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Aug 10th, 12:00 AM

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Keilbach, Anna; Karanasios, Stan; and Molla, Alemayehu, "Strategic Responses to Digitised Products: a Case Study of an Automotive Firm" (2020). *AMCIS 2020 Proceedings*. 19.  
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# Strategic Responses to Digitised Products: a Case Study of an Automotive Firm

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## Abstract

Firms are faced with the pace and complexity of digital transformation, which leads to changes in organisational structures, processes, culture and products. This study examines how an automotive firm attempts to align its strategy to an increasingly digitised and software-based product. The key observations show how digitised products disrupt intra-organisational and inter-organisational ways of working, and old-fashioned mass production. To combat these challenges, essential strategic responses including the implementation of new processes and the establishment of own software firms take place. In addition, since manufactured digitised vehicles are not sold as completed products and require frequent software updates during their lifecycle, organisations need to develop dynamic alignment competencies to continuously update their business strategy, thrive in a digital world and sustain their competitive advantage.

## Keywords

Strategic response, digital transformation, digitised products, ways of working, automotive firms.

## Introduction

The world is changing profoundly from the industrial age to a digital era with implications for individuals, organisations, and society (e.g., Vial 2019; Yoo et al. 2010). As a result, most firms are undergoing a digital transformation (DT) which is driven by the evolution and use of emerging, digital technologies (such as artificial intelligence, machine learning, SMACIT) to improve their performance. DT is defined as “*a process where digital technologies create disruptions triggering strategic responses from organizations that seek to alter their value creation paths while managing the structural changes and organizational barriers that affect the positive and negative outcomes of this process*” (Vial 2019, p. 1).

While DT has affected organisations in general, its implication on automotive firms is prevalent, as reported in studies of the car manufacturers AUDI (Dremel et al. 2017) and Volvo (Svahn et al. 2017). Nowadays, vehicles are enhanced by smart and connectivity components, thus changing existing activities in the value chain (e.g., Hylving and Schultze 2013; Porter and Heppelmann 2015) and impacting the firm’s strategy (Gao et al. 2014). New business models (e.g., mobility as a service, car-sharing), digital services (e.g., predictive maintenance), and product innovations (e.g., autonomous driving, car connectivity, electric driving) (Dremel et al. 2017; Svahn et al. 2017) present both opportunities as well as risks for automotive firms (Chanias and Hess 2016). As a result, these organisations are required to rethink, reframe, and adapt both “*their product, which is ‘mechanical to its soul’, and their business strategy to compete in a digital world*” (Piccinini et al. 2015, p. 5). In comparison to other manufacturing industries, automotive firms have unique characteristics such as a functional organisation, international orientation, legacy systems and process, and extended supply chain which make strategic responses necessary (Chanias and Hess 2016). This paves the way for an exploratory investigation of *how automotive firms’ way of working are disrupted by their digitised products and how that influences their strategic response*. In addressing this question,

this short paper offers a timely response to the call for more research on the internal impacts of DT (Nambisan et al. 2017) and adds to the emerging body of work on DT in traditional industries. Particularly, previous investigations shows little awareness of the consequences on specific industries (Morakanyane et al. 2017) such as the automotive industry (Henfridsson et al. 2009; Piccinini et al. 2015). The paper offers a unique, albeit preliminary, insight about ways of addressing the complexity of integrating strategies for novel work processes and practices into organisations with legacy systems and structures.

## Literature Review

In comparison to a vehicle produced thirty years ago, a vehicle nowadays has twice as many components (around 10,000) and is equipped with electronics, sensors, processors, camera systems and software. These digital technologies enable vehicle-to-vehicle communication, sophisticated in-car support, over-the-air software updates and automated driving (Piccinini et al. 2015). In other words, smart, connected vehicles “*have become complex systems*” (Porter and Heppelmann 2015, p. 7). Due to its numerous interdependent subsystems, it is no longer possible to break down and distribute tasks into individual components. Single experts are reaching their limits and even a group of experts are not enough anymore. Moreover, “*product development shifts from largely mechanical engineering to true interdisciplinary systems engineering*” (Porter and Heppelmann 2015, p. 7). This makes the product development cycles and especially the predevelopment phase increasingly complex and time critical (Porter and Heppelmann 2015).

For these reasons, organisational silos have to be opened (e.g., Dremel et al. 2017) and a network of many experts must collaborate in order to exchange necessary information and knowledge so that a functioning product can be developed. Nambisan et al. (2017) describe this phenomenon as “*digitising innovation involves processes and outcomes (product/services) shaping and being shaped by the other*” (p. 226). Accordingly, organisational transformation results in “*new [...] models for organising and performing work*” (Nograšek and Vintar 2014, p. 111) and thus, strategic alignments are needed. However, “*research at the intersection of technology, work, and organisations is still in its infancy*” (Cascio and Montealegre 2016, p. 365). Specifically, the DT literature provides insufficient knowledge about its effects on different aspects of an organisation, as an example traditional manufacturing firms struggle with adapting existing work processes and practices to new product development (e.g., Barley 2015; Hylving and Schultze 2013).

Various publications in the Management and Information Systems field relate to the *digital business strategy* and *digital transformation strategy*. For example, Drnevič and Croson (2013) provide justifications of the digital business strategy’s importance in order to achieve business successfully; Woodard et al. (2013) examined the formulation and execution of digital business strategy; and Chaniias and Hess (2016) investigated what processes (such as competitor pressure) and activities (e.g., digital initiatives by sub-communities) influence the development of *digital transformation strategies* in automotive firms. Moreover, it is known that digital technologies radically change “*business strategies, business processes, firm capabilities, products and services*” (Bharadwaj et al. 2013, p. 471) and that “*digitally enriched products*” (Hess et al. 2016, p. 126) are a strategy to achieve DT. Hitherto, the interdependencies of digitised products and organisation’s strategic responses have not been sufficiently investigated. Against this background, there is a need to understand how automotive firms’ way of working are disrupted by their digitised products and how does this impact their strategic response.

## Research Design

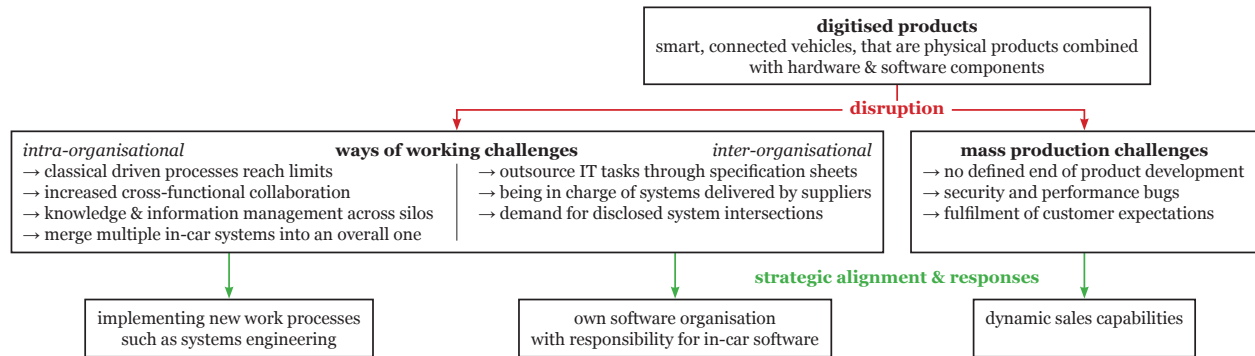
This study focuses on automotive firms that are challenged by DT as their traditional strategy, the modular product architecture, does not line up with digitally enhanced physical components (Hylving and Schultze 2013). Empirically, the research is conducted using an exploratory, qualitative single case study (Yin 2018). The case is a traditional, large multinational car manufacturer that has existed for over 100 years and produces prestige cars. It is based in Germany and has around 100,000 employees. The first author spent three weeks with two teams in the firm in December 2019. The first team (28 employees) develops automated driving functions and is positioned in the predevelopment phase of production. The second team (60 employees) is responsible for the integration of new methods and processes and is located within the strategy division. Data was collected through participant observation – this included observing daily work through 9 informal conversations, 14 meetings, and 6 job shadowing in combination with the “*think aloud*”

approach (Van Someren et al. 1994). It took place in a typical office surrounding including open workspaces and meetings rooms.

Many articles studying DT do not adopt a specific theoretical lens and there is “a limited understanding with regard to DT’s theoretical constructs and underpinnings” (Bohnsack et al. 2018, p. 36). As existing research did not help to provide a theoretical lens, our data was analysed in MAXQDA following the steps of “open coding”, “axial coding” (Strauss and Corbin 1998) and “theoretical coding” (Glaser et al. 1967). At the same time, this explorative study relies on an abductive approach to build theoretical propositions. Several iterations have been made to identify all relevant themes in the observation notes. Then, the coded themes were categorised into clusters inspired by prominent literature. Finally, findings and connections were derived. This stance allows the study to be informed by the empirical context, data collection and constant comparison with the literature. Understanding the phenomenon of DT in this way also enables the research to generate insights into the strategic responses of the firm. Subjectivity was managed through developing a data collection protocol, continuous discussion during data collection with the two co-authors, post data collection reflection and questioning during the process of data analysis.

## Findings

The three key findings of the case study are summarised in Figure 1. On the one hand, digitised products disrupt intra-organisational and inter-organisational ways of working. Essential strategic responses, including the implementation of new processes and the acquisition or foundation of software firms, tackle these challenges. On the other hand, manufactured digitised vehicles are not completely finished as they require frequent software updates during their lifecycle. This disruption will need dynamic sales capabilities.



**Figure 1. Digitised vehicles' impact on firm's strategic alignment**

### **Strategic response to intra-organisational challenges**

Due to product innovation, there is a tension between the type of product the firm is developing and their internal working strategy. “*Technological product challenges mean increasing organizational complexity*” (Observee 2). Despite the new product requirements, the firm has not been able to shrug off the traditional working strategy which is linked to the mindset of the organization as being a physical product manufacturer. Rather, the firm has to move towards a strategy that aligns its increasing digital product.

An important finding is that the digitised product has led to an increase in cross-functional collaboration with a need for multiple divisions, external partners, and suppliers across borders and time zones to work closer together. “*We must not stop at departmental boundaries but have to open silos, because the vehicle is networked just the same*” (Observee 15). This also involves more documentation on processes and interrelationships. Moreover, it was stated that novel and iterative working processes are required – in particular for the employees in the automated driving predevelopment division – to develop smart, connected vehicles as the complexity is increasing due to automated driving functions and in-car software systems. This means that in addition to a physical product, the firm has to deal with mechatronic and software systems and develop these concurrently. Nevertheless, it was commented that processes are still “*very classically driven*” (Observee 12).

The findings indicate that the firm is disrupted by DT in terms of information and knowledge management due to cross-divisional collaboration. Observees reported that there is no regular exchange with other departments. *“The biggest problem we currently have is a uniform communication of how we get the information across team boundaries”* (Observee 18). Information and knowledge are mainly documented in wiki pages (knowledge repository) which allows employees to add and update content. This system brings its own challenges such as ensuring data entered meets its standard as well as ensuring that it is used routinely by staff (rather than by only some staff). That said, there are several knowledge sharing platforms within the firm which make knowledge management even more difficult.

Moreover, a smart, connected vehicle encompasses diverse modules – numerous hardware as well as software systems – which have to merge. It has to be ensured that an individual all-in-one-system fit and function in the overall system. This means that vehicles need an overall operating system as a host or platform to apply the single systems. Consequently, the automotive firm has to integrate new methods, processes and tools through which such vehicle systems can be developed and tested for its interdependencies. In order to overcome this, there has been a shift towards a new working strategy (systems engineering), which draws heavily on software engineering. Its adaption to the automotive sector and its integration into the firm is novel. So far, the systems engineering process is only visible at the strategic level (management) and yet to be implemented across other levels. However, there is less interest at the team level towards changing work processes and practices.

### ***Strategic response to inter-organisational challenges***

Automated driving represents a technological challenge and has increased the complexity of vehicle development many more times. This has implications for current collaboration strategies. For example, it is no longer simple to outsource IT tasks via a specification sheet because of the complex nature of the product. At the moment, employees of the case firm are responsible for writing specification sheets and finding high-quality suppliers. Those are especially relevant for delivering software and systems as the firm’s employees do not conduct coding related tasks at the current stage. However, due to the impact of DT, the process of buying software and systems (e.g., in-car software) from external suppliers is disrupted. One reason is the transfer of responsibility from the supplier, who delivered the system, to the automotive firm due to new government legislations. Another reason is that a vehicle nowadays consists of many interrelating systems, hence it is not possible anymore to buy individual all-in-one-systems if the intersections are not disclosed. The firm’s strategic response is the creation of an own software organisation to develop in-car software inhouse.

### ***Strategic response to mass production challenges***

The innovation of digitised products requires a mindset and strategy change as a vehicle will not be sold as a finished product anymore. Even after sale, its software will require frequent updates. Beside the customer’s expectations of receiving updates from time to time, unexpected updates are required to fix security or performance bugs. According to an observee, the case firm still follows a traditional mindset *“it is actually still like this: end of assembly line, end of product development”* (Observee 26). At the same time, there is recognition that a change is required, moving away from a pure focus on mass production to a more dynamic sales strategy.

## **Conclusion**

Taken together, automotive firms are faced with altering their ways of working and, accordingly, their strategy to respond to the fast pace and complexity imposed by DT. In this case, the automotive firm aligns its strategy to an increasingly digitised and software-based product through integrating new processes to accommodate for intra-organisational and inter-organisational challenges of new ways of working. Moreover, this research-in-progress observed the tensions between the old ways of working – whose traditional mindset is rooted in the organisation’s deep structure – and the new demands of digitised products. Hence, this study contributes to the existing literature on *digital business strategy* and *digital transformation strategy* through illustrating the impact, challenges, and interdependencies of digitised products on organisation’s strategy. Future research will be carried out in the case firm to examine the alignment and opportunities of new strategic responses in firms’ businesses due to digitised products.

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