercq et al., 2014; González-Rodríguez et al., 2018). Accordingly, companies will attempt to align their strategy with contingency factors that will appear in highly changing environments in a dynamic and continuous process (Daft et al, 2010). Although in the first phases of the disruptive innovations there are no ideal business models (Teece, 2010), as innovations settle in society most alternative models converge in an adjusted and renewed business model (Morris et al., 2005; Chesbrough, 2010; Wang et al., 2021). That is why it is important to define those contingent factors that will affect future opportunities in order to anticipate the decision-making about how value will be created and delivered (Wang et al., 2019). Particularly, in the case of new mobility, where the near-future evolution of business models is still to be written, company characteristics become an interesting perspective for analysis (Massa et al., 2017).

2.2. The disruptive potential of CAV

The arrival of CAV brings digital innovation with a great capacity to optimize business models (Turienzo et al., 2022). The impact of CAV on business models will grow because of the intention of the technology firms and automotive industry to increase the automation level of vehicles (Epting, 2018). For instance, CAV deployment could alter mobility through increased security in terms of safety (Epting, 2018), availability of travel time (Turienzo et al., 2022), geographical and personal social inclusion (Epting, 2018), minor environmental impact (Nikitas et al., 2019), and could modify business models due to their capacity to generate data, connectivity, and autonomous driving (Turienzo et al., 2022). To make the most of those advantages, companies are interested in developing the disruptive potential of CAV to diversify their services into new market propositions (Marletto, 2019). However, there are doubts about CAV safety affecting both public opinion (Alhajyaseen et al., 2020) and policy makers (Corwin et al., 2019). Following the contingency approach, the CAV-related industry must have the capacity to align with legislation and governmental commitments and the investment in infrastructures that allow full and effective implementation (Marletto, 2019). In general terms, contingencies can be classified into five large groups: (1) legislative; (2) technological; (3) business environment; (4) socioeconomic; (5) geographic and infrastructure (Wade & Hulland, 2004; Hughes & Scott Morton, 2006; Wiengarten et al., 2013). However, such important contingencies as regulation and public acceptance require management by the traditional or new mobility firms.

In addition, the growing trend towards servitization (Mobility-as-a-Service or MaaS) affects multiple areas such as public mobility systems (Nikitas et al., 2019), service areas and gas stations (Clements & Kockelman, 2017), workshops (Pütz et al., 2019), parking (Harper et al., 2016), commerce (Bridgelall & Stubbing, 2020), logistics (Heard et al, 2018), insurance (Pütz et al., 2019), or infrastructure (Liu et al, 2019). The connection between CAV and MaaS will require streamlined resources and greater third-party resource integration to optimize and increase operational efficiency (Smith et al. 2020). Growing servitization, as another contingency factor, makes it possible to adjust market propositions to user preferences and behaviors, and thus data collection and analysis gain importance (Gonçalves et al., 2020).

The relevance of data management is increasing as it facilitates the design of sustainable business models (Luoma et al., 2021). In this sense, there are three types of data depending on their source (Lüdeke-Freund et al., 2021): (1) life cycle of services or products (very useful in the R&D of products and services); (2) business and operational data (enables improvements in business operations); (3) social trends (forecasts of business requirements, needs, opportunities, and threats). Consequently, data management is an interdisciplinary concept that should be able to integrate different types of information from the different management systems in the firm (Mennes, 2020).

Moreover, companies from multiple industries see the potential of mobility data management to deploy more user-centered mobility models, and this is reflected in the entrance of business models and innovative ideas associated with multisector companies (high-tech companies, telecoms, IT corporations, venture capitalists, data management companies, or energy firms) (Cassetta et al., 2017). Continuous and extensive data analysis to optimize services based on CAV innovation is expected (Altintasi et al., 2017; Smith et al., 2020). Through integrated data management, it will be possible to improve the whole business ecosystem (Smith et al., 2020), obtaining key performance indicators (KPIs) that are useful for policymakers and industrial operators (Pirra & Diana, 2019) and for understanding the end-user's requirements (Mora Cortez & Johnston, 2017). This "intrusion" of new players could be considered by traditional business models as a new contingency to deal with either from a competitive or a cooperative perspective.

Management of the situation can therefore become extremely complex, as new digital technologies and actors emerge in a scenario where user adoption and regulation are still unclear (Foss & Saebi's, 2017). Thus, the future is uncertain as various scenarios arise based on external constraints and contingencies, and managers should pay special attention to market changes (Veit et al, 2014). However, the literature to date does not study the impact of CAV on mobility-related business (Nikitas et al., 2019; Alhajyaseen et al., 2020). Therefore, it is critical to analyze how businesses might be affected by CAV beyond the automotive and IT industries to forecast the potential influence their deployment will have.

3. Methodology

3.1. Research settings

The effect of vehicle digitalization (i.e., CAV) in mobility-related business models is a novel, complex, and uncertain topic that requires a prospective approach beyond conventions (Plakoyiannaki & Budhwar, 2021). It means the need to develop new insights and theory, and the approach selected here is exploratory qualitative research because it provides an understanding of the management phenomena and challenges from the perspective of those who experience them (Lindgreen et al., 2021; Plakoyiannaki & Budhwar, 2021; Pratt et al., 2022). Therefore, the core of this research approach is to generate explanations of such reality through the analysis of participants' points of view (Johnson, 2015; Toussaint et al., 2021). It motivates the application of Grounded Theory (GT), an analytical method that allows behavioral and managerial patterns to be discovered through data analysis (Lindgreen et al., 2021; Toussaint et al., 2021). For instance, GT is useful to explore a previously unexplored literature field and identify new perspectives and frameworks to define elements of interest (Keränen & Jalkala, 2013).

This theory development requires an iterative process connecting the reality companies are facing with prior theory (Johnson & Duberley, 2015), in this case the contingency approach, to comprehend how companies prepare their activities for this new situation. The data collected from experienced practitioners in the field of analysis can explain how companies are applying contingency strategies to adapt the characteristics of their business models to the new scenario (Massa et al., 2017). The descriptions provided through interviews, rich in nuances and details from knowledgeable participants, are transformed into information through open, axial and selective coding to comprehend how managers are shaping business models (Creswell, 2007; Lindgreen et al., 2021). These descriptions can be extrapolated to answer "how", which is a useful approach for the purpose of this research (Elharidy et al., 2008). Therefore, given the limited evidence about the influence of CAV on future mobility-related business models, the qualitative research applying GT was deemed appropriate.

3.2. Sample and data collection

The sample for this research is purposive and dynamic, including specialists with extensive experience and responsibilities in future business models associated with new mobility. It involves specialists with wide-ranging expertise on the topic from different industries following the maximum variation criterion in the sampling: telecoms, consulting, workshops, infrastructure firms, energy companies (oil and electricity), insurance and public agents (Engel & Schutt, 2010). As Table 1 reflects, the sample incorporates general and strategic managers in leading international companies, but also R&D technicians and researchers in mobility and related business agents that allow different lines of enquiry to be identified (Plakoyiannaki & Budhwar, 2021). It

Table 1
Interviews information.

#	Position	Industry	Duration
#1	Strategy Manager	Telecom	36
#2	Economic promotion manager	Public business developer	56
#3	R&D Manager	Engineering company	39
#4	Senior strategic mobility consultant	Consultancy	68
#5	Business Manager	Oil company	56
#6	R&D Manager	Consultancy	96
#7	Business Transformation Manager	Insurance company	38
#8	Corporative Strategy Manager	Oil company	37
#9	Director	Mobility consultancy	49
#10	Strategy Manager	Consultancy	37
#11	Responsible for Operation, Maintenance and Life Cycle	Infrastructure Development	26
#12	Strategy Manager	Consultancy	39
#13	Mobility manager	Electric utility company	51
#14	ITS Manager for Centre of Excellence for Mobility	Infrastructure Development	77
#15	General Manager	Workshop	36
#16	Responsible Innovation Projects	Telecom	59

was a dynamic and adaptative process to obtain the highest value from individual respondents, and also to take advantage of access to new interview opportunities (Bansal et al., 2018). Once detected, more than 30 candidates were contacted by e-mail, LinkedIn, and phone to assess their willingness to collaborate and explain the nature of the survey and terminology used. The adequacy of interviewees was verified through a series of questions regarding the relationship between mobility and their companies, their strategies and technological development.

The interviews were held online due to pandemic restrictions. The same script was used to follow a similar approach in all interviews, and only one researcher participated when required so as not to influence answers (Kuckartz, 2014). The script was built from the literature review, including these blocks: (1) sources of value creation in new mobility, (2) the innovation provided by CAV, (3) assessments of social impacts of CAV, (4) expected evolution of business with the irruption of CAV, (5) expected impact on their industry, (6) process timeline (see appendix 1). With a view to testing the script, an interview was developed with a scholar who was unrelated to the research.

Data was collected from August 2020 to February 2021 through interviews lasting between 30 and 100 min. All interviews were recorded with descriptive and reflective notes regarding the behavior and reaction of the experts (Spry & Pich, 2020). That led to 147 pages of information and 14 h of recordings. The sampling and data collection occur in parallel with data analysis, in a dynamic process that allows the richness of information to be improved (Glaser & Strauss, 2009); comments and annotations were analyzed to complement the results.

3.3. Data analysis

As the qualitative collection gathered a large amount of data, it was essential to implement agile coding and information analysis methods (Johnson, 2015). Matrices were applied to synthesize the perspectives, interpretations and inferences of the different experts involved through a process of open and axial coding. Successive reductions of extensive matrices resulted in a final group of matrices. The MAXQDA PLUS software has facilitated the development of qualitative matrices, including a grid summary function enabling elaboration of thematic matrices that incorporate coded verbatim texts, researcher comments, and the classification by codes, as suggested in Grounded Theory (Kuckartz, 2014; Johnson, 2015). The first step was the open coding, to identify the main elements to be analyzed in this research, e.g., sources of value creation, impact of CAV on business models, or expected evolution. Next, through axial coding, a series of linkages between data and patterns were discovered, resulting in graphs that reflect the main trends and future characteristics of the businesses surrounding mobility. Finally, through selective coding, interrelated relationships were developed among the different patterns detected in axial coding to answer the research question. Two graphs were used: the code cloud (showing the relative frequency of occurrence of the codes by means of letter size) and a code co-occurrence map (recording the interrelation of codes). The larger the code letters, the more code assignments have been made with a given code. Complementary analysis of the most relevant quotes of the topics discussed has been carried out. These citations have been incorporated into each of the sections to reinforce the most relevant results and are detailed in Appendix 2.

To increase reliability in results for the object of this research, a series of triangulation techniques were used (Lindgreen et al., 2021). Those techniques included the analysis of participant reactions, additional documents (white papers and reports on the topic), and the reading of transcriptions by different researchers (Guenzi & Storbacka, 2015); transcribed data were independently analyzed by the authors for a subsequent joint review of preliminary results. Such triangulation strategies increase the credibility of the research and diminish distortion associated to a particular investigation context.

4. Results

4.1. Contingencies and managerial approaches of CAV implementation

According to the experts, the irruption of digital vehicles has potential to become a disruptive change for traditional mobility-players because CAV open new possibilities in the use of information and demand new competences in business (e.g., electronics and ICT). Despite the automation of vehicles not being expected soon, the adaptation to digitalization has already begun, making it possible to modify current vehicles to achieve higher levels of connectivity (level 2 or 3 of automation).[1] Moreover, this evolution may not be linear as it will depend upon the evolution of CAV until full implementation of automation is reached (level 5). This evolution may be highly conditioned by several contingencies, making the future very difficult to forecast. Fig. 1 reflects the importance of governmental policies and regulation in the evolution of CAV, which is a major issue that new business must consider. Furthermore, the emergence of unexpected barriers (for example, social considerations or available infrastructure), jointly with the pressure of professional drivers and labor unions, could slow down its implementation, according to the experts' contributions. Therefore, new business should be supported by empowering the enhancers, in terms of sustainability, efficiency, or safety.

According to interviewees, in a dynamic future with increasing competition and multiple contingencies (e.g., changing regulations, infrastructure or facilities, government policies, social pressures), companies must internalize three main competencies to create, deliver, and capture value. The main contingencies identified can be classified in the indicated contingencies groups: (1) legislative – e.g., uncertainty of future regulation and heterogeneous regulations at supranational, national, or local level; (2) technological – e.g., predominant technology, stage of innovation (TRL); (3) business environment – e.g., business positioning or relationship with technologies providers; (4) socioeconomic – e.g., culture, religion, purchasing power and preferences, social trends, or educational level; (5) geographic and infrastructure – e.g., road typology and connectivity, internet and GPS coverage, or climatology. First, experts point out that companies should reinforce the adaptive ability of business models to react to new environmental changes such as growing servitization and provide specific solutions. Second, experts also recommend strengthening the capacity to digitalize their market solutions to improve customer experience (see quote Q1 in Appendix 2). Third, the integrative ability to connect the company's web-services or applications with search engines and platforms such as those provided by Google or Apple should be fostered. The underlying idea, particularly for small- and medium-sized enterprises (SMEs), is the deployment of strategies more focused on personal-enhancement and complementary services that are intensive in data management to differentiate their company from digital companies (Q3). However, each company should design its own unique value proposition and its strategic implementation in consonance with the expected impact of certain environmental variables (social preference, adoption of servitization, technological infrastructure, or government regulations) and, overall, the presence of new actors or new business models.

4.2. Servitization and CAV deployment

The preference of many customers to access a service instead of purchasing a product is a contingency that mobility managers are facing.

[1] CAV level definition: Depending on the level of automation, the vehicles can be classified from level 0 (not automated) to fully autonomous vehicles (level 5). Level 0 has some basic assists. Level 1 maintains speed. Level 2 assists through adaptive cruise control and vehicle centering. Level 3 can auto-drive only in very restricted situations (traffic jams or parking). Level 4 can drive only in controlled environments (SAE, 2019).

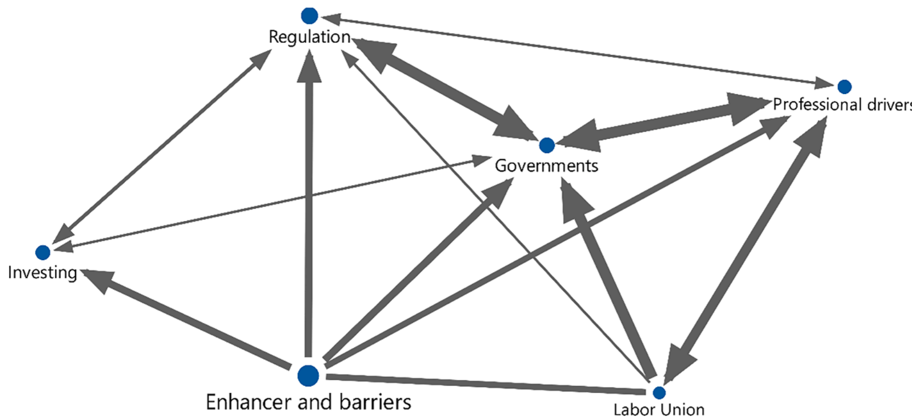

Fig. 1. Main barriers and enhancers of CAV implementation.

Thus, growing servitization is considered one of the main contingencies mobility-related business models must deal with. The data generated and the ability to manage fleets in real time through artificial intelligence systems might help firms to create an interesting scenario for the deployment of a richer MaaS system, with more efficient and profitable transport. This holistic approach enables integration of current MaaS services (taxis, VTC, or car-sharing) into the public service system, without requiring any human workload (e.g., robot-taxis), making it attractive to investors. In addition, this public service can favor the integration of highly dependent collectivities (elderly people, disabled people, children). This characteristic can increase the social and political acceptance of this business model. Greater connectivity could foster value creation and delivery of mobility-companies through more transparent and integrated systems, which would be reflected in the capture of new customers and the achievement of higher loyalty levels. Nevertheless, companies should adapt their strategies considering that there could be limitations (divergence in connectivity or in data protection laws) among regions and countries.

According to the experts' comments, the effect on long-haul transport will be the availability of multimodal services on both the first and last mile. Long-haul and suburban public services will be connected to multimodal services on their stops or stations, including the integration of parking areas (for individual vehicles or urban public services). This enables integration of all necessary services and a reduction in travel time providing a higher added value for companies. The MaaS service provider could offer one ticket for the complete long-haul service (plane, train, bus, suburban transport, last- and first-mile service). That is, planning the trip from door to door, reducing waiting times (better interconnections) and decreasing transit times due to the elimination of the driver's rest time that users can spend doing complementary tasks (e.g., shopping, reading, working, talking, sleeping - e.g., Q6).

Suburban and rural area mobility may also be affected by MaaS on the basis that CAV might increase efficiency (with potential solutions like robotaxis) and maintain a high enough service level and improved accessibility. Furthermore, the integration of parcel services and food deliveries, or pharmacy distribution can also be envisaged. Additionally, taking advantage of the interdisciplinarity associated to data management, in conjunction with IoT and AI, more combinations could be offered to customers, thus increasing the usage of transport means (Q5).

The integration of CAV in the MaaS fleets will be a major contingency to deal with. The cost of vehicles with emerging motorization technologies such as electric, hybrid, or hydrogen is expected to be much higher than the cost of the same vehicles with fossil-fuel engines. Applying a similar logic, vehicles integrating advanced CAV levels (4 or 5) will cost much more than those at lower development levels (1, 2, or 3). Indeed, the main economic advantage, saving the cost of the driver, will not apply to private users.

As Fig. 2 shows, the consequence of the higher costs of the vehicles purchase would be the lower adoption rates for CAV technology or the higher use of MaaS companies. These companies would opt for CAV levels 4 or 5 because of their different advantages such as more efficient driving, fewer accidents, savings in labor costs, fewer breakdowns due to better use of the vehicle, and greater capacity to manage the fleet based on the data provided by the vehicle (Q4). Those are the main enhancers that foster servitization in mobility as a new value driver of mobility-related businesses.

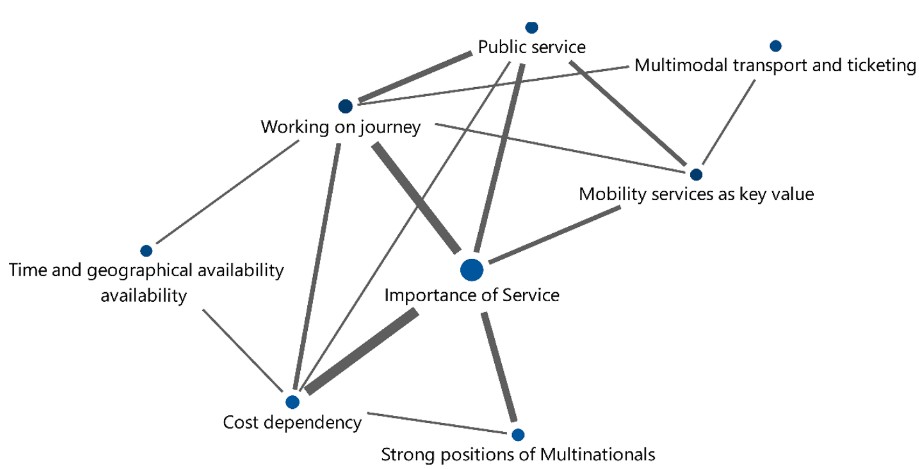

Fig. 2. Interdependencies between Servitization and CAV.

4.3. CAV impact on mobility related business

The growing servitization of transport emerges as a major social trend that could be reinforced by CAV. Consequently, companies should adapt their business models and services. According to the experts' insights, these services must be as efficient as possible and ideally customized for each client, providing unique experiences to engage customers (Q2). This will be of special interest for mobility-related businesses (i.e., insurance, commerce, logistics, among others). Managers may be able to obtain the maximum value possible from data, which can be classified into two groups: the data necessary for correct autonomous driving (distance between vehicles, speed and the like); and the data generated by the person in the vehicle. The former information would have scarce commercial value, but can be useful for public administration, Original Equipment Manufacturers (OEM), and insurance companies if there are accidents (a black box, for example). The latter data could be a kind of "I am here, I go there, I drive through this way…" This data may provide very useful information for the predictive maintenance of the vehicle, insurance adjusted to behavior and habits (Pay-as-you-Drive), current routes, culinary tastes, and so on, allowing personalized offers in service areas, restaurants, or shops close to the usual routes, and others considered of great value (Q10). Consequently, the information has certain potential to become a source of revenues for data owner since different companies, either infrastructure owners, logistics planners, or other retailers or service-firms, would be willing to pay for the data to adapt their company to the future business. Thus, different mobility-related businesses will be highly inter-dependent, looking for the same purpose (Fig. 3).

4.3.1. Integrated services for vehicles: The new conceptualization of service areas

As part of the increasing servitization linked to CAV, service areas may play an outstanding role due to their geographical location (Q22). Those service areas on interurban or long-distance roads would continue to be useful for vehicle users to satisfy their needs, but they can also serve the vehicle itself from a technical perspective. It is thus advisable for service area managers to reflect on their offerings to vehicles both with and without occupants, considering a wider variety of motorizations. CAV will need to stop to refuel or recharge, to inflate tires, or check parameters. Service areas will be interaction spaces for CAV users and personnel (Q24).

In populated areas, service to autonomous vehicles and fleets might be the central activity. According to the information provided by experts, as most CAV will be associated to MaaS fleet companies, service areas should transform their core business from retail services for final customers to industrial multi-services firms. This would also mean a decrease in their number and a move from city centers to suburbs (Q23). Location near electrical transformation centers to achieve cheaper and faster recharges will drive this displacement. They will enjoy new opportunities such as offering logistics hubs, recycling collection, or exchange areas between B2B, B2C, and C2C. Furthermore, potential alliances can arise between workshops and parking companies to share expertise and provide an integrated value proposition to customers.

Parking lots could progressively lose importance as CAV are implemented (Q19). This is due to the possibility of autonomously parking vehicles in free zones. Moreover, the more MaaS services are linked to the CAV, the fewer idle numbers there will be. In the same way, these vehicles will belong to fleets, so the parking lots will have to adapt to B2B autonomous vehicles and fleets. Consequently, location would no longer be a competitive advantage, and parking lots in commercial and office areas will become unnecessary and alternative uses should be given to them (Q9). Similarly, workshop businesses must be prepared for B2B, adopting the parameters of organizational buying behavior instead of consumer behavior due to the MaaS trend (Q27). Therefore, it is a real possibility that they will have to move their location from cities to suburbs to possess better facilities for serving large fleets. As result, the experts recommend reducing the number of sites in cities and displacing them to big multi-service areas in suburbs; this can reduce costs and increase services in collaboration with other potential partners.

In addition, vehicle workshops have already begun to transform thanks to the introduction of the first CAV levels. The interviewees, however, point out that this trend will become more acute for the following CAV levels. Currently, due to old vehicle fleets, workshops have been able to adapt slowly, but (step-by-step) their tasks will include

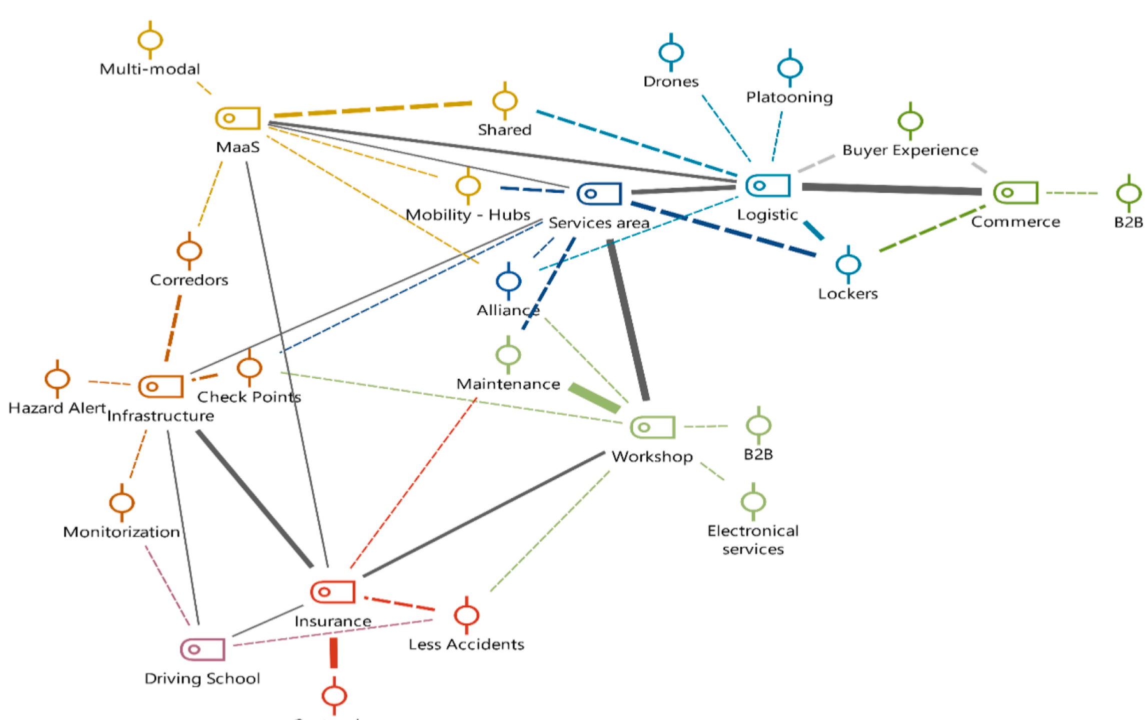

Fig. 3. Business models interdependencies and core elements favored by CAVs.

the repair and maintenance of software and electronic components. They must change the concept of the mechanics they offer by training and hiring software and electronics experts. With the introduction of higher CAV levels, it is expected that accidents, and consequently metal repairs, will diminish (Q26). In addition, mechanical components will suffer less damage thanks to better driving by avoiding the human factor, and greater simplicity of electric motors. However, the experts expect net incomes to stay the same because of the higher repair costs for electronic and software components. Furthermore, CAV will allow a large amount of information related to the vehicle's status to be gained in real time, an important source of value creation for customers to avoid problems. Workshops could be highly dependent on data to offer predictive maintenance. First, because they can access the usage of each component and second, because managers can contact the owner or user to suggest a timely, personalized repair based on a practically forensic analysis (Q28). This analysis would allow workshops to understand or anticipate software or sensor failures, in addition to reporting to OEMs and other parties such as infrastructure providers. Access to Artificial Intelligence and Big Data will be necessary to develop such a level in services.

Regarding urban service areas, the experts point out a possible transformation towards business-to-business service centers. Consequently, according to experts' reflections, they should focus their efforts on providing an adequate service and an entertainment experience (coffee, walking area, gym space, shopping center). They must also install goods lockers for B2B, B2C, and C2C interchange. Therefore, logistics companies would benefit in multiple fields from CAV. On the one hand, they will reduce the cost of long-haul services due to the reduced need for humans, who may still be necessary for loading and unloading, but probably not for driving. With the implementation of level 5, there will also be a decrease in transit time (human resting) and an increase in driving efficiency (Q15). This circumstance could boost the alliance between urban service areas and logistics companies to solve the last-mile challenge through lockers (Q16).

In addition, collaborations between MaaS and logistics companies would allow better and more efficient routes to be established, for example, through ridesharing with MaaS companies to deliver or cross-dock. The benefit of collaboration would result in more cost-efficiency and a higher number of services for both companies. These benefits may be achieved initially in services such as hub-to-hub logistics and later in warehouse-to-other logistics facilities (lockers). This could favor the advent of e-commerce companies and a closer approach by traditional retail companies to the digital world. This trend will be strengthened with the introduction of CAV because the occupants of the vehicles, who traditionally had to drive, will be able to do other tasks during the trip. Connectivity and availability of time during a trip would make it easier for consumers to buy via e-commerce (Q8). In the same way, the data generated by the vehicle would result in personalized promotions and real-time advertisements based on travelers' usual or specific routes. The combination of digital tools with human services would also provide customized services to compete with the prices of purely e-commerce firms (Q7). Associations with infotainment companies (able to create a new trip experience) and technological companies (able to offer a better service) may help to make the most of the route-based information and allow competition with giant digital-retail platforms (Q11).

4.3.2. Paradigm shift associated with the absence of a driver: insurance, infrastructure and driving schools

Insurance companies base their business on measuring the intrinsic risk of each driver. However, experts suggest that humans would soon be secondary. This is due to the increase in safety systems linked to CAV levels and even the disappearance of the driver as a figure. Therefore, insurance companies should estimate the risk of the area instead of the driver. Similarly, the variables of irresponsible human behavior such as drunk driving or speeding will be limited. According to the experts, MaaS and CAV would transform B2C business towards micro-insurance contracts linked to a specific journey that could be offered in close collaboration with MaaS companies. MaaS could offer insurance coverage as an optional service. Therefore, insurance business would partially move from B2C to B2B. In addition, insurance companies could establish value propositions based on pay-as-you-drive or pay-for-your-way. These would start in the first stages of level 4 with high connectivity, using the data obtained from the vehicle. Depending on the route, speed and other parameters, a risk assessment would be provided.

On the other hand, it is expected that crash rates may decrease with higher levels of CAV, making insurance contracts no longer mandatory. For this reason, theft and fire insurance would be the most common policy types. Furthermore, given the great value of the information generated, data protection could gain relevance, and insurance companies could offer multi-insurance contracts, encompassing different issues: home, accidents, personal, and travels needs (Q19). Insurance policies must cover manufacturing, design, and programming processes developed by TIERs and OEMs. This is because they should cover autonomous machine failure and estimate the risk of the differing autonomy algorithms associated with any OEM brand or cyberattack risk (Q17). However, results suggest that the main business would be that of infrastructure owners due to expected crashes linked to problems in infrastructure maintenance or wrong information (Q18).

Therefore, road infrastructure must adapt to the needs derived from the implementation of CAV. The systems should be aware of the real-time physical state (maintenance needs, weather) of the infrastructure. In the same way, they will have to monitor the status of the users in real-time (speed, vehicle automation level, breakdowns, and so on) and communicate incidences and warnings to the vehicles and passengers (Q20). That communication, currently in the form of information panels, should be continuous and may be developed from the implementation of level 3. As indicated by interviewees, these requirements raise the issue of official road approval, based on better design and maintenance (Q21). CAV might need better infrastructure (road surfaces and physical and electronic signals) and planning based on analysis of the vehicle-generated data. Furthermore, the physical infrastructure must be complemented with a parallel technological infrastructure and ensure widespread coverage (Q12). Traffic signals could be adaptable in real time and able to stipulate the rules for the vehicles. It is important to avoid coverage problems that can leave CAV disabled; buildings, for example, could affect the vehicle-to-vehicle communication range. GPS may be complemented with other information sources to avoid problems in tunnels or complex areas. Finally, the technological infrastructure has potential to reduce the cost of CAV because of data management in the cloud and a reduction in the embedded software and hardware needed or reduced dependence on sensors. It would also allow better data optimization (Q25).

It is expected that infrastructure companies may need staff with enough capacity to manage the flow and rules that govern the mobility of CAV within a certain infrastructure, adjusted to weather conditions, vehicle density, vehicle or infrastructure status, incidents, or other variables (Q14). Depending on those variables, they would be responsible for sending the information to vehicles and users. There would be a newly created career, similar to air traffic controllers, deployed to coordinate and ensure the movement of CAV in critical areas such as urban centers or high-capacity roads. Training for this could become an opportunity for driving schools; otherwise, training companies run a great risk of disappearing if they do not adapt to new needs or recreational functions (Q13).

5. Discussion

In line with contingency theory, the research supports that the technology is not a disruptor by itself, and it is closely associated with the consolidation of new business models and the evolution of different environmental elements (Christensen & Raynor, 2003). For instance, technology can be considered a barrier or a driver depending on how businesses can adopt it to provide a better customer service (Teece & Linden, 2017). Based on contingency theory and the experts' insights, a series of micro- and macro-level perspectives were included regarding the status of CAV development and its expected effect on MaaS and mobility related business. The methodological approach has allowed an understanding of how CAV implementation is progressing and how the vehicles could shape managerial and competitive strategies.

Specifically, the public service associated to CAV can facilitate their use to traditional dependent collectives like the elderly, the disabled, or children due to their capacity to provide autonomous mobility (Epting, 2018). In addition, MaaS business models based on CAV have potential to reduce some economic barriers associated to a vehicle purchase or providing better prices given the absence of drivers in comparison to traditional taxi services (Turienzo et al, 2022). These characteristics of CAV may facilitate both the support and acceptance of the MaaS-type business models by governments, public entities, and social agents, particularly because it is expected that level 5 driverless cars will bring new jobs and companies, and the mobility ecosystem must adapt itself to a new reality (Bridgelall, & Stubbing, 2020).

Regarding timing and the current implementation of CAV, experts point out that the classic concept of cars may disappear to be replaced by a new concept of vehicles. Nevertheless, this development is dependent on contingencies in the form of regulations and innovation development. CAV technology can improve transport efficiency based on data analytics to provide adjusted offerings to all mobility users (Epting, 2019), it means new potential applications for mobility-related business models associated with data management. The relevance of the data generated by vehicles and passengers through CAV becomes an opportunity for business models based on Data Management with ITC technology. Road infrastructure may need adaptations to support CAV, and road infrastructure managers, either private companies or government, should invest in technology to make connectivity and data management (between vehicles, objects, and users) possible. Following the regulation, these infrastructures and insurance companies could create an ecosystem able to forecast needs associated with the higher levels of CAV technology. Although there are already level-3 vehicles in circulation, there will be more of a delay in the implementation of future levels than previously expected. Specifically, the economic crisis linked to COVID-19 and the European Union's extensive regulatory framework and ethical debates compared to other regions, could delay such implementation. For full adaptation, experts estimate that those higher levels will have to wait until the end of this decade or the beginning of 2030. In such an evolution, government policy plays an essential role as both barrier and enhancer in the introduction of the technology associated with the upper levels of CAV technology. Current barriers to implementation (regulation and investment) can become enhancers depending on the policy adopted and the active participation of governments in the matter (Nikitas et al., 2019), while the social impacts such as employment may become critical in the equation.

Therefore, the experts recommend that all stakeholders (governmental regulations, OEM, road infrastructures, insurance industry, driving schools, and services areas) should adapt their operations to the technological advancements that are appearing to increase and diversify their incomes, not only to allow CAV implementation. The related mobility industry may consider following the servitization trend (MaaS based on CAV) and adapt their business models to serve these fleets of vehicles, supported by a high level of digitalization and an increasing personalization through data analysis. The IoT, Big Data, AI, and partnerships with technological companies such as Google or Apple, or other firms with expertise in mobility, become fundamental (Cassetta et al., 2017). With increasingly personalized services, customers will access more customized value propositions, and business managers need to internalize this to provide comprehensive services (Teece & Linden, 2017). Thus, MaaS implementation and its subsequent development could be supported by a better service based on data and a reduction in the required financial capacity of the population (Shergold, 2019). The technologies associated with new vehicles have proven to be a determining factor in how attractive the cost of the product is at the time of purchase (Turienzo et al., 2022). Thus, reducing usage costs by having no driver or demonstrating energy efficiency become two major issues when it comes to consolidating the implementation of CAV and electrification technologies, respectively (Turienzo et al., 2022). For this reason, MaaS based on CAV utilization may become increasingly attractive as CAV reduce costs; MaaS related companies should pay attention to this evolution and become part of the solution to define the expected path. Enhanced and efficient public transport can coexist with MaaS, reducing the need for space dedicated to private vehicles (Altintasi et al., 2017). Consequently, depending on how interdependent MaaS and public transport become, a vehicle will have full geographic and timetable availability in order to meet the customers' specific needs.

On the other hand, our results confirm the need for alliances between MaaS and logistics companies or intermodal and complementary MaaS enterprises (Smith et al., 2020). We extend this recommendation to workshops, parking lots, and service areas, combining their resources to attend to MaaS companies. However, this association will only succeed if companies have access to data platforms for profiling customers' preferences. In addition, results reveal the need to integrate business models with the prevailing technologies and look for new alliances (Cassetta et al., 2017). Professionalism and higher personalization will thus become a potentially winning formula (Pütz et al., 2019). The results extend the need to increase the training of managers in new methodologies and tools to better understand the technological complexity linked to digitalization of CAV in traditional business models. The extent that managers can understand the new opportunities opened by technology to meet customer needs will determine whether the viability of businesses increases or decreases.

6. Conclusions

The research intends to anticipate the horizontal impact of disruptive innovations (CAV and MaaS) on business models. Regarding the impact of CAV implementation, it is noted that there is greater digitalization in the development of mobility-related business. Entrepreneurs and managers could create two types of business models depending on their core business: one oriented to passengers and the other to assist vehicles. Experience, ease of use, and cost-effective solutions will provide the main source of value for customers, but this can only happen if alliances between complementary businesses are established. Among the alliances, those between workshops, parking lots, service areas, and logistics companies are highlighted, but they would need to change their mindset from B2C markets towards strategies oriented to a highly demanding B2B market. This change is expected in line with the higher servitization (MaaS), which will demand a higher number of services to be provided to firms instead of final customers. Something similar may happen in logistics, as shipments optimization, which is becoming increasingly necessary, will be favored by CAV incorporation in last-mile delivery services, although specific additional problems will have to be solved. In addition, as large technology companies have become the main players, playing a central role in the vehicle's integration of on-board systems and services, it is necessary to adopt new competitive strategies. Managers should decide on how to integrate their business with the prevailing technologies and platforms to maintain or adapt their value proposition. Dependence on the digital economy will increase, and it will influence strategic formulations. It is thus necessary to analyze those contingency variables, in the redefinition of strategies and during integration processes, to increase the performance obtained from data management and the physical structure created. This approach makes it possible to offer a service with a good cost/added-value ratio to continue evolving in its adaptation to the environment.

As the word cloud reflects (Fig. 4), active data management to provide customized service is at the core of the interviewees' contributions.

Fig. 4. Word cloud from interviews.

The cloud suggests that the changes associated with centering and adapting businesses around self-driving vehicles will also be important (data management, industrial estate, artificial intelligence, etc.). The key will be to take advantage of customer information to provide people with the highest possible value from technology and to adapt strategies based on a better understanding of the data so that needs can be satisfied. The importance of data and its potential monetization can become highly attractive for those companies focused on data management to actively integrate into the value creation associated to CAV, resulting in a central element of the value proposition equation of mobility.

From a social impact perspective, mobility, currently limited to dependent sectors, could be accessible to the whole of society as there is no need for driving ability. In addition, the economic factor may not prevent access due to the foreseeable decrease in the cost of MaaS services as they are operated through CAV, which possess enough mobility potential to become an integrating element in society. This potential outcome of the introduction of CAV may enhance its adoption and deployment through public and private investment reinforced by the social benefits.

As for theoretical implications, this research reveals that the Contingency Theory is valid for addressing highly volatile industries. This is a central theory in the organizational sciences and provides a flexible but also a robust framework to analyze the evolution of business models of multiple industries that are facing many future challenges from expected and unexpected factors, namely, technological evolution, public policies to prevent climate change, and other geopolitical tensions that would need to be addressed in the near future; particularly, for the formulation of multisector and interrelated business strategies in dynamic environments affected by technological innovations. Likewise, this theory provides a suitable approach to define potential strategies that help transform the value proposition of business from B2C to B2B markets. Its use could be complemented by other theories on how to adopt those strategies, such as resource dependence theory or principal agent theory for the understanding of the previously suggested alliances, or dynamic capabilities theory to define those core tasks and strategies to be undertaken, or social exchange theory to continue identifying enhancers or barriers that business models may face. In essence, it is an open field because the impact of digitalization will affect most industries.

The research also reveals important practical implications, like the need for technological integration in mobility-related business models. This greater cooperation and alliances with tech-companies (e.g., Google or Apple) or data management companies will make it possible to provide real-time personalized services, and even provide a comprehensive service through multi-sector platforms, creating synergies to take advantage of the servitization favored by CAV. To do this, managers, academics, and labor-union groups must offer training to their employees and attract digital, electronic, ICT, and data analyst talent. Finally, managers should develop and adapt their business models (value creation and delivery) considering different environmental characteristics or societal preferences, to capture the highest portion of value possible.

Of course, because of its nature, the current research possesses some limitations. First, its exploratory nature and the technical complexity of the topic makes the future difficult to forecast. However, it is an effort that researchers need to make to provide potential solutions and a greater understanding of this dynamic environment. Second, there are very few companies that are anticipating and participating in future strategies, making it difficult to obtain more viewpoints. Third, as the validity of the results may have been affected by the limited scope of the sampling frame, future empirical research deployed from these research findings could confirm or refute the experts' insights on the topic.

CRediT authorship contribution statement

Javier Turienzo: Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Pablo Cabanelas:** Writing – review & editing, Writing – original draft, Methodology, Funding acquisition. **Jesús F. Lampón:** Writing – review & editing, Validation, Supervision, Funding acquisition, Formal analysis, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. Questions discussed during interviews

Sources of value creation_.
1. Can you briefly explain the activity of your firm? How is it connected to mobility?
2. What would you understand as 'value creation' in the context of the new mobility system?

Business models and CAV innovation_.
3. How will the mobility sector be able to evolve with the irruption of CAVs? for what level of automatization is your firm planning changes in the business model?

Assessment of social impact_.
4. Which business model will benefit most from mobility sector change? Who might be excluded?
5. What is the social potential and restraint derived from the CAV?

Expected evolution of business_.
6. In this new environment of mobility, what key competencies may companies develop? Among them, which will be central? (Global).

7. From a business perspective, what are the most important changes of CAVs to your market? What is the potential market? (Global).

8. From what level of automatization of mobility driving do you think the services offered by complementary business should be adapted so as not to become obsolete?

9. And what about the data management? How can information management affect the services provided to customers? What new services can be derived from the management of data resulting from CAVs? (Global & Data).

10. What new services must businesses offer to ensure their future? (Global).

11. Where will the revenues come from? (Global).

Expected impacts by industry_.

12. How should insurance coverage adapt to the introduction of automation? And car workshops? How will the business model evolve from CAV driver's training/education? (Insurance & Workshop) (Driving school).

13. Regarding daily mobility, do you think autonomous MaaS will replace autonomous private vehicles? Will autonomous cars benefit MaaS? Is servitization a consolidated trend? (MaaS and Servitization).

14. Bearing in mind that vehicles can arrive without occupants, what role will road infrastructures have? Will service areas change? (Infrastructure & Service Areas).

15. How will the introduction of CAVs affect logistics business models? and retailing? (Logistics and Commerce).

Expected timeline_.

16. How close do you think the massive implantation of CAVs is: 2030, 2040 or 2050?

Appendix 2. Selected quotes from interviews organized by topic

N°	Topic	Company	Quote
Q1	Business Competences	#6	*You have to be very involved, and this highly involved ecosystem implies changes, but basically, they are summarized in digitization, connectivity, IoT and security to be in touch with your clients*
Q2	Business Competences	#7	*I think there will be these companies, as I tell you, monthly subscription, monthly leasing but I think the customer experience will be fundamental*
Q3	Business Competences	#8	*Clients want to give only one order. That, if you go to the road, the search engine, the Google of the car, be a Google and not fifty applications. In the end the car on a journey if it is autonomous, it will stop at a service station and somehow, they have to talk to you and not to the competition*
Q4	CAV as MaaS impulse	#7	*These technologies and the autonomous car, we are not even talking about their price in their first years on the market. So, what is going to be done is to move towards a model, rather than a property model, […] the majority of middle-class citizens, at least in the first years, will not be able to afford that technology. It will either be a leasing model or a model of what we were talking about, from Uber, Cabify …*
Q5	CAV as MaaS impulse	#16	*With a fee in which I take your medicines home or the taxi will only go to pick your medicines and take them home or you will have to specialize in having a tourist experience when you arrive in a city because you have an augmented reality, etc., etc.*
Q6	CAV as MaaS impulse	#6	*Make trips for work reasons that may be an hour or two hours. For me it is wasted time many times because I am moving, but I am not working, even if it is in my work time, I am not "producing".*
Q7	Commerce	#6	*We could all buy online but the path that Inditex is taking. They provide a user experience that goes beyond the purchase. It is the mere fact of experience*
Q8	Commerce	#15	*The future is digital and more if you can do other things from the car. You can go working, chatting, shopping or watching movies. Whoever wants to reach the customer will have to arrive in his idle moments […] and people who get bored if they can go shopping, do so. Commerce should be inside the vehicle*
Q9	Commerce	#1	*Nowadays, parking is a very important element in the design of houses and shopping centres. In a shopping centre, it is currently competitive advantage, if the autonomous car were to become a reality, there would be a lot of space that would have to be filled*
Q10	Data and connectivity	#6	*Someone can hack my car and drive it from outside. Obviously, if someone hacks my car and drives it from outside, he can take me where I don't want, or make me commit a crime […] There is a security or cybersecurity part*
Q11	Data and connectivity	#13	*There are a lot of opportunities arising from information management. Always oriented all this to the provision of service. To better understand the client and to give him more and more a more efficient typology of services*
Q12	Dependencies to deploy	#6	*CAV needs an infrastructure that complements what is on the vehicle camera or the vehicle sensors and I think that they will be there. As soon as we have infrastructures for the vehicle and legislative issues…*
Q13	Driving school	#1	*Maybe we drive like someone who rides a horse, someone drives because he likes it and he goes to a circuit and as something recreational*
Q14	Incoming companies	#9	*For being autonomous … it is not that there is a business, let's say a new one. There will be niche things […]. Where I see that if there is a very big change it is in connectivity due their informative capacity*
Q15	Logistics' future	#6	*Logistics must offer Just-in-Time, ensure times, ensure destinations, ensure many issues […]If I were not depending on truck driver […] I will be more agile, at any time of the day, 24 / 7, 365 days a year*
Q16	Logistics' future	#7	*Regarding to the delivery of parcels by CAVs, […] the problem will be who brings the package home to you? Automated delivery points or collection points for packages would have to be established*
Q17	New insurance field	#2	*The failure of the car is attributable to the manufacturer […] unless there is bad maintenance on my part or that it circulates with damages, the party responsible for the accident is who has programmed*
Q18	New insurance field	#11	*Against construction companies or companies that manage highways or infrastructures. Could be. Possibly in the case that "hey, you have not warned me that there was an accident here" or you have not noticed this and that is why the autonomous did not know what to do*
Q19	Parking	#14	*They will change the car parks too. The car parks right now live from people leaving their car. But the autonomous car is supposed to… on the contrary, it will be a car that works more and is running longer. Therefore, the need for parking will be less or different*
Q20	Road Infrastructure	#11	*When you enter a highway, and the highway manager is locating and monitoring everything it is doing. Both of speeds and if it stops abruptly or whatever. It can allow you to innovate, act at the slightest moment.*
Q21	Road Infrastructure	#14	*We believe, first of all, that in the early years, autonomous cars will only be able to circulate on approved roads. We believe that the toll roads should be officially approved.*
Q22	Services areas	#14	*The functionality of the service area zones is going to be very different. Perhaps it will be much more user-oriented than the vehicle itself*
Q23	Services areas	#1	*Autonomous cars will continue to need service, but the service will surely be autonomous […]. Even serving as a parking on suburbs […] and for autonomous cars to go there when they need […] changing from retail concept to industrial concept*
Q24	Services areas	#16	*The service areas have to provide services that they do not provide today. Recharge or refuel hybrid vehicles even if there are no people driving but who have to charge that device, maybe they are places to leave packages. The best areas may be those same points at which to leave the packages and there use your vehicle to load and to give information. That is, checkpoints to do maintenance, etc.*
Q25	Social impact	#4	*Precisely, if we start to move slowly towards that autonomous vehicle, that experience will change. The experience will not be how to drive, […] It is about the experience of being in the vehicle*
Q26	Workshops	#2	

(*continued on next page*)

(*continued*)

N°	Topic	Company	Quote
			The workshop either disappears or is reconverted […] will be software, computer systems and sensor equipment workshops. Idem to repair shops, if the sheet-metal is bad it will be because a stone falls on it, because the car will not have accidents
Q27	Workshops	#14	*The company let us say, the service operator will be in charge of taking the car to the mechanic. It will no longer be a B2C, the car mechanic will be a B2B*
Q28	Workshops	#7	*In addition to fixing what the physical damage is, there will also have to be an analysis, I don't know if to call it, but I'm going to call it a forensic one. Why has my car algorithm failed?*

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