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How Digital Tools Align with Organizational Agility and Strengthen Digital Innovation in Automotive Startups

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Abstract

Digital tools can be an enabler for automotive startups to strengthen their digital innovation capability. Still, few empirical studies describe how automotive startups apply digital tools to do this. Digital innovation capability is essential for survival in a volatile global digital marketplace. Therefore, we conducted a qualitative study based on 23 interviews with nine global automotive startups to understand how they apply digital tools to strengthen their digital innovation. The results showed that automotive startups use cloud services almost exclusively for their business. We conclude that startups choose to use digital tools as SaaS to strengthen their organizational agility and digital innovation initiatives. It harmonizes with their agile culture, effectively enabling innovation collaborations between employees internally and with external actors enabling rapidness to market. SaaS providers' startup programs enabled startups to remain focused on their innovation initiatives and not worry about scalability since the solutions scaled from the start.

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Keywords: Digital Tools, Organizational Agility, Digital Innovation Capability, Agile Culture, Automotive Startups

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1.Introduction

It is crucial to quickly embrace and adopt new technologies in a volatile digital market to constantly keep up with accurate technical competence [1, 2]. It seems to be something that startups have been able to master compared to incumbents since newer technologies seem to favor startups over incumbents [1, 2]. Cloud services provide a cost-effective, easily accessible infrastructure that enables product companies to stay focused on their core business [2] which is vital for companies to provide rapid continuous digital innovation. In particular, it is vital for startups due to their need to collaborate with external actors since co-creation in various forms with external actors is almost exclusively how innovation projects are set up [3]. Digital tools are required that simplify communication and collaboration across company borders cost-effectively and flexibly [4, 5]. Startups tend to foster an agile culture, where communication and collaboration occur more informally and where digital tools can enhance relatedness, making people feel safe and openly trusting each other as a sounding-board over a chat channel for fast knowledge exchange and effective collaboration for continuous learning [3]. Open innovation in ecosystems and communities seems to benefit from digital social tools supporting people in the heavily collaborative co-creation culture that promotes fast and easy communication, content sharing, and quickly shaping the tools to fit people's needs to search for information effortlessly [6, 7]. The key here seems to be simplicity, significant added value for the customer by providing the necessary means for collaboration regardless of location and subscription as a business model without lock-in effect [8]. The approach supports 21st-century companies as Act et al. [2] describe platform organizations, replacing vertically integrated organizations via network effects. It seems to be an approach that many tech giants like Spotify, Salesforce, Twitter, Slack seem to apply when they, e.g., recently launched new innovative working policy programs, "Working from anywhere" [9, 10, 11, 12]. These companies take full advantage of digital infrastructure and tools supporting their organizational culture similar to disruptive startups to enable companies to gain access to talents, regardless of location, to enhance and accelerate their digital innovation pace [13, 3, 14].

The automotive industry is undergoing major transformation challenges due to digitalization and the attempt to create similar innovation capabilities as startups. It may require them to reconsider how they view their product vehicles and begin to see it as a multifaceted platform for continuous digital service delivery in a high-speed ecosystem [15, 16, 17]. Different leadership qualities, digital toolboxes, logic and co-creators may be needed [18, 19]. In response to the prominent challenges, most Swedish automotive incumbents in 2017 embraced an all-in agile transformation. Hence our curiosity to better understand what these startups do when they innovate.

We found limited empirical evidence describing how automotive startups use digital tools and their extent to strengthen the company's organizational agility and digital innovation capability. Therefore, we have conducted a qualitative study with nine global automotive startups active in Sweden to better understand how the startups use digital tools and how it affects the companies' organizational agility and digital innovation capability.

This study explores how startups in the automotive industry apply digital tools to strengthen their digital innovation capability. We, therefore, ask the following research question: How do automotive startups apply digital tools for agile culture fit to strengthen their digital innovation initiatives?

The paper is organized in the following way: first, we review previous research on organizational agility and relate that to research on the relationships between organizational culture and digital tools. After that, the method section presents the qualitative study and selection of companies, followed by results and analysis. The result and analysis are then discussed using digital tools to strengthen their organizational agility and digital innovation capability. The paper ends with conclusions and limitations.

2.Literature review

Organizational agility is defined as an organization's ability to adapt quickly and proficiently to an unpredictable, continuously changing, competitive global market [20, 21, 22, 23]. It is driven by culture, not processes, which means that effectiveness is achieved when leaders and people match an agile culture, i.e., agile behavior and values [18, 24]. This session provides a brief overview of organizational agility and how digital tools for agile culture fit can enhance people's output.

2.1.Organizational agility

The term agility was coined already in 1991 when the Agile Enterprise concept was presented as an outcome of an extensive research project in cooperation with industry and government leaders conducted by the Iacocca Institute at Lehigh University (PA), aiming to study how US industries could regain the lead international competitiveness [25]. Some critical elements of the agility paradigm are the relationships of interpersonal, cross-functional, and organization-spanning [26]. It is essential to promote a culture of change and development to successfully achieve organizational agility, enabling continuous innovation at a high pace [27]. Attempts to scale up agile to an enterprise-level seem to be challenging due to cultural barriers. There are suggestions that new approaches to leadership and change management are needed [28]. The main driving force for agility is the response to change, ability to sense, seize, and transform to capture new business opportunities as they arise [29, 30]. However, this requires that organizations have a culture of transparency and reward cross-company collaborations [3]. The primary focus is not improving efficiency, cutting costs, and temporarily handling market competition or market declines [25]. The hyper-efficiency that organizations can achieve is a side effect of organizations being agile [25]—The Lego Agile transformation "The team developed and demonstrated a minimum viable product in just two sprints—four weeks, and less than 800 hours—one-tenth of the originally estimated 8,000 hours" [18: p28].

2.2.Tools for digital innovation

There is an indirect relationship between digital technologies and agility since digital technology can support agility with digital options, defined as a set of information technology-enabled capabilities such as digitized work processes and knowledge systems [21]. Organizations apply the concept of culture fit to screen potential recruits and determine if their beliefs, values, and behavior align with their core values and culture. If they are aligned, there is a greater likelihood that the recruit will thrive and be efficient in the particular organization, similar relationship identified between culture and organizational agility [24]. Two examples documented in previous research are the Siemens Medical Solution and the Lego agile transformations experience demonstrates that it can be successfully executed by applying agile values and principles enabling Agile behavior [18, 31]. Startups that intensely leverage digital technologies as critical elements of their business models through growth and maturation the market perceive as digital organizations [32]. Digital tools provided as cloud-based services subscription allow the startups to focus on their innovation initiates and business growth [33, 34]. Digital tools boost open innovation at speed by facilitating rapid and easy access to open information, which can easily share with a community [35, 36].

According to Brisco, Whitefield, and Grierson [37], social networks have become a natural place for personal and professional communication. Collaborative tools, like, e.g., Slack, allow work to be conducted synchronously and asynchronously [38]. These tools support global virtual teams in their collaboration regardless of their availability and location, meaning that dispersed teams do not need to communicate face-to-face in virtual collaborations like, e.g., innovation ecosystem, efficient real-time communication, and shared access to information to manage the ongoing work effort [7, 38]. For distributed virtual teams, collaborative tools for communication and collaboration may be superior to face-to-face communication as it allows team members to revise and review communication [39]. For example, Slack and its integrations (i.e., bots, apps) seem to play an increasingly essential role in software development beyond team messaging and archiving. On some occasions, Slack replaces email and enhances the software development process [40]. Software developers use and develop diverse integrations (called bots) to support their work [40]. A bot is a software application that is programmed to do repetitive tasks without human intervention, and they usually are much faster conducting the work than humans. Cloud services give startups incredible flexibility and maximum value for their money while providing digital tools for an agile culture fit.

2.3.Agile culture as an analytic lens

We have chosen to apply agile culture [24] as an analytic lens when analyzing our data. We define culture as a recurring pattern of behaviors, attitudes, beliefs, and values that may achieve something. According to Schein [41], culture as a concept can help us explain the phenomena below the surface, invisibly leading to a powerful impact and, to a considerable degree, unconscious. "Culture and leadership are two sides of the same coin" [41: p22], the sum of

shared basic assumptions of a given organizational culture can be seen as its DNA [41]. If the application of digital tools is good, bad, or functionally effective does not depend on the culture alone, but on the relationship of the culture to the environment in which it exists. [41].

In an agile culture, people are driven by curiosity to promote a desire to experiment with new ideas with others to achieve a higher purpose [24]. It is an inclusive team spirit where members want to create innovative solutions quickly to create customer value and business growth and positively affect organizational agility [24, 42]. Transparency is essential because it builds trust, which in turn creates an engagement and commitment that makes it easier for individuals to focus on the right thing and make better decisions as the basis holds more accurate information [3]. For people rapidly respond to change, the structure must be dynamic and simple rules be applied to act as a navigator in the innovation environment [28]. Digital tools can enable agile capability if there is a match in how the tools can support agile behavior and values (see Table 2).

3.Settings and methods

3.1.Research approach

We have chosen a qualitative multi-case method to better understand how organizational culture might impact startups' utilization of digital tools to leverage organizational agility in digital innovation [43]. We applied semi-structured qualitative interviews, enabling the interviewee to exemplify why, when, and how they apply digital tools in their daily activities, allowing us to gain a more in-depth understanding of peoples thinking and behavior in terms of the norms, values, and culture in their organization as we continuously learn during our dialogue [44].

3.2.Data collection

We screened the automotive and mobility startup landscape in Europe to identify potential startups in the mobile industry for the study. The selection criteria for this study were startups in the automotive or mobility domain as they are undergoing significant changes due to digitalization and electrification. 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. The startup sizes followed the European Commission definition of SMEs being enterprises that meet the staff headcount. We chose nine international startups, mainly in Sweden and one from the USA active in Sweden, because of their active approach to digital service innovation since this is generally driving innovation in this domain today [45]. The selection of the startups was based on their ambition to master the new digital service markets. Four startups were or had been located at a corporate incubator to speed up their co-creation capability [46].

We designed a semi-structured interview guide with 37 predefined open-ended questions and additional 11 questions to cover demographics. We interviewed individuals with management and strategic positions, primarily the founders, to understand how the company's board and top management enable and apply co-creation to promote digital innovation growth. Nevertheless, other organizational actors were also interviewed to provide a broader picture and verify whether the management's statement could be correct [47]. We conducted 23 interviews to helps us answer the research question: How do automotive startups apply digital tools for agile culture fit to strengthen their digital innovation initiatives?

We conducted interviews with five startups at their company site and the remaining four via interactive online dialogue. The interviews took approximately 1.5 - 2.0 hours, and all interviews were recorded and afterward transcribed. It has been straightforward to ask supplementary questions to the interviewees afterward to fill gaps in understanding the data we had collected. Additional secondary data collection included white papers, web pages, social media, and a literature survey [47]. White papers, websites, and social media were mainly used to link to current market events in the automotive industry to strengthen our argumentation in the introduction section and verify the interviewer's statement about how they used social media.

3.3.Data analysis approach

We applied a systematic combining approach, moving back and forth between data, preserved literature, frameworks, and analysis [48]. The data analysis was performed by transcribing and coding the recorded interviews using a bottom-up method [49]. We then compared each recorded answer with the corresponding application area for interview questions to systematically identify similarities and differences between companies' ways of using digital tools to strengthen their digital innovation capability [44]. We have applied our analytical lens to see how the startups' tools support their agile behaviors and values, enabling the wanted agile capabilities, mapping between the tools and the agile behavior and values. To further strengthen our results and reasoning, we have chosen quotes from our interviews to give a sense of how these companies think about their business, market opportunities, and how they use digital tools to strengthen their digital innovation.

4.Results

All startups tried to refine and buy the necessary infrastructure, digital tools, storage, and maintenance through cloud service subscriptions. A very appealing business model for startups that often cannot afford expensive licensed digital tools, requiring internal resources to operate and maintain. By subscribing to cloud services meeting current needs, they can focus on their core business and keep a high digital innovation pace. We identified four different tool categories where digital tools matched agile behaviors and values, enabling agile capabilities (see Table 2).

Communication, collaboration and workspace: Several startups stated that email was seldom used, more applied for formal communication when approaching new customers or authorities. Instead, startups used cloud solutions for collaboration like Notion, Google Drive, Slack, where they shared all documentation and dialogues. It enabled quick and smooth collaboration within the startups' organization regardless of resource location and efficiently and smoothly included external actors to collaborate on ongoing projects. It could be to share syntax in an ongoing innovation initiative, share documents, or chat for quick and easy collaboration. Inclusion was something that some of the startups mentioned as essential so that everyone could feel that they were part of the (family) company. When asking one of the founders for startup C if he could elaborate on how Slack builds team feeling, he answered, *"I think in some unconscious way you feel a team affiliation. You see that others talk; when you come to work, then you knew that a discussion has happened, you are involved. You had to use text messages in other places, some were planning something, and then you were not welcome to join. Just that there is a general forum. One of our most active channels now is where you discuss stock shares, what to buy or sell. Something that has to do with savings and nothing with the company itself, but it very much builds a team feeling."* Eight of the nine startups used Slack as one of their most important communication and collaboration tools. They usually had different channels for different type of dialogues, and these channels were open to all employees. Some of the startups had also given access to their external partners. An interviewee at startup A stated, *"Slack is the absolutely primary communication channel that we use. We do not have telephones via the company, but all each other's private mobile numbers. We very rarely do use email, we run almost everything in Slack, discussing customer projects, who is at home with a sick kid. Leisure interest in other channels."* The CEO at startup A stated, *"Slack is the world's best tool to use since we are spread geographically. We use a lot of digital communication since it is traceable, searchable, and easy to walk through if something impacts us."* When trying to mirror the captured holistic view of how they used digital tools the joint statement among the startups was that it would not have worked otherwise.

Social marketing: When it came to marketing and external communication, startups used LinkedIn, Twitter, Facebook and Youtube to both market the company but also to build customer relationships and collect ideas, product improvements. Some of the startups could not afford to invest in innovation, they needed to buy innovations or in best case apply exploitation and use their customers as co-innovators to some degree, this by collecting their needs, ideas and also to use them for testing early versions of new enhanced products. For startup E they used Youtube for progress films, both for the things that went well as the things that did not worked well, a way to share learnings with the market in a very open way and at the same time engage potential future customers while building a hype-brand around them that would facilitate attract new investors, since most of their financial means was through crowdfunding. Even though most of the startups were aware that it is important to have a capability to utilize social media to its advantage

due to limited resources not all startups showed to possess that capability. It is a difference between being aware of the need and to actually possess the capability to deliver on it, e.g., startup H stated *"It is part of our strategy to be out on the social media."* But when we tried to verify how they applied it, we just capture a few award announcements they had won, more a monologue than dialogue.

Development toolkit: Most startups applied GCP (Google Cloud Platform), Github, Jira as a development environment toolbox. The responsible developer for development environments at startup C explained they had chosen GCP due to it being very streamlined. The responsible developer for development environments at startup C explained they had chosen GCP due to it being very streamlined. All services are built to connect without any extra work, this referring to Cloud Functions, PubSub, BigQuery, Cloud Run, and similar services. Comparing with AWS (Amazon Web Services), which is based on an exchange of loose services that developers need to pick up themselves, it becomes more cumbersome. According to the developer, *"GCP equals to a finished car in good condition, which may give a little less choice, but all parts are optimized to work with each other. AWS = IKEA car where you get three different variants of each part. Although GCP sounds a bit stiff in comparison,… it is generic enough to act as a backbone for the whole of Google and all their products."* The primary reason for choosing GCP, except for being significantly cheaper for complete development environments as fully managed services and maintenance, is its simplicity of use, giving the startups full control over all their parts regardless of whether it is large or tiny. Additional services that startup C brought up were Google's CLI tool, which is very flexible to 100%, Data Flow, a unique framework for building parallel computational pipelines with infinite scalability in every step, which they were looking to apply for stream computation and bulk analysis. Some other services were regarding AI (artificial intelligence), which startup C mentioned as *"…completely superior without debate regarding AI / ML on big data with BigQuery and its built-in AI engine, models run directly on the data with zero latency."* When asking if there were any lock-in effects when utilizing this platform, startup C stated that since 95% of their product would be legacy and require redevelopment if moving to another platform. However, their code volume would approximately be 25%, and the remaining 75% would be by using components provided by the platform. Some startups also needed to use AWS when co-creating with incumbents. The CEO at startup A stated, *"We also integrate with AWS because several of our customers use AWS as a cloud service to connect their IoT devices. However, we use Google Cloud for all operational services such as mail, file server." S*tartup E, applied a digital-first strategy, meaning that they first built a digital model before developing a physical product helping developers in their design and manufacturing process. It simplified to keep track of all the dependencies between the different components and notified component owners when a change had been made to a component that affected their components. Further efficiency for developers could be achieved by utilizing more sophisticated Slack-bots where that they can restart virtual machines, roll back updates, dump logs from services, just by sending messages to a bot.

To facilitate our reasoning in the discussion section, we have mapped how the different digital tools support agile behavior and values, Table 2.

5.Discussion

If organizations succeed in choosing digital tools that promote and support their culture, and not the other way around, there is a reasonable probability that an organization succeeds in being agile and not doing agile [18]. Startups' strength is that they have no legacy or business constraints, have an ability for imagination, and can rethink everything, open to experimenting with new technologies and business models [19, 50]. Startups tend to prioritize digital tools depending on how well they harmonize with their needs, agile behavior, and values. The tool cost comes secondary if it ultimately supports their work and enables rapidness to market. Different colored checkmarks represent the different matches by visualizing the tool match and harmonizing with specific agile behavior and values identified in the literature supporting organizational agility. The scale is green for best-harmonized matching across tool categories, followed by yellow, purple, blue, and blank for no match.

Table 2. Distribution of agile cultural values in relation to tools used in the organizations studied —The color codes are described in the discussion section

Agile Behavior & Values	Slack Primarily Communication and Collaboration	Google Workspace Document Storage, Email, Calendar, E-Meetings	LinkedIn, Facebook, Youtube Social Marketing	Google GCP, Github, Jira Development ToolKit
1. Dynamicity	✓	✓	✓	✓
2. Friendship	✓			
3. Common Family/Team	✓			✓
4. People Centric	✓			
5. Passion	✓			
6. Empowerment	✓	✓	✓	✓
7. Loyalty	✓		✓	
8. Feedback	✓		✓	✓
9. Commitment	✓	✓	✓	✓
10. Tradition				
11. Engagement	✓	✓	✓	
12. Reflection	✓		✓	
13. Leaders: mentors and role model models	✓		✓	
14. Communication	✓	✓	✓	✓
15. Transparency	✓	✓	✓	✓
16. Inspiration	✓		✓	
17. Simple Rules	✓	✓	✓	✓
18. Creative Solution	✓			✓
19. Customer Satisfaction	✓		✓	
20. Rapidness To Market	✓	✓	✓	✓

✓ Matching with organizational dynamics across tool categories ✓ Matching with agile leadership and creative people across tool categories
✓ Matching with feedback across tool categories ✓ Matching with relationship building for inclusiveness across tool categories

Matching with organizational dynamics across tool categories (green): These digital tools represent a start-toolkit for startups, enabling rapidness to market. Two tools standing out in the startup toolbox were Slack and GCP. The GCP harmonizes with their behavior and values and supports them with development environments, analytical tools, storage, collaboration workspaces, and marketplace supporting startups' go-to-market opportunities: all cost-effective and reliable, scalable platforms from the start. Startups described Slack as a magic and indispensable tool, used for almost everything due to ease of use, traceability, searchability, ease to set up different channels (public/private) if needed. Intelligent bots can decrease innovation costs by assisting developers in performing simple repetitive jobs like restarting virtual machines, roll back updates, dump logs from services by sending messages to a bot. It enables better utilization of everyone's time, enabling developers to focus on more advanced tasks leading to increased efficiency since the Slack-bots perform these tasks much faster than humans [40]. Bots can also act as a first-line customer support agent who can quickly answer common questions and improve customer experience and satisfaction, given customers being mature for this kind of digital support [19]. *Social marketing* is the marketing approach applied by all startups, which requires digital tools to keep an active dialogue with customers and capture their feedback and demands. The simplicity that subscription creates adds value to startups by enabling them to subscribe when needed and unsubscribe when not needed, a cost-efficient and smooth way to get hold of the right digital tools needed to enable dynamicity for startups.

Matching with feedback across tool categories (yellow): Whether internal or external feedback, these tools enable all individuals to better understand weaknesses, failures, unwanted behavior, values that need to change regardless of whether it is regarding product, individual, or company. The tools can facilitate canalizing the feedback and bring the problems to the surface, making them transparent to people and leaders to get them quickly fixed or at least improved. Feedback can enable transparency and build trust and lead to engagement, facilitating enhanced collaboration with stakeholders [3].

Matching with agile leadership and creative people across tool categories (purple): These digital tools facilitate

leadership mentoring of building the team by permitting trustworthy relationships to be crafted to succeed in co-creation [3]. The need for collaboration across company borders has led to collaborative tools being used extensively for activities that the tool suppliers might not have considered initially. To fully benefit from digital tools, they should support people's work, and this requires people to be empowered to explore which tools best support them in a given situation [18]. The major part of the people in these startups was very involved and engaged in the startup innovation initiatives, not due to being commanded by their CEO but for having the capabilities to contribute and drive [19]. These tools enabled reflection and inspiration to be communicated to coach people inside the organization and crafting trustworthy relationships with external actors. When trust is established, committed people can build creative solutions to achieve customer satisfaction with a probability of increased loyalty to the company [3]; when customer dialogue can easily and often be incorporated into the ongoing innovation initiative, the chance of better solution fulfillment for customers increases.

Matching with relationship building for inclusiveness across tool categories (blue): Slack stands out by being the unique tool best catalyzing most of all agile behaviors and values to enable agile capabilities. What distinguishes the tool from others is how it makes it possible to deepen the relationship building for an inclusiveness culture for crafting trustworthy relationships for collaborations and co-creation across company borders.

No matching tool category (blank): Among the 20 cultural dimensions of agile behavior and values identified in previous research, no tools harmonized with the dimension *tradition*. It is probably because these companies are still in an early phase in their life cycle where the supply of new individuals is not stable. We define *tradition* as to how elements of a particular culture regarding beliefs, principles, behavior, values, and characteristics in a particular society or group have continued to follow for a long time.

In all, digital tools alone are not enough unless there is a culture fit to harmonize agile behavior and values that may lead to developing agile capabilities, an approach that can keep a company competitive in a volatile global digital market.

6.Conclusions and limitations

This study aimed to clarify how startups use digital tools to strengthen their digital innovation capability. First, we found that startups choose to use digital collaboration tools provided as cloud services due to flexibility and effectively support their agile culture by harmonizing with their behavior and values, enabling them to develop agile capabilities. Second, subscribing to cloud services enables them to stay focused on their innovation initiatives without worrying about scalability or lock-in effects, hindering them from radically changing direction regarding what digital tools to use. Third, digital collaboration tools and social media seem to enable startups to access resources that they otherwise would not have developed or paid for, this by choosing to focus on their core and share or co-create for product parts they do not need to own.

The contribution to organizational agility research is that the more digital tools harmonize with cultural behavior and values, the more they seem to catalyze agile capabilities that drive digital innovation. Contribution to practice is how cloud as a service enables organizations to focus on their core innovation and not waste time and money developing parts that are not important for the company to own but can instead be shared with others. The challenge with this approach is that it may require specific safeguard clauses to be included in the agreement with the SaaS company to protect the company data and intellectual property.

There are some limitations in the study based on the following; not all companies' specific tools are included, such as specific tools utilized in hardware production that only one company utilize. We have only included the tools that the startups use in their core toolbox. In addition, the sample size was small and mainly limited to Sweden, even though startups acted globally. With this in mind, one must be careful with generalization.

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