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An approach for identifying collaborative business opportunities for networked organizations: application to connected and autonomous vehicles

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Abstract

This paper presents the results of a study conducted with a network of organizations involved in the connected and autonomous vehicle's technology as an emerging trend, which aimed at developing an approach for the identification of collaborative business opportunities by deploying coopetition theory, design thinking principles, and business model theory. The purpose of this paper is twofold. Firstly, it tries to develop an approach that will enable organisations to identify collaborative business opportunities and, secondly, provides insights into the challenges and requirements for the realization of full scaled solutions for the connected and autonomous vehicles.

Keywords: design thinking, coopetition, connected and autonomous vehicles

Introduction

Emerging technologies and innovations are creating a new landscape of competition with disruptive business models being introduced into traditional industries. Therefore, it is suggested that firms should be strategically prepared to respond to emerging trends. A common strategy for that involves the transformation from separate product and service offering toward more complex value propositions that will enable firms to harness market opportunities to sustain and grow their market position. However, high uncertainty for the final offering, products' short life cycles, technology convergence and R&D expenditure intensity are just some of the reasons of why vertically-integrated resources and capabilities are never enough for a standalone firm when new industries are formed (Bengtsson and Kock, 2014). Hence, these product-service value propositions can only be realised where different actors collectively create and deliver value by integrating their resources and capabilities to overcome technological and commercial challenges.

Connected and autonomous vehicles (CAVs) are about to become a reality and, thus, automotive manufacturers have made considerable investments to make the technology more viable, affordable and safer focusing on safety case development, environmental impacts, traffic operations and infrastructure design (Talebian and Mishra, 2018). Through that, it is evident that the traditional value creation chain is shifting to an

ecosystem of multiple partners who contribute to the technological readiness and will be part of the value propositions for the emerging opportunities around CAVs. Thus, an approach that identifies collaborative business opportunities seems relevant to move forward.

This study views coopetition as an entrepreneurial process that can cope with uncertainty, explore and exploit opportunities and develop innovative solutions within a collaborative environment. Therefore, the aim of this study is twofold. Firstly, it tries to develop an approach that will enable organisations to identify collaborative business opportunities under the coopetition theory by utilising design thinking principles and the business model canvas. Secondly, empirical data is analysed to provide insights into the challenges and requirements for the realisation of full scaled solutions for the connected and autonomous vehicles.

Context

Coopetition

Coopetition - the simultaneous competition and cooperation among firms- is discussed in strategic management as an alternative for rival organisations to complement their competencies through collaboration (Bengtsson, Kock and Lundgren-Henriksson, 2018; Gnyawali and Ryan Charleton, 2018; Hoffmann *et al.*, 2018). In their review of coopetition research, Bengtsson and Kock (2014:182) provide an inclusive definition of coopetition, which is seen as '*a paradoxical relationship between two or more actors simultaneously involved in cooperative and competitive interactions, regardless of whether their relationship is horizontal or vertical'*. This definition outlines that coopetition includes relationships in both the inter-organizational and the intra-organizational level of analysis. In this paper, we discuss coopetition as the simultaneously collaborative and competitive relationship among firms in the value chain of connected and autonomous vehicles that constitute an emerging technological innovation.

Coopetition fit for opportunities and innovation

As noted earlier, high technology industries seem to face unique challenges and opportunities that require the collective contribution of different actors to be resolved and exploited, respectively. Thus, the strategic choice of coopetition seems more conductive in those industries. Scholars have emphasized coopetition strategies as the main triggers in innovation efforts as firms have used them for the development of new products (Bouncken, Clauß and Fredrich, 2016), and innovative business models (Velu, 2016). Moreover, evidence show that coopetition enriches the process of generating value-creation opportunities (Ye and Yamamoto, 2018), is a mechanism for learning and sharing knowledge (Bouncken and Kraus, 2013), and it can protect innovation projects from imitation through novelty in the business concepts and competencies (Ritala, 2012; Ritala and Hurmelinna-Laukkanen, 2013). Empirical evidence shows that being involved in coopeting relationships is essential not only to acquire new technological knowledge and skills, but it can also support the creation and access of other capabilities exploiting the existing ones (Quintana-García and Benavides-Velasco, 2004). It seems relevant to outline that radical innovations are suitable to be exploited in the setting of where more

than two firms are involved in coopetition (Yami and Nemeh, 2014). On the other hand, strategic innovations on their own can lead to increased cooperation and competition (Roy and Yami, 2009). All of the above evidence suggests that coopetition can be beneficial during the innovation process and can determine ways to move forward for the post-launch phase. Hence, it is important to be considered for connected and autonomous vehicles where new collaborative value propositions are likely to be offered in the future.

Coopetition and uncertainty

Coopetition strategies have been seen as mechanisms to cope with uncertainty (Bouncken and Frefrich, 2012). While innovation is strongly linked with uncertainty, and coopetition is a source of opportunities for enhancing innovation efforts, it is a beneficial practice under other conditions as well (Ritala, 2012). For example, the application of coopetition is relevant when industry develops swiftly, and its future is unpredictable. Firms involved in coopetition can harness multiple benefits under those conditions such as a risk of failure and cost sharing and increase their market performance (Ritala, Golnam and Wegmann, 2014). Moreover, competitors that operate in similar domains possess similar resources or complementary resources, and insights about the business environment, hence, they can better determine what these new offerings and new markets will be decreasing uncertainty. Ritala, Golnam and Wegmann (2014) suggest that in the creation of industries and offerings, coopetition is beneficial due to positive network externalities. These network externalities refer to offerings where the value that is delivered to the customer from a product or service depends on the number of other customers utilising the same product or service (Wang and Xie, 2008). For example, the mobility benefits of CAVs are expected to increase as the adoption of the technology increases in the market; therefore, competing firms are in critical roles to form a common basis for utilizing resources that work together.

Design thinking

Design thinking has different definitions as the technique has been developed simultaneously by different groups and organisations. Gruber *et al.* (2015, p.2) describe design thinking as a '*human-centered approach to innovation that puts observation and discovery of often highly nuanced, even tacit needs right at the forefront of the innovation process. It considers not just the technological system constraints but the socio-cultural system context'*. Design thinking can be practised at multiple levels by people with different capabilities since it depends on an argumentative process in which the people involved can perceive a problem and explore potential solutions gradually.

Dunne and Martin (2006) argue that management solutions use inductive and deductive logic and are acquired from a list of proposed potential solutions. Design thinking aims to think outside these predetermined answers, and to use abductive logic to attempt to see what could be. Hence, design thinking is appropriate for dealing with uncertainty when there is not available information that can solve ambiguous problems. In that sense, it fits the innovation process for connected and autonomous vehicles as within a business perspective it combines the generation of new ideas with their analysis and evaluation of how they apply in a holistic sense (Vinnakota and Narayana, 2014).

Business models

A business model has been seen as a platform between strategy and practice, describing the mechanisms of value creation and capture for organisations (e.g. Amit and Zott, 2001; Chesbrough and Rosenbloom, 2002; Teece, 2010). Essentially, a business model is a story that explains how an organisation works. To that end, business models and coopetition are linked since, in both, value creation and capture are central elements (Nalebuff and Brandenburger, 1997). Business model tools can be used to support the innovation process. Utilising the business model canvas, developed by Osterwalder and Pigneur (2011), is an effective way to understand a firm's business model by reducing complexity through a holistic analysis. Having developed a logical and tangible perspective of an organisation is important for facilitating discussion, debate and exploration of potential innovations in existing business models and promote the creation of new value through the joint resource utilisation of coopeting firms (Ritala, Golnam and Wegmann, 2014).

Approach/methodology

The 4-stages approach is based on co-creation design thinking using closed-loop processes to enable the generation of ideas based on customer aspirations and to translate them into product features and services. In particular, for emerging industries and new technologies, such as CAVs, new insights, innovations and new capabilities can be realised rapidly. The method used in this project was made up of the following four phases: discovery; design; define and ideation, and delivery phase and consisted of the following elements:

- The utilisation of the business model canvas to map organisational elements, resources, capabilities and the relationship of each organisation with its customers, suppliers and partners using semi-structured interviews with each participant organization. The business model canvas permits to visualize the main elements and was used as a guide in the ideation process (Bocken *et al.*, 2014).
- The analysis of the business model elements and the expectations for participant organisations about the connected and autonomous vehicles were utilized to design the workshop that was introduced in the define and ideation phase. This involved the visualisation of all relevant information in enabling information and knowledge transfer among the coopeting organisations informing each organisation about relevant resources, capabilities and the perception for the technology solutions around the CAV.
- Following the background work and based on resulting syntheses, a workshop was organized following these specific activities
    - Activity 1 was dedicated to helping participant organisations to understand the business model elements of their coopetitors and complement on resources and capabilities for the connected and autonomous vehicles. This facilitated a draft of the key points of the business models to assist the innovation process.
    - Activity 2 was dedicated to the development of insights about what could be enabled by the technology in the future. Hence, following a user-centred approach, participants were positioned on the role of the customers to visualise the CAVs as part of their day in the future and match their aspirations with product and service offerings.

- Activity 3 consisted of framing the problem of commuting and finding out how CAV can provide a solution to these problems. This allowed participant organizations to work for a common goal and connect product and services related to CAVs with actual problems.
- Activity 4 was dedicated to the analysis of the ideas for products and services of the previous activities to allow clustering them and combine them in relevant business opportunities.
- Activity 5 involved the discussion around which business opportunities seems more appealing from each organisation's perspective and voting for the most favourable. The participants evaluated the concepts that reached a consensus and then selected the ones as more likely to be further developed.
- Activity 6 was dedicated to exploring how competing organisations will co-create value for the most favourable business opportunities. This involved the allocation of relevant resources and capabilities of each organization to enable the development of the business opportunities scenarios.
- Activity 7 was dedicated to the identification of barriers for the realization of these scenarios considering the technical robustness and the fit with to the users. Then, mitigating actions to these barriers were defined.

- In the last phase, the documentation of the solutions and recommendations for next steps in a report allowed participating organisations to provide their feedback.

An abductive research process was followed since it is a way of working that enables data collection and theory development to take place simultaneously and fits the purpose of study that targets on a specific problem in the automotive industry (Saunders et al., 2015). Moreover, there is a clear link of abductive reasoning with the design thinking process.

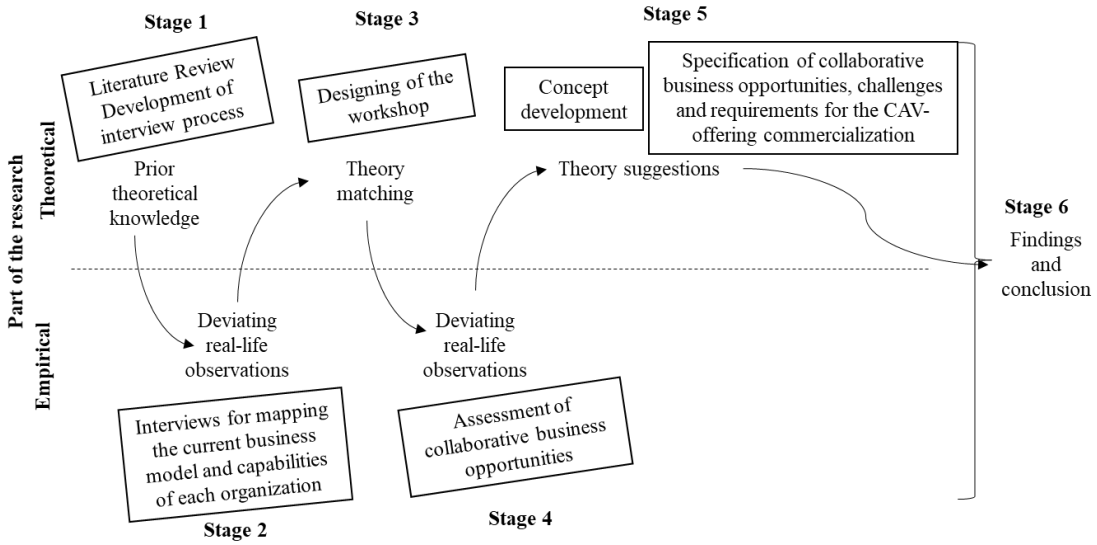

Figure 1-The abductive process adopted by Kovács and Spens, 2005

The research was built towards the development of an approach that will enable the effective exploration and exploitation of collaborative business opportunities for

connected and autonomous vehicles. A case study is the most appropriate research method since it moves away from just closing theoretical gaps through basic research and explores theory to provide a solution to a problem. To enhance the research, interviews and a workshop were selected as the most appropriate data collection tools.

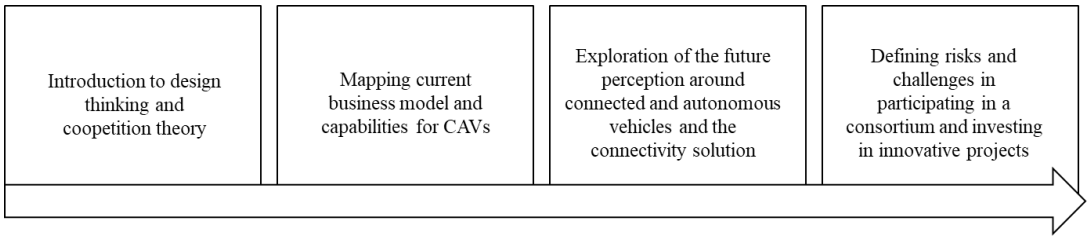

Figure 2- The interview process

All interviews were conducted via face2face meetings to secure that participant organisations were adequately informed, and their input was captured, providing them with the chance to follow-up on issues if needed. Organisations that collaborate in an established project and will be involved in the formation of commercial solutions for the connected and autonomous vehicle were interviewed. Through that, the necessary technological and market knowledge was secured, as well as, the fit of coopetition theory. Table 1 provides a full list of companies and their relevant role.

Table 1- Participant information

No.	Participant organisations	Description of their role	Interviews	Workshop
1	Automotive OEM	Car manufacturer	✓	✓
2	Infrastructure provider 1	Physical road network and maintenance	✓	✓
3	Infrastructure provider 2	Physical products and software solutions	✓	✓
4	Telecom company	Mobile connectivity	✓	✓
5	Automotive supplier	Devices and software solutions	✓	✓
6	Local authority	Urban road network	✓	✓
7	University 1	Research and development		✓
8	University 2	Research and development		✓

Findings

As illustrated in Figure 3, a new approach based on design thinking was developed, called the 4-stages modified design thinking process. The modified approach provides a strategic approach to identifying the most advantageous co-creation opportunities for an emerging industry where the final offering is still uncertain.

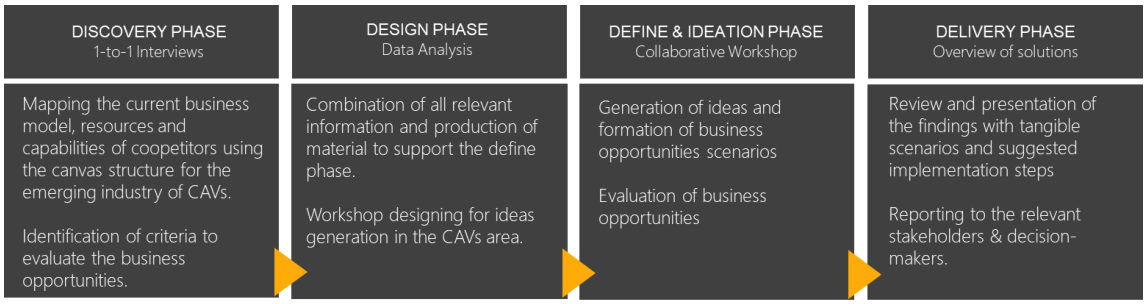

Figure 3- 4-stages design thinking process

The process utilized a modified version of the business model canvas to inform coopeting organisations on the resources and capabilities of each organisation, eliminating the inaccuracies on information gathering and transfer. This is achieved by

enabling organizations to provide feedback on the information gathered through the interviews. Moreover, the business model canvas provided an effective way for knowledge and information sharing enhancing the cooperation and allowed matching ideas for co-creation with relevant resources and capabilities of each organization (Osterwalder and Pigneur, 2011; Bouncken and Kraus, 2013).

Design thinking worked as a mean to dissolve competing relationships in the ideation stage by positioning participants in the role of the customer where details of user's lives led to new and more profound insights for offerings enabled by the connected and autonomous vehicles that were translated into products and services. A second impact during the ideation stage was observed by focusing on exploring the problem of commuting itself and, then, based on the new understandings; ideas were generated for products, services and business models to solve these problems. Dorst (2015) has argued that problem framing is one of the key design practices that make the method more likely to yield better solutions than conventional approaches to problem-solving. This stage was enhanced by having participants with different backgrounds from academics, product managers, business developers to technology specialists as different perspectives on the examined issues were combined.

Participant organizations had to collaborate in order to achieve a consensus about the most beneficial business opportunities and match their resources and capabilities to these scenarios. To achieve this, organizations had to define which technology will be used for the connectivity side. Despite that, opportunistic behaviour can be seen on determining the mix of technologies as organisations compete following their individual strategies, consensus on the resources and capabilities that are required for the realization of the final three business opportunity scenarios was found. In that sense, coopetition seems to be seen as a strategic choice for the CAVs among the networked organizations (Roy and Yami, 2009). Figure () describes the results of following the developed approach.

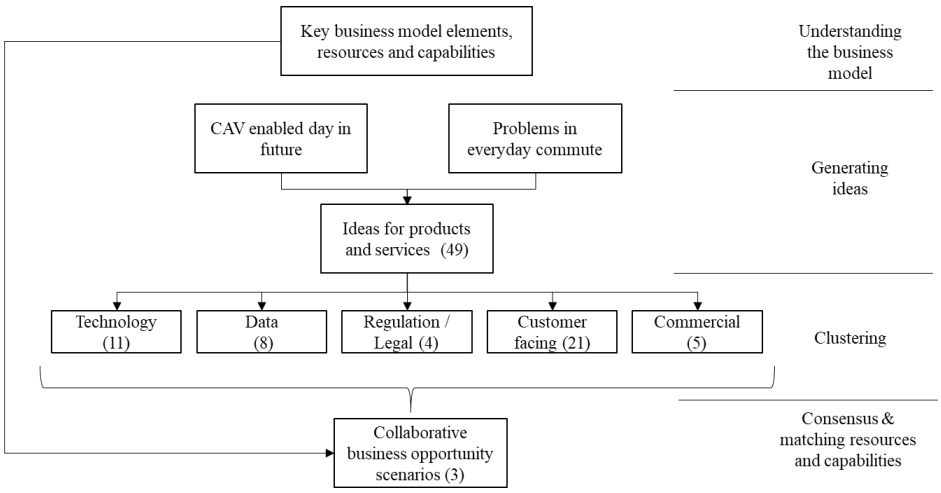

Figure 4- Results of the approach

Using a design thinking approach enabled discussions and observations that have not been identified focusing solely on the development of the technology. Hence, further insights were formed for the difficulties of commercialising CAV-enabled products and services. Except of the technological development, which is the base level in the suggested framework, data ownership and sharing issues, and incentivization were

identified as two challenges that organizations should overcome to realise the final offering of connected and autonomous vehicles. To that end, the collaborative efforts should be targeting on understanding how the customers will adopt the technology and how to demonstrate these benefits through the offerings. Moreover, the huge amounts of data that will be generated and collected as the connected vehicle interacts and exchanges data with other vehicles and the infrastructure should be classified in order to build a joint agreement about its usage and ownership. Finally, specific attention should be given around the security of the systems and the formation of an adaptive regulatory environment for the CAV technologies, products and services, with the involvement of both organisations and governments to clarify the path in all levels of commercial readiness. Figure 5 illustrates the framework for CAV commercial readiness.

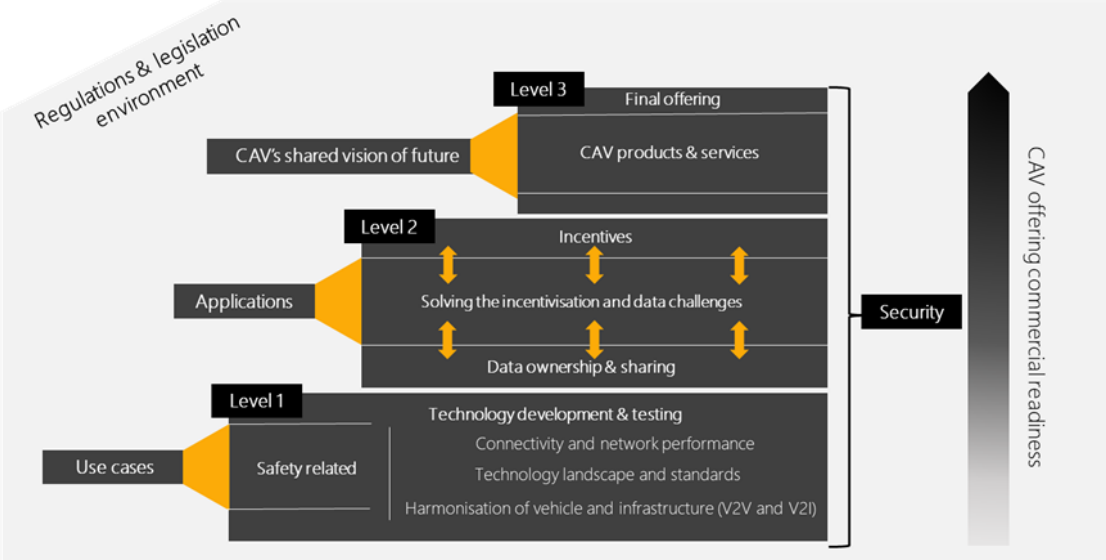

Figure 5- Framework for CAV products and services commercialization

Conclusion

To summarize, this study provides an approach for the identification of collaborative business opportunities utilizing coopetition theory, design thinking principles and the business model canvas. The case study results indicate that all three topics can be combined through the approach to enhance networked organizations in the innovation process of emerging technologies focusing on connected and autonomous vehicles. Moreover, it illustrates how competition and design thinking are valuable to provide new insights on emerging trends as they can be used for the identification of challenges and requirements that were not considered before. Finally, it provides a framework for the commercial readiness of the CAVs as the outcome of the empirical analysis. Through that, it shows that an intermediate level is required from technology development to full-scale solutions.

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