How co-creation supports digital innovation in automotive startups

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HOW CO-CREATION SUPPORTS DIGITAL INNOVATION IN AUTOMOTIVE STARTUPS

Research paper

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Abstract

Co-creation is an essential aspect of organizational agility enabling organizations to gain digital innovation capabilities, such as support in developing critical peripheral services or attracting talents and investors. Co-creation is especially essential for startups because of their limited resources. It fosters organizations to learn and innovate across company boundaries to remain competitive. Little is known about how startups apply co-creation to support their digital innovation initiatives. This paper presents a qualitative study of eight automotive startups, based on 22 semi-structured interviews. We applied the prediction and control framework as an analytic lens and identified three key advantages of co-creation. Embracing co-creation in ecosystems increases startups' resource capacity and speed for digital innovation. We concluded that automotive startups that apply visionary and transformative logic were found to have a better ability to lead digital innovation in a controlled way and attract wanted talents and actors.

Keywords: Automotive Startups, Organizational Agility, Co-Creation, Framework of Prediction and Control

1. Introduction

Co-creation is an aspect of organizational agility which can be defined as the ability in companies to utilize resources to increase innovation, regardless of where the resources are located or who owns them. Typically co-creation happens both inside and outside the organization, and embraces cross-functional innovation and the creation of alliances with other external actors to enhance competitiveness (Goldman, Nagel and Preiss, 1995). Co-creation is described in the innovation literature as an important resource for organizations involved in digital innovation, regardless of industry domain. There are different reasons for companies to co-create with external actors, and such innovation initiatives are carried out differently depending on, for example the company's size, age and culture.

The literature has identified that most incumbents have an organizational environment where waterfall planning and prediction strategies, based on a statistical calculation, are used to predict the future (Wiltbank, Dew, Read and Sarasvathy, 2006). This in itself usually leads to organizations being reluctant to look beyond what they already know. For example in 2007 few could seriously believe that the iPhone with its 4% market share in desktop operating systems and zero market share in mobile phones could conquer the dominating mobile phone companies Samsung, Motorola, LG, Sony-Ericsson and Nokia, who at that time collectively controlled 90% of the market (Van Alstyne, Parker and Choudary, 2016a). Somehow, iPhone alone succeeded in generating 90% of the global profits by 2015, while the major part of the incumbents made no profit at all (Van Alstyne et al., 2016a). Apple succeeded to overrun the incumbents by sensing and seizing an opportunity for a completely different business, namely exploiting the power of the mobile phone as a platform and leverage digital service innovation by bringing together producers and consumers in high-value exchanges (Van Alstyne et al., 2016a). By
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applying this business platform strategy, Apple accelerated and expanded its business manifold by connecting developers as service providers with users as service consumers—generating value for both groups and gaining a network effect as participation grew (Van Alstyne et al., 2016a). Other strategies are found in startups that primarily use co-creation to gain access to resources that they would not otherwise have access to and thus be able to accelerate their innovation into the market (Tumbas, Berente and Brocke, 2017). Fast response to change, and access to resources become important to leverage startups' innovation speed and survival (Motoyama and Knowlton, 2016). Co-creation in ecosystems seems to emphasize a shift of focus, e.g. shifting from creating processes to persuading participants, from customer value to ecosystem value, subsidizing one type of consumer in order to attract another type. In this type of ecosystem business boundaries can shift rapidly.

The automotive industry is identified by literature as a market that is currently involved in substantial changes due to digitalization, autonomous-drive, electrification, digital service platforms, economy-sharing, and the need to become agile, which in turn challenges the existing car-manufacturers' business models (Denning, 2020). It is not so remarkable that some premium automotive incumbents in Europe in recent years have embarked on 'all-in agile' transformation journeys with the hope of gaining organizational agility enabling co-creation across company borders to solve its slow digital innovation dilemma and in turn survive in a volatile digital market (Hohl, Münch, Schneider and Supperich, 2016). Even car-manufacturers seem to need to make a similar journey as Apple, i.e. the need for a major mindset shift, from a focus on a physical product sold to individual customers to instead seeing the car as a mobile digital platform that can open up completely new business opportunities and completely new customer segments which the companies might not even have today (Van Alstyne et al., 2016a; Sebastian, Ross, Beath, Mocker et al., 2017). Furthermore, companies might also need to take on complete new role(s), by going from car-manufactures to platform owners and providers, these are completely different roles than the ones they hold today. However, even-though some few incumbents have succeeded with becoming agile enterprises (Steiber, Alänge, Ghosh and Goncalves, 2020), the automotive incumbents seem to be struggling with keeping up the digital innovation pace (Dow, 2017; Voigt 2020; Denning, 2020). An interesting phenomenon seems to be that a new generation of digital automotive startups seem to possess the necessary dynamics, the needed emerging technology knowledge and experience, and drive their innovation growth through co-creation in ecosystems (Tumbas et al., 2017). Tesla could serve as an example when they contributed to other car-manufactures innovation to accelerate the shift to electric vehicles (EV:s) when they decided to share patents freely and created the world's first open-source car (Musk, 2014). Tesla could still be seen as a startup based on its ability to have retained a startup entrepreneurial culture, a flat structure facilitating organizational dynamics, obsession with speed for every operational decision, and a continuous innovation capability (Steiber and Alänge, 2016; Filloux, 2020). Tesla's mindset, of seeing the car as a mobile digital platform enabling continuous digital service innovation deployed over the air, differs from its competitors (Sebastian et al., 2017). An example is how the Tesla car is being perceived as an investment by the customer, as mostly everything continuously gets enhanced regardless of if it is increased engine performance or new digital services, which becomes available at no additional cost. The Tesla mindset differs radically from the other car-manufactures where the owners perceive that the car value starts to decline as soon the new owner puts in the car key.

However, while literature has focused on incumbents attempts to become agile in order to enhance their digital innovation capability and pace (Paasivaara, Behm, Lassenius and Hallikainen, 2018), relatively little is known about how these new generation of digital startups develop their innovation capability. It seems that co-creation is important for these startups, but we do not know much about how they use co-creation to be fast and flexible when it comes to innovation. Therefore, this study aims to explore how co-creation can give startups increased digital innovation capability. We ask the following research question: How does co-creation support digital innovation in automotive startups?

The paper is organized in the following way: first we review previous research on how co-creation is positioned within organizational agility and digital innovation, followed by a presentation of the theoretical lens for classification of how organizational environments enables or hinders different types of co-creation. More specifically, the Framework of Prediction and Control (Wiltbank et al., 2006) will be used. The method section presents the qualitative study and selection of companies. The results are
then presented and discussed from the perspective of how co-creation supports digital innovation in automotive startups. The paper ends with conclusions, limitations and future research.

2. Literature Review

Organizational Agility has become crucial in recent years due to digitalization and an increasingly turbulent competitive global market, forcing organizations to adopt Agile practices such as co-creation to primarily improve their digital innovation capability and pace, enabling responsiveness to customer needs in a fast way (Xu and Koivumäki, 2019; Holbeche, 2018; Denning, 2020). The primary idea with Agile is to utilize existing resources regardless of where they are located or their ownership, embrace collaboration across company borders to enhance its competitiveness (Goldman et al., 1995), e.g., enabling organizations to accelerate their innovation initiatives through co-creation with external actors (Mihardjo, Sasmoko, Eldjjen and Rukmana, 2019). By applying this approach, companies will intentionally improve resource availability, develop new relationships and collaborations with potential new partners and customers, and also improve their reputation and brand (Pera, Occhiocupo and Clarke, 2016).

2.1. Organizational Agility

Organizational Agility is crucial for organizations' digital innovation and competitive performance in contemporary business (Sambamurthy, Bharadwaj and Grover, 2003; Tallon and Pinsonneault, 2011). It requires that companies commit to continuously transform and understand that Agile strategies imply changes at all levels of the organization from its structure, through its leadership and decision-making dynamics, all the way down to the skills and interpersonal relationship of individuals implementing the Agile mission (Appelbaum, Calla, Desautels and Hasan, 2017). The term ‘agility’ was coined already in 1991, in an extensive research project in cooperation with industry and government leaders, conducted at the Iacocca Institute at Lehigh University (PA) — with the purpose of studying how US industry could regain its international competitiveness leading to the concept of Agile Enterprise (Goldman et al., 1995).

The original definition of Organizational Agility is delivering value to customers, being ready for change, valuing human knowledge and skills, and forming virtual partnerships (Goldman et al., 1995). Organizational Agility mainly represents the idea of "speed and change in the business environment" (Dahmardeh and Banisashemi, 2010; Conboy, 2009). Agility focus on building organizational dynamics and aggressively embrace and master change, creating new opportunities for profit and continuous innovation growth, and not about improving efficiency, cutting costs, and temporarily handle market competition or market declines (Goldman et al., 1995). The hyper-efficiency that organizations can achieve is rather a side effect of organizations being Agile (Goldman et al., 1995). The Agility capability strength lies in proactively anticipating future customer needs and lead to the emergence of new markets through continuous innovation (Goldman et al., 1995). Organizational Agility can serve as a foundation for competition by providing the company with the capabilities of sensing, seizing, and transforming to enable the organization to capture new business opportunities as they arise and secure profit growth (Dove, 2001; Teece et al., 2016). This foundation can enable a knowledge-rich environment that provides customer-driven products and services in a volatile marketplace (Yusuf Sarhadi and Gunasekaran, 1999).

The term organizational agility includes, in its definition, the type of practices commonly referred to as Agile methods. While the Agile Manifesto (Beck, Beedle, Bennekum, Cockburn, Cunningham et al., 2001) applies a bottom-up approach on how to develop better software, the Agile Enterprise advocates a holistic enterprise approach, regardless of software or hardware (Goldman et al., 1995; Yusuf et al., 1999). Since Agile has, to a great extent, become associated with software development, and it still seems to be a misconception that Agility originated with the Agile manifesto in 2001. However, for organizations to keep up with the needed innovation pace, they need to develop different collaboration and co-innovation practices, e.g., co-creation in communities and ecosystems (Chesbrough, 2012; Van Alstyne et al., 2016). To achieve this kind of co-creation capability, organizations need to understand how these types of innovation environments operate and compete (Van Alstyne et al., 2016). There are some implications and challenges that need to be addressed, such as leadership, structure, culture and ability to develop trustworthy relationships with external actors (Hohl et al., 2016; Svahn,

2.2. Co-Creation

In this study, we define co-creation as the contributions of collaborators, to increase the resource capacity and speed for digital innovation, as well as a way that firms achieve competitive advantage. While the extant literature has been focused on value co-creation with consumers, there is less known about value co-creation from a multi-stakeholder perspective, particularly where startups are also addressed as a type of stakeholders (Pera et al., 2016). When co-creating, innovative ideas are drawn from all actors involved, which increases the companies’ capacity to generate insights, enabling companies to take advantage of opportunities which they otherwise might have missed to identify, and at the same time reducing financial risks by using global networks and communities (Ramaswamy and Gouillart, 2010). Co-creation-driven innovation as a concept is derived from the research on service-dominant logic (Vargo and Lusch, 2006) and business model innovation (Osterwalder and Pigneur, 2002; Chesbrough, 2010) and has become part of organizational agility (Holbeche, 2018; Mihardjo et al., 2019). Multi-stakeholder co-creation requires individual characteristics such as creativity, flexibility and negotiation for shared value to be built (Pera et al., 2016). Romero and Molina (2011) argue that value creation is an essential aspect of open business models, which seek to integrate available competencies wherever they are, into networked communities for co-creation. For the same reason, it has become an essential aspect of organizational agility (Goldman et al., 1995; Holbeche, 2018). Co-creation enables ‘greater’ products and services to be launched into the market, challenging the traditional distinction between supply and demand (Prahalad and Ramaswamy, 2004). All points of interaction between the consumer and the company are opportunities for both value creation and extraction (Prahalad and Ramaswamy, 2004). To make co-creation happen in an efficient way all involved actors must recognize that the interaction between them must be built on trust, inclusiveness and transparency (Prahalad and Ramaswamy, 2004; Pera et al., 2016).

Startups tend to embrace open innovation and co-creation as a method to leverage their digital innovation capability (Tumbas et al., 2017). Since startups are often challenged by resource limitations and have a weakness of limited ability to scale up for high-volume operations, the ability to co-create with external actors is of great importance to them (Autio, Nambisan, Thomas and Wright, 2018). Co-creation enables the startups to maximize their knowledge utilization and use of competence where it makes the best contribution in order to rapidly reconfigure and re-align the business to serve a particular purpose as the window of opportunity opens up (Tapscott, 2015; Holbeche, 2018; Goldman et al., 1995). Co-creation could also contribute to speed up knowledge growth not just for the involved actors but also for a broader market including whole industries in a region, which would be of interest for policy makers (Steiber and Alänge, 2020).

As technology evolves and enables new ways of co-creation, it becomes important to design environments that support the organizations’ intended form for how they want to drive their digital innovation initiatives and what kind of support they need, e.g. access to knowledge, mentors, investors, capital, and so forth (Wiltbank et al., 2006; Steiber and Alänge, 2020). For Tech startups, e.g., Google, open innovation is the primary choice of how to drive innovation initiatives (Tapscott, 2015; Steiber and Alänge, 2013). Following these new value co-creation approaches, organizations are trying to create strategies that enable them to participate and gain fast competitive advantages through the emergence of new open innovation forms. However, even when collaboration with external actors can be technically straightforward, organizations tend to struggle when it comes to commercial agreements between the different parties (Svahn et al., 2017). Co-creation with startups normally requires a different type of relationship, engagement and contracts compared with traditional large incumbent suppliers e.g. Denso and Bosch (Svahn et al., 2017). Startups normally see themselves as external entrepreneurs engaging with an automotive company to develop their own business (Svahn et al., 2017). It requires a different alternative approach to motivate external stakeholders to share their intellectual property, one way for automotive companies to solve this could be by emphasizing mutual liability and cost neutrality contracts (Svahn et al., 2017). This new type of co-creation between startups and incumbents requires some new knowledge for how organizations effectively can co-create together (Prashantham and Birkinshaw, 2008).
Co-creation is a crucial aspect of an organization’s ability to develop organizational agility (Holbeche, 2018). The ability to co-create is shaped by many different aspects, such as effectuation and whether the company has a goods dominant or service dominant logic (Sarasvathy, 2001; Vargo and Lusch, 2008). Effectuation and service-dominant logic originate from independent streams of research that provide a basis for developing a new understanding of business creation. Effectuation is defined as a logic of building ventures out of non-predictive control that takes a set of means as given and focuses on selecting between possible effects that can be created with the possessed means (Sarasvathy, 2001). Effectuation identifies co-creation as an approach that entrepreneurs learn for controlling the uncertainties of developing new firms, products, and markets. Co-creation is similarly integrated with service-dominant logic, where Vargo and Lusch (2016), explicitly articulate the sixth foundational principle as ‘value is co-created by multiple actors, always including the beneficiary.’ Extended to co-creation for heuristics effectuation and service-dominant logic, this may clarify the theory around capital input and outputs of co-creation. Capital, both economic and human, applied in co-creation may differ in essential ways from capital used in existing markets (Read and Sarasvathy, 2012). Foss, Foss, Klein and Klein. (2007), argues that not all capital is equal. The value of capital differs depending on the source of the capital, but it is also impossible to predict the value, as the potential of co-creating unanticipated value between funder and co-funder cannot be assessed in advanced. The issue is that it is difficult for any external entity to judge or value the risk inherent in starting a new firm, such as a startup, an insight that easily extends to uncertain co-creation activities. Even the entrepreneur might not be able to judge the risk or return to co-created artifacts that may emerge from his or her interactions with committed stakeholders. As Prahalad and Ramaswamy (2004) explains that co-creation is a two-way street, risks cannot be one sided. All actors involved in the co-creation initiative must take some responsibility for the risks they consciously accept. The involved actors can inject or state their expectations and willingness to monetize their own experiences and make it explicit, while the company can accept or reject the transaction at that time (Prahalad and Ramaswamy, 2004).

While Read and Sarasvathy (2012) state that it cannot be determined how customers will co-contribute to the interaction of co-creation until they become customers, Xie, Wu, Xiao and Hu. (2016), offer an alternative business strategy for organizations to apply in a digital economy. According to Xie et al. (2016), a stable cooperative relationship can only be established when organizations engage in value co-creation with customers through service exchanges and mutual support as actors evolve into cooperative assets. Xie et al. (2016) argue that the cooperative relationship's sustainability is higher than that of the ‘customer relationship.’ The explanation given is that when customers are only viewed as ‘passive value recipients,’ they can effectively switch between different brands or companies. When companies can offer digital platforms for customers to participate in value co-creation, customer participation produces more robust path-dependent behavior that connects them with the companies. Customers choose the company and the experience environment to invest effort in to interact and co-create value which they are willing to pay for (Prahalad and Ramaswamy, 2004). Once invested in this co-creation community relationship customers tend to stay loyal to the community they have been a part of designing and develop, an indirect locking effect can then be achieved.

3. Prediction and Control Framework as Analytic Lens

Literature has primarily shown from an incumbent perspective that there are different ways organizations can co-create with external actors and that manager skills, organization- and innovation environment design could have an impact on how organizations succeed with their innovation initiatives (Prashantham and Birkinshaw, 2008; Usman and Vanhaverbeke, 2017; Sarasvathy, Dew, Read and Wiltbank, 2008). The purpose of applying the framework of prediction and control (Sarasvathy, Dew, Read and Wiltbank, 2008 ), Figure 1, as an analytic lens is to help us understand how the startups' applied strategies enable or hinder the desired innovation approach to be successful, e.g. enterprise agility is essential in a dynamic business environment (Appelbaum, Calla, Desautels and Hasan, 2017).

Wiltbank et al. (2006) developed the framework of prediction and control based on a literature review on strategic management. Four key strategic approaches are arranged based on their orientation toward two underlying variables, prediction, and control, and the framework shows where the transformative approach differs in its logical orientation from the other three. The four organizational design logics: 1) Planning approach assumes the environment is beyond control but predictable. Companies invest in
predictive techniques allowing them to design an organization which they anticipate be favorably positioned for the future. 2) Adaptive approach assumes the environment being unpredictable. Companies shorten their planning horizons and invest in flexible organizational designs that effectively respond to changes in the environment. 3) Visionary approach assumes that the environment is predictable but malleable and companies impose their vision of the future, shaping the environment to achieve their desired outcomes. This strategy emphasizes a vision as the starting point to motivate and direct other factors (Steiber and Alänge, 2016). 4) Transformative approach assumes future environmental factors are contingent on human action and design. Companies seek to create products through interactions with others, including committing to imagined new futures viable out of current means. The transformative environment supports agility, entrepreneurial visionary innovators, continuous change, and learning (Goncalves et al., 2020). The focus is to transform current means into co-created goals with others that commit to contributing. This enables risk sharing and control since the affordable loss is decided upfront.

4. Research Method

The interest in investigating digital innovation capability in digital automotive startups is based on the observation that these startups have challenged incumbents in the automotive industry, despite their limited resources. The automotive industry is undergoing a major change that affects all its structures, culture and ways for innovation collaborations. Therefore, we aimed to gain a better understanding of how co-creation supports digital innovation in newly started vehicles. To identify potential startups for the study, we screened the automotive startup landscape in Europe, mostly in Sweden. The sample selection criteria for this study were startups within the domain automotive, the company is no more than ten years old, and the founder is still in the company. The startups should have a headcount of at least four employees, and the company should be a product development company, and digitalization is part of the company strategy. We have chosen a qualitative research approach to get a deeper understanding of how the startups’ leaders think when designing their organization and environments to enable co-creation initiatives with external actors. By conducting semi-structured qualitative interviews, primarily at the location, tacit information got exposed to us which could further explain the companies' applied strategies. This kind of unspoken information might guide us afterward on how to interpret the interview data.

Eight internationally active startups within the automotive and mobility domain were chosen because of their active approach to digital service innovation since this is generally driving digital innovation in this domain today (Lyytinen, Yoo and Boland, 2016). The sample selection criteria for this study is that the founder is still in the company and has at least four employees. It is a product development startup within the automotive domain and is not older than ten years. We mostly interviewed management at strategic positions to understand how the company's chief officers enabled and applied co-creation as an approach to enhance digital innovation capability. Still, other organizational actors were also interviewed to provide a broader view and verify management's statement (Eisenhardt and Graebner, 2007). Since the studied companies were rather small, one person could hold several roles.

4.1. Data Collection

We conducted 22 semi-structured interviews (Bryman and Bell, 2015), presented in table 1—the startup sizes: S less than 50 employees, M 51-150 employees. 18 of the interviews were conducted at the Twenty-Ninth European Conference on Information Systems (ECIS 2021), [Marrakesh, Morocco]A Virtual AIS Conference].
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location, and the remaining four interviews were conducted via interactive on-line dialogue. All interviews followed a set of 37 open-ended questions and 11 questions to cover for demographics. Each interview took approximately 1.5 - 2.0 hours. People answered the questions to the best of their ability and pointed out if there would be any further questions or if clarifications would be needed we could contact them again. All interviews were recorded and afterward transcribed. Additional secondary data collection included white papers, web pages, and a literature survey.

<table>
<thead>
<tr>
<th>Startup</th>
<th>Size</th>
<th>Type</th>
<th>People interviewed</th>
<th>Roles Interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S</td>
<td>IoT &amp; AI, Incubator</td>
<td>4</td>
<td>Co-Founder; CEO; Head Sales; SW Team Lead; Company Board Member External Investor</td>
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<tr>
<td>B</td>
<td>S</td>
<td>Digital Services &amp; HW Product, Incubator</td>
<td>2</td>
<td>Co-Founder; CEO; Partner; Product Owner</td>
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<td>S</td>
<td>Digital Services</td>
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<td>Two-Sided Cons. Platform</td>
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<td>CEO; Keyless Lead</td>
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<td>E</td>
<td>M</td>
<td>OEM, EV &amp; New Platform</td>
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<td>Marketing Director; Autonomous System Director; Innovation Manager; Head of Software; Director Energy Storage</td>
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<td>F</td>
<td>M</td>
<td>Two-Sided Cons. Platform</td>
<td>1</td>
<td>Director R&amp;D</td>
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<td>S</td>
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<td>1</td>
<td>CEO &amp; Co-Founder</td>
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<td>H</td>
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<td>HW &amp; SW Platform, Incubator</td>
<td>3</td>
<td>Co-Founder; CEO; Board Member; Developer</td>
</tr>
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</table>

Table 1. Startup sample for this study

Four startups out of 8 startups in this study were or had been connected to the same incubator. The incubator had been launched by some incumbents that came together in an attempt to speed up their digital innovation capability through co-creation with startups (Prashantham and Birkinshaw, 2008; Usman and Vanhaverbeke, 2017; Weiblen and Chesbrough, 2015). The incubator offers startups with pioneering ideas to accelerate through the possibility of a strategic partnership with six global incumbents within the mobility and connectivity domain. The startups need to apply if they want to join. The application is open to all startups regardless where they are located, and the application window is normally open during one month. The startups that get selected are called to pitch for the board of partner companies. If accepted into the incubator they can stay connected for six months to co-create with the incumbents associated to this incubator.

4.2. Data Analysis

We applied a systematic combining approach, meaning going back and forth between data, extant literature, framework and analysis (Dubois and Gadde, 2002). First, we transcribed and coded the recorded interviews using a bottom-up approach (Myers, 2013). Second, we compared each recorded answer to the corresponding interview question ‘area’ to systematically identify similarities and differences between the companies’ approach to co-creation as a digital innovation approach. Third, we returned to the literature to find support to help us differentiate the different patterns found in our empirical data (Dubois and Gadde, 2002). We then found and choose to apply the framework ‘Prediction and Control’ as our analytical lens to analyze the four different combinations of entrepreneurial logic that we found in our empirical data. The results are shown directly in the framework of prediction and control (Wiltbank et al., 2006), Figure 2. Fourth, we have selected quotes from our interviews to better reinforce our results, reasoning and also to give a sense of what strategies these companies applied to drive their business, market opportunities, and innovation. Fifth, we organized the results according to the different strategy logics in the framework of prediction and control (Wiltbank et al., 2006) to better convey a graphical view of the results. The reason is that there are four different competing logics that enables or hinders innovation to happen. These logics rewards different leadership and people behavior. In addition, different types of organizational culture can foster and enable these different logics and promote different organization focus, internal versus external (Goncalves et al., 2020). The internally focused organizations tend to keep a long-term perspective with a focus on processes and the needs of
its people. The externally focused organizations tend to keep a short-term perspective and a focus on customer needs and competitiveness. An agile culture combines flexibility with both long and short term perspective and rewards a transparent entrepreneurial leadership that values collaboration, teamwork, group success and community (Goncalves et al., 2020). It is an exploring and venturesome culture, that pushes forward despite uncertainty. The environment normally requires flexibility, adaptability in order to handle unexpected challenges (Wiltbank et al., 2006; Usman and Vanhaverbeke, 2017).

5. Results

The result is organized in the following way. First, we present general results about the type of startups. Then we apply the prediction and control framework by Wiltbank et al. (2006), which identifies different kinds of logic and factors that influence co-creation and which we used for both analyses of the data and to visualize the results. This visualization approach of the results also enhances how the different logics and factors influence each company’s ability to use co-creation to improve its digital innovation capability. Three companies applied only planning logic for co-creation and were positioned in the upper left quarter of the framework. Remaining companies spanned two types logics. All combinations identified are presented in Figure 2.

5.1. Type of Startups

The result showed a wide range of startup entrepreneurial practices of prioritizations. A common denominator for all companies was that people had similar motives for joining the company. We identified: a) to work with professional people that they respected, b) be able to contribute to a challenging social vision, c) work with exciting and interesting things, d) be able to influence their situation, such as controlling their own time.

Startup C and E had deliberately designed their organizations to enable transformative co-creation to drive digital innovation. The other companies did not follow any particular digital innovation approach. They generally had an agile culture that they aimed to implement and retain. Startup D claimed to have applied ‘Holacracy’ (Robertson, 2015), as an organizing vision encoding autonomy, agility, and purpose-alignment into their organization, leading to maximizing the use of all resources at the company, including top management. Another aspect that all companies mentioned was to be authentic, passionate, personal, and transparent. The investors to some of the companies demanded fast profitability, limiting these companies’ ability to participate in co-creation.

5.2. Startups Applying Planning Logic: A, B, H

The startups that applied causal logic based their innovation strategies on predicting the future and showed to be growing very slowly. None of them had a challenging social vision that they used as a driver. Startup H was very dependent on investors, and indirectly their digital innovation progress suffered from this dependency. Despite winning various innovation prices within Europe, they still had a huge struggle to gain resources from investors. Startup H mentioned that they even hired an expert to help them with the application for venture capital, without success. They mentioned that it was tough to get venture capital in Sweden, much more accessible in other countries like the USA and Israel.

All incubator-based startups, according to table 1, except for startup G, stated that the incubator co-creation concept did not work due to a lack of capability from the incumbent side. However, they had still chosen to remain connected since it was an excellent way to expand their network and gave them marketing advantages.

Startup B and G were not dependent on venture capital; their digital innovation was mostly financed by themselves. The drawback of this approach was the lack of means that slowed down digital innovation pace. Even though they started from given means that they possessed, it still falls into the causal logic since they try to predict how to reach their goals and to do everything themselves. Not that they did not want to co-create with others, but they were not able to persuade external actors to buy in into their idea of opportunity.

Startup A did not have a challenging social vision, but more a goal of how the company would grow from 18 employees to 500 employees. This startup had a more traditional entrepreneurial causal logic of how to build companies. This was also the driver for the CEO of startup A, who had a long working
experience of building entrepreneurial companies. He explained that there is a difference in mindset between Swedish and American incumbents. He explained that in the previous company that he had founded and grew them to become large, it was possible due to acquisition by an American incumbent. “We participated in procurement for one of the major cable companies in the US. We thought we had lost the deal because we had no significant turnover or many reference cases. We got the deal, and we did not understand why. We asked them why we got the deal. They replied: ‘We are going to make you!’ It was so damn smart. They came in as a significant customer at an early stage, and they always had the latest. They joined our journey and took advantage of the latest and became a little 'hyped’.”

All four startups were technology-driven. Technology drove their value creation experimentation on the market. People in these startups had a passion for technology. The founders had a broader view regarding what the companies could achieve business-wise. These companies were also part of an incubator as a way to get easier access to incumbent firms. None of the companies were able to successfully co-create with incumbents, despite having direct connection to the right actor in the incumbent within the incubator. Startup H stated, “We have not even been able to exchange a single cent during my years at this incubator.” - CEO Startup H. The startups stated that the co-creation part with the incumbents had never taken place. Once the companies were in agreement about to co-create something together, the incumbent contact would vanish.

5.3. Startup Applying Planning and Adaptive Logic: G

Startup G was no longer within the incubator but stated they had had a good experience of the co-creation of one product with one of the incumbents. When asked to elaborate on this answer, startup G replied that students had done the actual work. These students were in the last year of their bachelor program and were coached by the startup. The incumbent had not committed or gotten involved during the time that the product was at the incubator. First after that the product was transferred from the incubator to the incumbent innovation garage the incumbent took over the ownership and continued the innovation activities. The startup also mentioned that everything took quite some time to get done when the incumbent was involved due to the incumbent’s structure and decision process. The person involved had no mandate to make any decisions. However, a positive incubator synergy was the recruitment of students. The company used the time colocated inside the incubator to get a sense of the students' competence and performance. “We hired one student each.” — CEO at startup G.

5.4. Startups Applying Visionary and Adaptive Logic: D, F

The startups positioning within visionary and adaptive logic applied a challenging social vision but focused more on exploitation due to lack of means for conducting exploration. The startups applied the big social vision as a strategy to attract talents and external actors to contribute as co-creators. Talents joining the company did it in order to be part of contributing to the company’s vision. These startups develop digital mobile services for physical products that they purchase and place out on two-sided market platforms, e.g. Uber services. Startup F stated, “When Uber came to Sweden we saw the ‘right’ type of digitalization of the taxi business but everyone used the ‘wrong’ type of vehicle.” These startups are in the hands of investors who apply causal logic, leading to limited resources for exploration. The focus is on fast profitability and data measurements to tap into improvement work and exploitation. As an improvement method, startup D worked with high stretch goals, OKRs (objective and key results,
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originated from Intel and Google model). They commit to 3-5 OKRs per quarter. Once the OKRs are set, everyone decides which OKRs to signup for and form a global OKR team. The exploitation method applied by the startups is data and marketing driven. These companies have a good understanding of what their customers might need simply by conducting big data analysis and experimenting with new digital services that they launch to parts of their user community, and if positive results, they expand to the remaining population. All startups were extremely cautious with how they prioritized their time and what ‘digital innovations’ to exclude. Startup D stated, "Capital usually contributes to innovation and technology development, but not always. We are working on a model based on the fact that we innovate to build a better product or we buy the market." The explanation given was that there is venture capital within digital services towards end-consumers that wants to win the market quickly, such as towards consumers, mobility, and private loans. The money usually goes to market growth, and this is not necessarily innovation. This type of investor wants to make sure that they quickly get part of the market and are unwilling to wait for an innovation to hit the market. These companies are valued based on their market shares and not on how great the product is.

Another interesting factor was how different their product works in different markets. In the Netherlands, the brand is big, so they can put demands on car owners and customers if they want to use the two-sided platform. The Netherlands has no automotive industry and, therefore, they usually have considerable car costs, so people can get significant synergies by sharing a car. In Germany, they lag when it comes to digitalization, and considerable effort is needed to call and persuade car owners to join the platform. Sweden has been digitalized for a long time, and the market is more mature for digital services. Startup D stated that their digital innovation process is prolonged as no decisions are made 'on the gut feeling,' but every idea has to be proven with data evidence. For example, they conduct measurements for six months to see if there is a pattern before making any product changes. They have 30-40 initiatives popping up all the time. The focus is on deciding what not to include. These startups had many moving parts in their business model, which required intensive calculation efforts to bring the economy together. According to startup D, sometimes those who have less money and resources are forced to be more innovative.

5.5. Startups Applying Visionary and Transformative Logic: C, E

These startups presented the most ambitious digital innovation progress in the short term compared with the other startups in this study, given their capability to grow their companies and their high innovation pace. They apply exploration and exploitation as a digital innovation approach. These startups were more in control of their digital innovation progress than the other startups. They were able to attract investors with different decision logic that were open to join them and work according to an effectuation logic. They were selective in their choice of partners and customers whom they invited for co-creation. The startups designed their organizations and environments to enable effectuation as a digital innovation approach. Agile organizational culture was applied as an enabler to increase their digital innovation capability and control their volatile environment. People were very passionate about what they worked with and about belonging to the company. The CCO at startup C stated, "What a difference it is to come to a workplace where you feel you have more energy when you go from there than the other way around. It is so damn good. This is where you want to be."

Startup E created a great interest in their product and company, which attracted many incumbents who contacted them and tried to convince the startup that there was a win-win if they could be part of their co-creation. The head of software stated: "The funny thing is that it is very rare that it is a salesperson that visits us, but more often CEOs that come to us." That incumbents knock on a startup's door and try to convince the startup that there are win-win opportunities and even significant gains by letting the incumbent in for co-creation is quite unusual. This startup created the 'hype' around them by continuously sharing their stories and progress on social media and being out on different fairs and showing their product progress.

Startup C has gone from 0 to 12 employees in less than six months. All startups recruited talents within their academia family tree or network. According to the founders, it is crucial that people have the 'right' attitude and mindset, and match their organization's agile culture. Both startup C and E applied co-creation strategies for expanding their means and drive their digital innovation forward. Always keeping a holistic perspective, guided by their challenging social vision, and with the ecosystem as a
starting point. It is essential not just to think about digital innovation as building the latest cool gadget but also to create significant digital innovations that contribute to developing a better sustainable world. Startup E has won many international innovation prices, leading to massive media attention. However, focusing solely on pushing ideas and innovation to an extreme without leaving room for people to reflect and exhale, resulted in key talents leaving the startup due to a lack of work-life balance.

6. Discussion
6.1. Emphasis on Prediction
When companies deliberately emphasize prediction logic they assume that the environment is beyond their control (Wiltbank et al., 2006). Our findings showed that prediction logic strategy become an impediment for having co-creation with external actors to actually happen (Wiltbank et al., 2006). Despite of the startups trying to co-create with incumbents the lack of the needed leadership characteristics such as creativity, flexibility, negotiation and fast decision making at the incumbent side inhibited co-creation to happen (Pera et al., 2016). Both incumbents and startups had the insight of that it could be a win-win to come together and co-create (Usman and Vanhaverbeke, 2017) but when the incumbents provided a leadership of opacity, exclusion and no real commitment and fast decision making it did not enable co-creation (Pera et al., 2016). This was one of the reasons for transformative startups to not choose this strategy for co-creation with incumbents. If incumbents could provide the needed enablers it would have enabled incumbents with a fast track for testing their products in a early phase by incorporate and test its products in the startup's prototype, increasing the digital innovation precision by using it as a probe for their market-fit (Usman and Vanhaverbeke, 2017).

6.2. Emphasis on Control
When companies deliberately emphasize control they assume future environmental factors are dependent on human action and design and seek to create the wanted environment through interactions with others enabling co-creation to drive their innovation initiative in the desired direction and pace, e.g. as startup C and E (Wiltbank et al., 2006). Co-creation in ecosystems can provide startup companies with support for developing critical peripheral services necessary for the product's market success (Motoyama and Knowlton, 2016; Ojaghi, Mohammadi and Yazdani, 2019). When all actors in an ecosystem innovate in parallel, the necessary dependencies between their products are dealt with as they arise, and directly validated in its entire value-flow (Pera et al., 2016; Tumbas et al., 2017). We found that this served as a proactive risk mitigation approach, which ensured that the products would work as intended when marketed (Tumbas et al., 2017).

Products positioned from the start in an ecosystem, acquire considerable synergetic value on the market due to multiple product innovations in series that benefit from each other (a multi-product ecosystem). Startups that apply this co-creation strategy gain a holistic decision-base for driving continuous digital innovation. Applying a holistic perspective for continuous digital innovation makes it easier to decide the correct development timing of individual products for a multi-product ecosystem. It indicates to the startups when to onboard external actors for co-creation.

Co-created minimum viable products in the innovation ecosystem enable the higher product value to be proven and more likely to attract external capital (Tumbas et al., 2017). For example, what is the point of launching the simplest electric car if no one can then charge the car battery on their journey? Could another company have co-created a battery chargers network simultaneously as the car manufacturers in an ecosystem? This critical aspect of collaborating side-by-side and having people move from one organization to another is essential for co-creation to happen (Chesbrough, 2012). When companies can prove the higher value of their product by positioning it in a market ecosystem, investors can more easily assess the value of the product in its proper context. Also, it allows them to estimate the likelihood of market-fit and risk.

The transformative startups experimented across a wide range of processes when trying to find the best way of co-creating in an innovation ecosystem. Startup E could serve as a great example, they explained how incumbents involved in their innovation used them as a kind of testbed, building brand value, and growing new customer relationships (Pera et al., 2016). Products that are co-created and an
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Essential part of an innovation ecosystem are more likely to attract external innovation partners since these see a higher degree of mutual interest in collaborating. For startups, the major win is increased resource capacity due to contributions from the incumbent co-creation partners. When startups actively co-created in an innovation ecosystem, they understood how to develop digital innovation capabilities. These new insights in practice and learning, may with time, lead to generic patterns, concepts, and models that will nourish and grow the capabilities of the entire innovation ecosystem.

The innovation ecosystem enabled the different parties' contributions to cover a more significant part of developing system-of-systems in parallel and to a higher digital innovation pace. The openness required in ecosystem participation could expose ideas and solutions to other competing ecosystem companies, especially incumbents, with more substantial resources (Prashantham and Birkinshaw, 2008; Weiblen and Chesbrough, 2015). However, this is not a problem according to startup C as only they had access to the unique and crucial knowhow and technical expertise for their product innovation.

6.3. How to Design Innovation Ecosystems for Co-Creation

Mastering design and orchestration of innovation ecosystems will become increasingly important for the future of co-creation (Chesbrough, 2012; Pera et al., 2016). The primary issue with the incubator was that co-creation had not taken place as intended, due to the significant organizational cultural differences between startups and incumbents (Burchardt and Maisch, 2019; Goncalves et al., 2020). Research has previously shown that mixing an agile culture with hierarchy and market culture can be inefficient as it tends to cause significant tensions when moving between these cultures (Goncalves et al., 2020). According to Pera et al. (2016) there are some leadership characteristics of creativity, flexibility and negotiation that need to coexist in order for co-creation to happen. The different decision-making logics between the startups and incumbents do not enable fast and smooth decision making (Prashantham and Birkinshaw, 2008). Startups experienced that they had a need for speed that made incumbents decision-making processes seem slow and cumbersome. If a company is going to co-create, there needs to be a commitment from all parties involved to contribute to the co-creation work with whatever is needed in a timely matter, e.g., transparency, decisions, resources (Prashantham and Birkinshaw, 2008).

It became evident that incumbents struggled to match the startups organizational dynamics and keep up with the needed decision making pace in the co-creation environment. Substantial transformative changes are required to address organizational agility in large incumbents, e.g., culture, structure, the ability to embrace continuous change, and fast continuous learning (Usman and Vanhaverbeke, 2017). All startups connected to the incubator were startups that applied the planning logic. One reason for this could be that their digital innovation speed needed to be increased, and by participating in an incubator, they expected to gain market legitimacy by working with these well-established incumbents (Prashantham and Birkinshaw, 2008; Usman and Vanhaverbeke, 2017).

Every startup and its leaders are not entrepreneurial (Schumpeter, 1934), and agile at heart, or have a good foundation for mastering co-creation. We found that only the startups actively designing their organization and environment for an effectual logic and having an explicit co-creation strategy were successful. Even startups have to continuously invest considerable time and effort into their organizational culture to align their employees to succeed in co-creational activities.

Research has previously shown that it is crucial to match recruits — leaders and talents — to the company culture to protect it from deterioration (Goncalves et al., 2020; Steiber and Alänge, 2016). Likewise is needed when selecting partners and investors. Investors who are too focused on fast profitability, as for startup D and F, tend to actively interfere with the startup management’s decisions, especially the time spent on various activities—something affecting the entire digital innovation approach (Haagen, 2008). How to successfully design and orchestrate innovation ecosystems for co-creation is of great importance to incumbents in a digital economy, an ability that also makes a startup develop and survive in a volatile digital market, e.g., Tesla.
7. Conclusion and Contribution

This paper aimed to clarify how co-creation support digital innovation in automotive startups. First, we conclude that automotive startups that applied co-creation could expand their means and accelerate their digital innovation progress by gaining access to external resources, knowledge, know-how, and risk-sharing. It enables continuous value stream validation and verification, leading to increased speed, shorter time to market, better solution precision, and minimizes the risk of market failure. Secondly, the automotive startups that perceived a high output of digital innovation capability related to the amount of resource put in had actively designed their organizations to maximize digital innovation progress and speed. They accomplished these results by applying an agile culture, lean structure, and applying a visionary and transformative logic that enabled co-creation. Thirdly, the automotive startups applying a visionary and transformative logic were more proactive and strategical in leading their digital innovation initiative than startups applying planning and adaptive logic.

Our contribution to the organizational agility theory is our empirical finding that a combination of visionary and transformative logic seems to most forcefully enable co-creation that leads to continuous digital innovation. The contribution to practice is that transformative startups are selective and choose whom they want to involve, depending on their ability to contribute to the startup's digital innovation initiative. By being selective, they also keep control over their digital innovation direction. To make co-creation happen, startups tend to select partners applying a transformative logic. In turn, it sets demands on co-creating partners to possess transparent behavior and external collaboration skills.

8. Limitations and Future Research

This study has some limitations since the data collection comes mainly from globally active Swedish automotive startups. It would be interesting to study startups from other countries, especially considering that some of the startups in this study pointed out that not all countries have a culture of openness and external collaboration. Also, applicable to incumbents since they showed missing external collaboration capability. Are there any patterns from startups’ external collaboration capability that can be transferable to incumbents? Especially considering that missing an external collaboration capability usually leads to an inhibitory effect when making co-creation happen. Given that the sample represents startups in a specific domain, generalization of the results must be made cautiously.

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