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Future Mobility Challenges for Established Car Manufacturers: A Systematic Literature Review

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Abstract

This paper provides a view on the "state of the art" of the business of automotive companies in context of the future mobility. By performing a systematic literature review, a comprehensive corpus of 981 articles pertaining to the subject matter was obtained from ISI Web of Science. We use Endnote and NVivo to support our research. The top journal in terms of number of publications is International Journal of Operations & Production Management, followed by International Journal of Technology Management, Supply Chain Management – an International Journal, Total Quality Management & Business Excellence and Journal of Product Innovation Management. The number of articles published along the analysed period has increased, indicating an increased interest in the topic. In terms of qualitative analysis on the abstracts, we identified different knowledge areas in the automotive industry from a business perspective, namely business transformation, cooperation, manufacturingp, finance, organizational development, and communication. Also, various strategies and practices are used by automotive companies to generate revenue and sustain their operations.

Keywords: Automotive companies; Car manufacturing; Future mobility; Systematic literature review

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1. INTRODUCTION

The market for future mobility is driven by a combination of technological changes. These are connected mobility, autonomous driving, electric mobility, and shared mobility. The successful market entry of Tesla Motors has shown that seemingly insurmountable barriers can be overcome by new commers (Stringham et al., 2015). Established car manufacturers (ECM) are facing new rivals in this dynamic market (Perkins & Murmann, 2018).

The systematic literature review aims to analyse the way car manufacturers do business. We assume that significant changes have taken place recently and will take place due to technological change and the entry of new market participants (MacDuffie, 2018; Perkins & Murmann, 2018; Thomas & Maine, 2019). We are particularly interested in identifying possible categorizations of knowledge areas to analyse how established car manufacturers do business.

This paper is organized as follows. First, we present the methodology. Next, we present the results of the systematic literature review, divided between descriptive statistics and thematic analysis. We end with the concluding remarks.

2. METHODOLOGY

To understand the business and competitive dynamics of automotive companies, we perform a literature review.

In terms of methodology, we considered three options: traditional literature review, systematic literature review, and meta-analysis (Jesson et al., 2011; Saur-Amaral et al., 2018; Tranfield et al., 2003). However, due to the limited availability of standardized quantitative studies in the field automotive, we excluded the option of meta-analysis from the outset.

Traditional literature review has been widely criticized for its inability to generate reliable evidence. It is often regarded as suitable for undergraduate studies but inadequate for postgraduate or scientific research due to the absence of search protocols and the subjective nature of paper selection (Jesson et al., 2011; Saur-Amaral et al., 2018). In contrast, systematic literature reviews address these limitations by incorporating transparent data selection procedures and combining statistical analysis with thematic analysis (Saur-Amaral et al., 2018).

Considering these criticisms, we have chosen to conduct a systematic literature review and have followed three steps typically associated with this approach, as outlined by Saur-Amaral et al. (2018), namely: planning (development of the review protocol), searching (implementing the review protocol by two independent researchers), and reporting (analyzing results and developing literature maps).

In order to carry out the systematic literature review, an initial unstructured review of the subject matter was undertaken. This preliminary investigation provided the foundation for creating a search protocol, which involved identifying keywords, planning and specifying search criteria, and establishing filters and guidelines to determine relevant findings (Saur-Amaral et al., 2018).

To ensure transparency and replicability, two independent researchers strictly followed the review protocol while conducting the search on ISI Web of Science - Current Contents. They meticulously recorded all the steps taken and compared intermediate and results (Saur-Amaral et al., 2018).

Subsequently, we exported the obtained results to Endnote 20 for the initial relevance analysis and selection of valid results based on abstracts. The full-text files were then imported into NVivo 14 for content analysis and coding. In this process, we utilized the most frequent words in abstracts as an orientation framework and adopted a grounded theory approach, following the principles outlined by Charmaz (2006) to construct node categories (Saur-Amaral et al., 2018).

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3. RESULTS

3.1. DATA COLLECTION

The search was conducted on April 7, 2023, at two distinct time points referred to as Search 1, Search 2, Search 3 and Search 4 as shown in Figure 1.

- In Search 1, we utilized the search equation "car AND manufact* AND firm" in Topic, within the Web of Science database of ISI Current Contents. The initial search produced 145 results. The results were filtered by the research areas Business Economics or behavioural sciences. Furthermore, the search was limited to article and review article published in English and German being, resulting in 84 results.
- In Search 2, the search equation used was "car AND manufact* AND compan*" In Topic, within Web of Science database of ISI Current Contents of ISI Current Contents. The initial search produced 318 results. Like Search 1, the results were filtered by the research areas Business Economics or behavioural sciences. Furthermore, the search was limited to article and review article published in English and German being, resulting in 68 results.
- Search 1 and Search 2 have then been combined by using the search history with the search equation “Search 1 OR Search 2” resulting in 135 results.
- In Search 3, we utilized the search equation "car AND manufact* AND firm" in Topic, within the Web of Science database of ISI Current Contents. The initial search produced 1020 results. The results were filtered by the research areas Business Economics or behavioural sciences. Furthermore, the search was limited to article and review article published in English and German being, resulting in 586 results.
- In Search 4, the search equation used was "automotive AND compan*" in Topic, within Web of Science database of ISI Current Contents of ISI Current Contents. The initial search produced 1745 results. Like Search 3, the results were filtered by the research areas Business Economics or behavioural sciences. Furthermore, the search was limited to article and review article published in English and German being, resulting in 446 results.
- Search 3 und Search 4 have then been combined by using the search history with the search equation “Search 3 OR Search 4” resulting in 890 results.
- In the last step we combined the results of the equations “Search 1 OR Search 2” and “Search 3 OR Search 4” with OR by using the search history of Web of Science to ensure there were no duplicates records in the final sample. The Sample was exported to Endnote 20 and from there to Nvivo 14 to perform further analysis.

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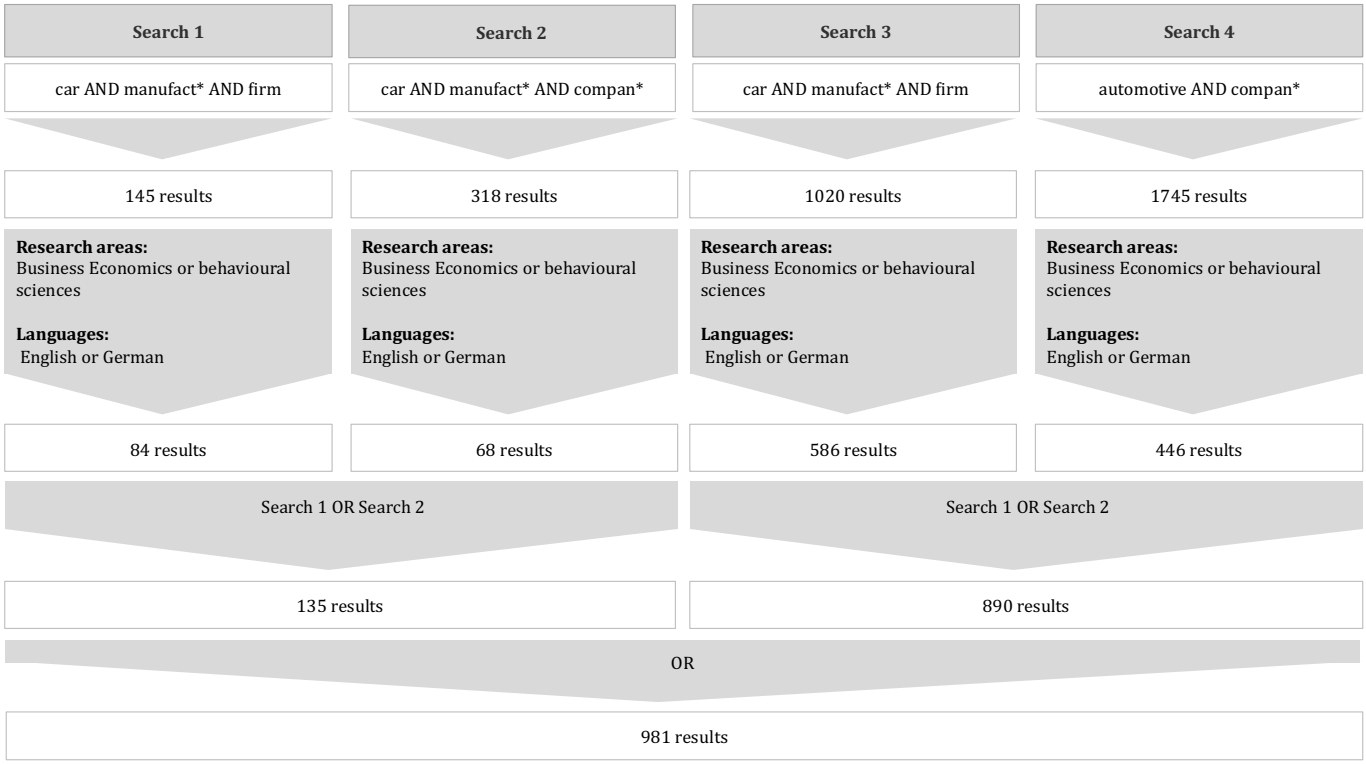

Figure 1 - Process used to perform the search

3.2. QUANTITATIVE ANALYSIS

Regarding the distribution of papers over the years, as shown in Figure 2, there has been an upward trend from 1996 to 2011.

However, in 2012 and 2013, the number of papers has decreased to the levels between 2008 und 2009. From 2014 until today, there has been a clear upward trend.

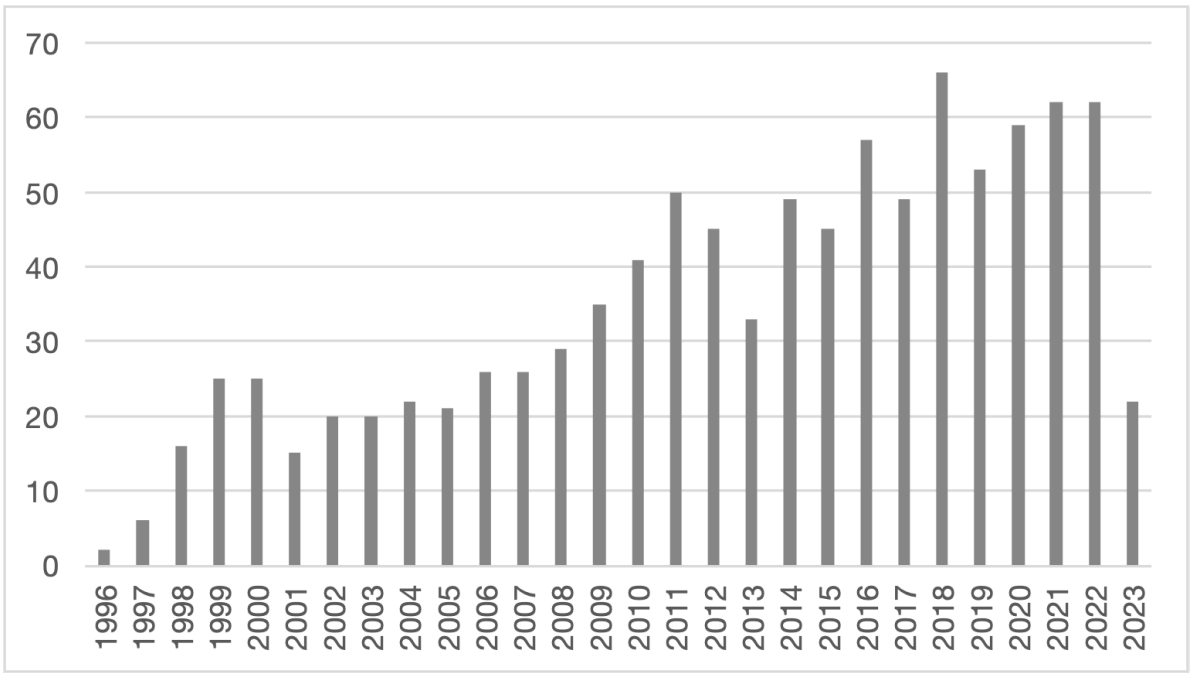

Figure 2 - Paper distribution per publication year

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A similar pattern can be observed for the number of publishing journals per year (see Figure 3).

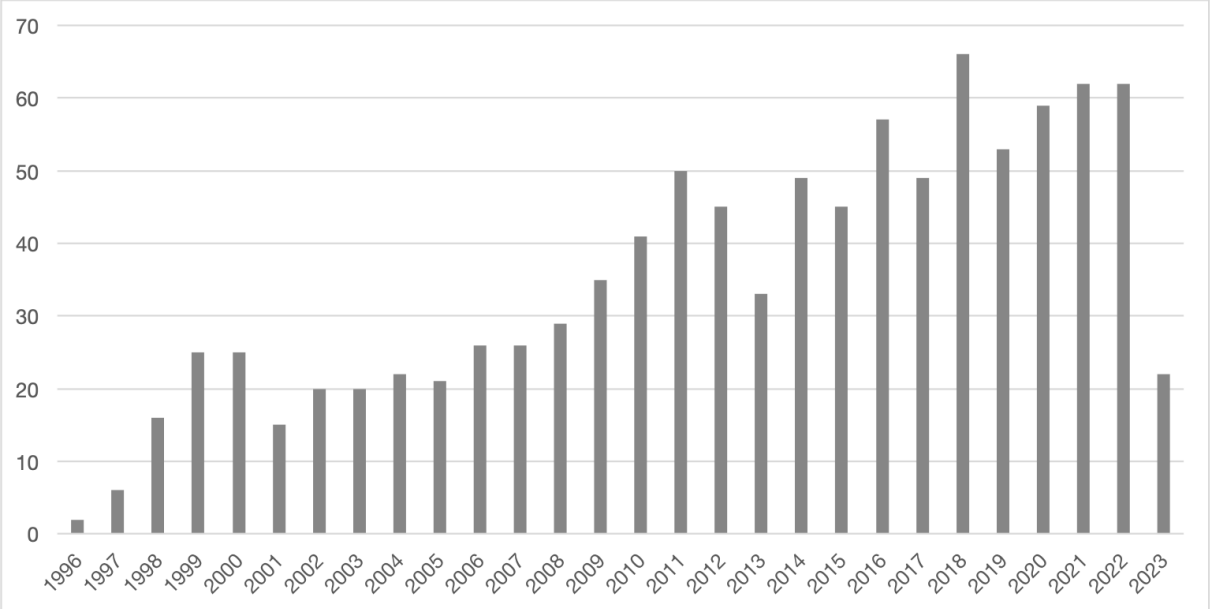

Figure 3 - Number of journals per publication year

According to Figure 2 and Figure 3, the paper distribution per year suggests a lack of specialization in publishing papers related to automotive companies from a business perspective.

The top five journals in terms of number of papers published in the analysed period are: International Journal of Operations & Production Management, International Journal of Technology Management, Supply Chain Management – an International Journal, Total Quality Management & Business Excellence and Journal of Product Innovation Management (see Figure 4).

Top five journals account for 16% of all publications our sample.

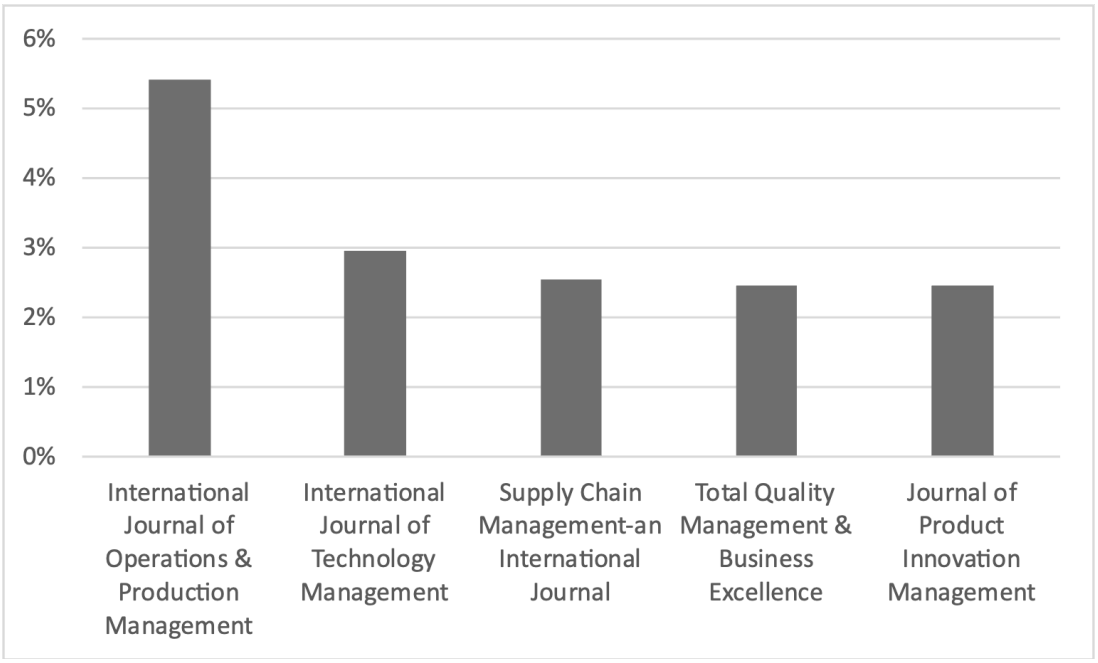

Figure 4 - Top 5 Journals

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3.3. QUALITATIVE ANALYSIS

To identify emergent themes, a word frequency query was conducted in NVivo 14 on all abstracts at the beginning of the process. Figure 5 demonstrates that, in addition to the anticipated importance of terms such as new, product, management, innovation, development, industry, business, market, model, technology, process and platform are also noteworthy.

Figure 5 - Word Frequency Query

We performed content analysis supported by NVivo on all abstracts of the 981 papers and identified the knowledge areas shown in Figure 6.

The domain of **business transformation** encompasses various facets, such as data-driven business models (Loebbecke et al., 2012), the influence of prominent technology companies (commonly referred to as "Big Tech"), advancements in autonomous driving, and the emergence of electric mobility (Johnson & Suskewicz, 2009; Magnusson & Berggren, 2011).

Within the realm of **organizational development**, scholarly discussions encompass subareas including quality management (Cole & Flynn, 2009; Power et al., 2011; Tanco et al., 2012), knowledge management (Andriani et al., 2022; Gonzalez, 2017), human resources (HR) and leadership (Jayaram et al., 1999; Pearce & Herbik, 2004), as well as organizational change dynamics (Lee et al., 2000; Midler et al., 2019).

The area of **cooperation** entails comprehensive explorations of supply chain management (Vickery et al., 2003), procurement and supplier management (Chen et al., 2004; Krause et al., 2007), open innovation practices (Di Minin et al., 2010; Ili et al., 2010), and the concept of coopetition (Akpinar & Vincze, 2016; Munten et al., 2021).

In the context of **manufacturing**, research focuses on production knowledge, smart manufacturing methodologies, industry 4.0 principles (Krzywdzinski, 2017; Paschou et al., 2020; Sjodin et al., 2018), lean management approaches, as well as the configuration of product options, modularization techniques, and product variety considerations (Abbas & ElMaraghy, 2018; Manzini et al., 2018).

The field of **finance** involves a comprehensive understanding of investment strategies (Chen et al., 2010; Scheuplein, 2021; Underwood, 2012) and pricing (Busse et al., 2010; Moreno & Terwiesch, 2015) dynamics.

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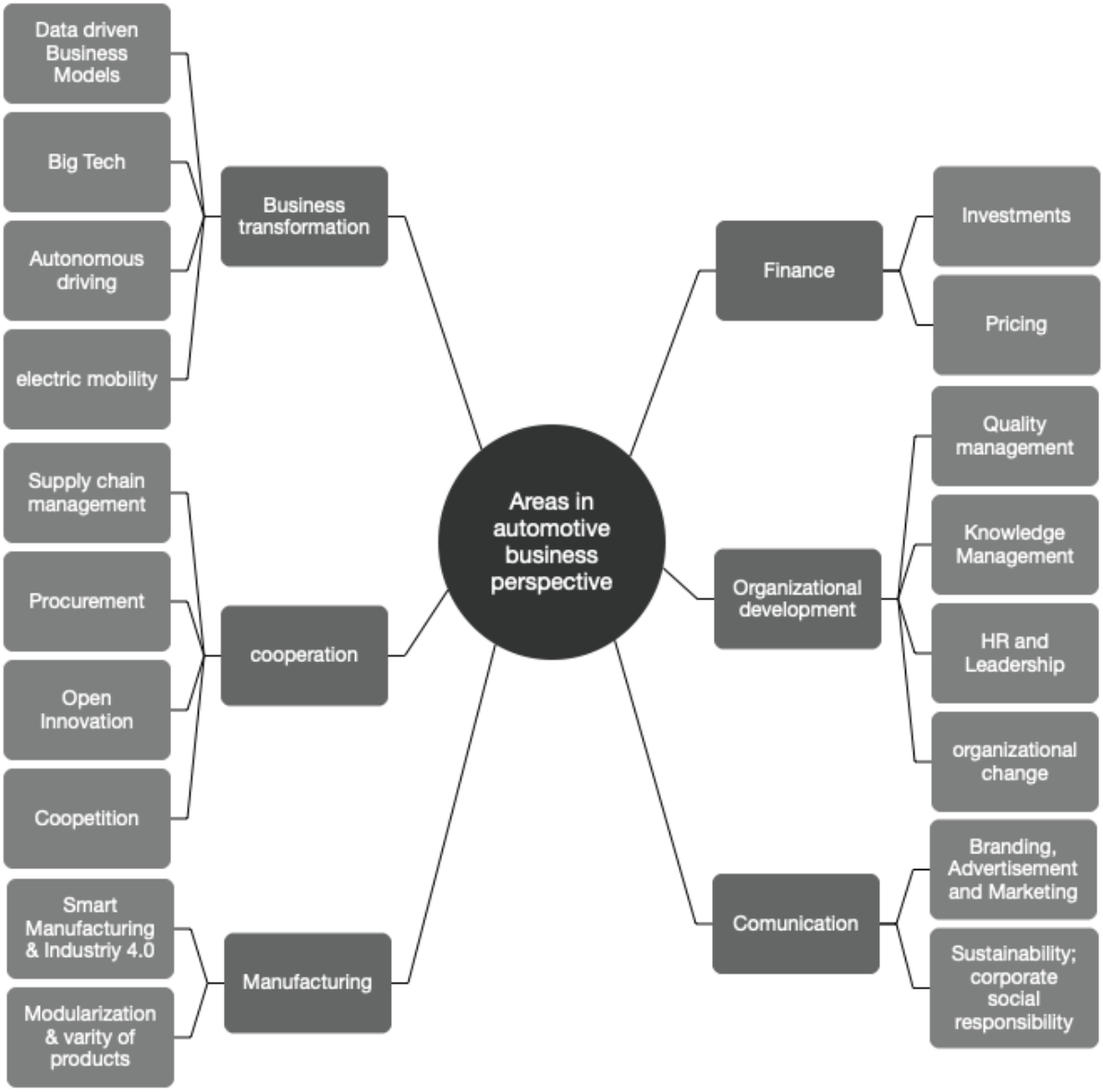

Figure 6: Areas in automotive business perspective

Lastly, the area of **communication** encompasses multifaceted dimensions, including branding initiatives, advertisement and marketing strategies, sustainability aspects, and corporate social responsibility (CSR) practices (Hahn & Figge, 2011; Schaefer et al., 2006; Yeniyurt et al., 2007).

4. CONCLUDING REMARKS

In the context of the extensive changes in the automotive industry and the competition with new rivals, the necessary competences and knowledge areas for ECMs are also changing (Murmann & Schuler, 2023; Thomas & Maine, 2019). Our research showed that there is a growing interest in the business perspective of the automotive industry.

Based on the journals in which the studies examined were published since 1996, it can be determined that until today special attention has been paid to the following knowledge areas: perations & Production Management, Technology Management, Supply Chain Management, Quality Management and Busines Excellence and Innovation Management.

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In our view, the knowledge areas can influence each other and have different overlaps. The knowledge areas of business transformation (Lopez-Vega & Moodysson, 2023; Mustak et al., 2023; Pavlinek, 2023) and organisational development (Agren et al., 2022; Kirchner et al., 2022; Mei et al., 2022) may play a special role in this change process.

n this context, the further investigation of relevant knowledge areas that influence the future viability of established car manufacturers could be a relevant path for future research.

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