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From Tradition to Transformation: Development of an Approach for Business Model Adaptation in Automotive Supplier SMEs

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Abstract: The automotive industry is undergoing a profound transformation driven by electrification, digitalization, and evolving value chains. Small and medium-sized enterprises (SMEs) in the supplier sector face particular challenges in adapting their business models to these changes. This study addresses this issue by developing the PIC approach, a structured process model consisting of three phases: Preparation, Implementation, and Control. Based on a systematic literature review, the model integrates theoretical insights with practical tools tailored to SMEs. A fictitious case study demonstrates the applicability of the approach and illustrates how companies can use it to assess their current state, define a strategic direction, and manage the transformation process. Continuous improvement is supported through the integration of continuous improvement process principles. While the PIC model is conceptual in nature, it offers a promising foundation for practical application. The objective of this approach is to support successful adaptation, helping users address challenges and mitigate risks arising from ongoing changes in the automotive sector. This work is carried out within the TraFoNetz project—a regional initiative in Germany's Northern Black Forest that supports the transformation of SMEs in the automotive supply industry. Future research will focus on validating the approach in real-world settings and refining it further.

Keywords: Digital Transformation; Automotive Industry; SME; Process Model; Business Model Adaptation; Automotive Supplier

1. Introduction

Germany's gross domestic product has shown continuous growth since the 2009 financial crisis, with the exception of 2020 due to the COVID-19 pandemic [1]. As one of the country's most critical economic sectors, the automotive industry remains a cornerstone of national prosperity, generating €564 billion in revenue in 2023 alone [2]. However, recent structural developments—such as the planned closure of production sites by Volkswagen (VW), the world's highest-grossing automaker—have raised concerns about job security and economic stability [3]. These closures not only affect VW's workforce but also impact its extensive network of suppliers, many of which are small and medium-sized enterprises (SMEs). Southern Germany, home to industry giants such as Mercedes-Benz and Porsche, is particularly vulnerable due to its high concentration of automotive OEMs and suppliers. A study by the German Association of the Automotive Industry (VDA) warns that approximately 140,000 out of 780,000 jobs in the German automotive sector are currently at risk [4], with implications for rising national unemployment [5].

The primary driver of this disruption is the industry's accelerated shift toward electrification—away from traditional internal combustion engines toward electric powertrains. This transformation is driven by global efforts to reduce CO_2 emissions through tighter regulations and consumer demand for sustainable mobility. With over 1.5 million electric vehicles (EVs) now registered on German roads [6], and consistent annual growth in EV adoption [7], OEMs and their suppliers are under increasing pressure to adapt.

Despite German brands' strong domestic position in the EV market [8], international trends paint a more concerning picture. Germany's share of global automotive production is declining, while China continues to expand its dominance [9]. In terms of EV output, only three German companies appear among the world's top ten producers—BMW being the highest ranked—compared to six Chinese automakers and the ever-competitive U.S. company Tesla [10]. Forecasts suggest that the global EV fleet may reach 479 million vehicles by 2035 [11], intensifying global competition and placing further strain on Germany's automotive ecosystem.

While large OEMs have access to the capital, talent, and strategic alliances needed to navigate this transition—including acquisitions of tech startups or joint ventures in emerging fields such as battery systems and automotive software—SMEs often lack these resources. For smaller suppliers, the dual burden of sustaining current operations while developing future-ready capabilities presents a considerable challenge. This includes decisions about the right timing for technological shifts and coping with the financial risks of parallel investments in legacy and new systems [12].

Given their structural disadvantages, SMEs require targeted methodologies and tools to support transformation in a manageable, strategic, and sustainable way. This paper introduces a structured procedural approach tailored to the needs of SMEs in the automotive supply sector. The objective is to provide a practical transformation methodology that supports companies in realigning their business models, innovating their offerings, and navigating the ongoing structural shift in the industry. By equipping SMEs with a step-by-step framework, this approach aims to reduce risk, increase adaptability, and ensure long-term viability.

This work has been developed as part of the *TraFoNetz* (Transformationsnetzwerk Nordschwarzwald) project—a regional initiative in Germany's Northern Black Forest. TraFoNetz offers direct support to SMEs in the automotive supply industry through services such as strategic consulting, digital maturity assessments, funding advice, and workforce training. The initiative also serves as a regional networking platform linking businesses, research institutions, and policymakers to drive coordinated transformation efforts.

At the European level, the recently published *EU Auto Industry Action Plan* by the European Commission represents a broader political response to the sector's challenges. It calls for investments in emerging technologies such as artificial intelligence and automated driving, regulatory flexibility, and support for the rollout of charging infrastructure [13]. While welcomed by the VDA as a necessary step, the plan is seen as insufficiently focused on SMEs. The VDA advocates for stronger SME representation at the EU level and for reducing regulatory and bureaucratic barriers to make the transformation process more accessible to smaller firms [14].

Although the exact impact of these policy measures on SMEs remains to be seen, political recognition of the issue marks a step in the right direction. Against this backdrop, the need for methodological support tailored to SMEs becomes even more urgent. The procedural framework proposed in this paper contributes to addressing this need by providing a structured and scalable approach to SME transformation in the German—and by extension European—automotive supply sector.

2. Materials and Methods

The following section will present the methodology behind the systematic literature review used in this paper, which is based on the five-phase approach defined by vom Brocke et al. [15]. The basic structure of this approach is presented in **Figure 1**. Each step will be explained in detail in a separate subsection.

2.1. Definition of Review Scope

In the first phase, the scope of the literature review is defined. This is based on Cooper's taxonomy from 1988 [16], which considers six different characteristics: focus, goal, organization, perspective, target audience, and coverage. Precisely defining the parameters to be examined is crucial for conducting a targeted literature review.

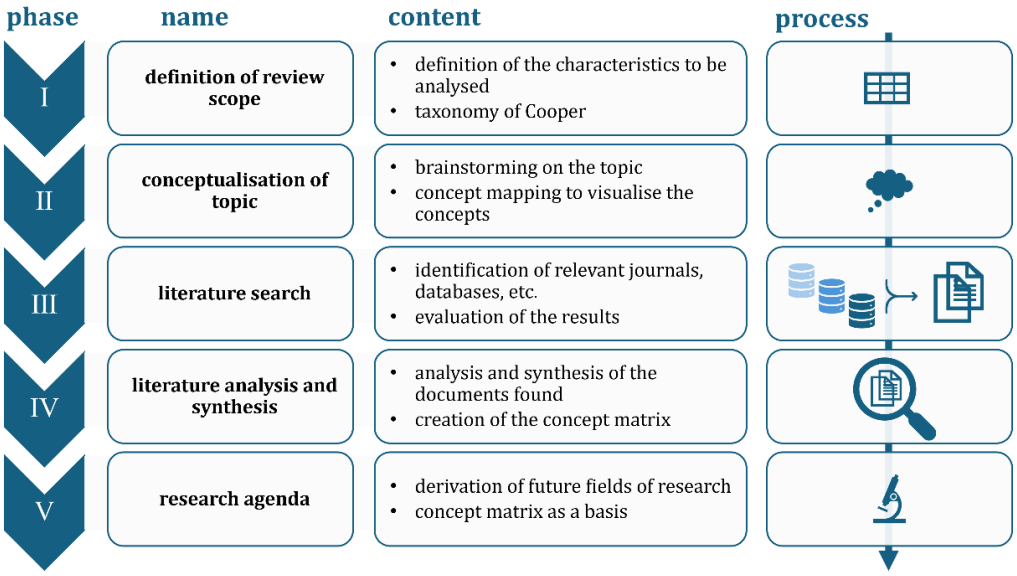

Figure 1. Procedure of a Literature Search. Own Illustration Based on vom Brocke et al. [15].

This study concentrates on identifying and analyzing existing practical approaches to digital transformation in the automotive industry. In addition to these practice-oriented models, theoretical foundations and methodologies that can inform the development of a structured transformation process are also considered.

The primary objective of this research is to integrate and synthesize the existing body of literature on transformation strategies within the automotive sector. By critically evaluating and comparing relevant approaches, the study aims to develop a unified, procedural framework tailored to the specific needs of SMEs.

In terms of structure, the study employs a conceptual organization of literature. This means that publications addressing similar themes, concepts, or ideas are grouped and discussed collectively, enabling a more systematic comparison of their contributions. The literature review is conducted from a neutral perspective, as opposed to an evaluative one. This approach allows for an unbiased examination of the strengths and limitations of each source without predefining a preferred outcome or stance. Regarding the intended readership, the research primarily targets industry stakeholders, particularly companies seeking guidance in transformation efforts. However, due to the broader economic and policy implications, the findings may also be of relevance to policymakers and institutional actors involved in shaping the future of the automotive industry.

Finally, the study adopts a comprehensive review strategy, ensuring that a wide range of relevant literature is considered. This allows for the in-depth exploration of concepts and practices essential to the development of a practical and transferable transformation approach.

2.2. Conceptualization of Topic

In the second step of the methodology, the approach to conceptualizing the topic *"transformation in the automotive industry"* is explained. The conceptualization of this subject is a crucial step in the literature review, as it systematically explores and structures the chosen research topic. The goal of this phase is to identify and define key terms, concepts, and interrelations to develop a clear understanding of the subject. This conceptualization thus forms the foundation for a targeted examination of the topic and the further development of the study. As part of a brainstorming process, relevant terminology, as well as ideas and insights related to the topic, is collected and documented. The ideas gathered are then organized and interconnected using concept mapping. Upon completing the concept mapping, the foundation for creating a search string is established, which will be further examined in the following subsection.

2.3. Literature Search

The third phase focuses on searching for relevant literature. First, a search string is defined, which is essential for retrieving precise information from databases and search engines. Additionally, using a search string ensures the reproducibility of the search, allowing other researchers to use the same string to obtain similar results. It is beneficial to combine multiple terms using logical operators (AND, OR, NOT) to cover various research areas. In addition to English terms, German words were also used, as this also queries German automotive knowledge. This ensures an international and broader selection of literature.

The preceding concept mapping process determines the key research areas necessary for constructing the search string. As a result, the following search string was used for this literature review:

"Transformation" OR "Vorgehensmodell" (English: approach) OR "process model" OR "Change" OR "Business model" AND "Automobilindustrie" (English: automotive industry) OR "Automotive industry" OR "Automobilzulieferer" (English: automotive supplier) OR "automotive supplier".

This search string was applied in three different literature databases and search engines: SpringerLink, ScienceDirect, and Google Scholar. To ensure relevance, the search was limited to literature published within the last five years. Furthermore, for the subsequent analysis, the top 30 most relevant search results from each database were selected.

2.4. Literature Analysis and Synthesis

In the penultimate step of the literature review, the identified sources are systematically analyzed for their content and relevance to the study's topic. To facilitate this process, the concept matrix by Webster & Watson (xvii) is used [17], providing a structured and precise approach to analyzing the literature. In addition to general characteristics such as publication date, title, and language, the selected sources are examined based on predefined parameters. These parameters are derived from the terms and associations established in the concept map. If a source shows a high degree of alignment with the defined table parameters, it is marked as relevant. The key findings of this analysis are presented below.

A statistical evaluation of the concept matrix reveals that 21 out of the 90 analyzed sources are written in German. It is worth noting that despite using a bilingual search string, SpringerLink and ScienceDirect exclusively generated English-language results, which explains the predominance of English literature. Consequently, all German-language sources originate from the Google Scholar search.

Additionally, the analysis determined that 29 sources were deemed irrelevant to the topic of this study. Furthermore, 20 search results could not be examined in detail due to restricted access to the respective literature. The remaining 41 relevant and accessible sources can therefore be utilized for further research in this study.

Furthermore, a forward and backward search also led to the identification of ten additional relevant sources.

2.5. Research Agenda

By establishing a research agenda, the systematic literature review is concluded in the final step. Once again, the concept matrix is utilized as a basis for identifying a potential research gap. Initially, characteristics from the category *Theoretical/Technological Foundations* are examined. The topic of transformation in relation to the automotive industry is addressed and described in most of the reviewed sources. The fact that this subject is discussed in the publications already serves as a foundation for identifying further aspects. In particular, the significance and impact of transformation in the automotive industry are emphasized in nearly all sources. When analyzing characteristics from the category *Influencing Factors* (advantages, disadvantages, drivers, and challenges), the reviewed literature provides relevant arguments. Furthermore, the analysis reveals that trends such as digitalization and electromobility are most frequently associated with the transformation of the automotive sector.

However, it becomes apparent that only a few of the reviewed works offer a concrete framework or a structured approach for achieving a successful transformation in the automotive industry. Instead, some studies focus on a specific problem within individual cases or companies and propose ways to address those particular challenges. Additionally, many sources lack a perspective on SMEs, as most literature adopts the viewpoint of OEMs. As a result, a research gap emerges, which this study aims to address by investigating the following research questions (RQ):

1. What approaches exist to support companies in their respective transformation processes?

2. Can these approaches be applied to SMEs in the automotive industry and can they be combined?
3. Are there alternative approaches to complement existing approaches?
4. What does a general approach for the transformation of SMEs in the automotive industry look like?

3. State of the Art in Science and Research

Provide a concise and precise description of the experimental results, their interpretation as well as the experimental conclusions that can be drawn.

3.1. Trends and Changes in the Value Chain

When discussing trends in the automotive sector, the term "CASE" frequently comes up. This acronym consists of the initial letters of four key mobility trends: connectivity, autonomous driving, shared mobility and electrification [18]. The following sections explain the impact of these mobility trends and the factors driving them.

As part of digitalization, vehicles are evolving into connected units within the internet of things (IoT). This connectivity enables data exchange between vehicles and infrastructure (V2X) and enhances services such as navigation, real-time traffic information, and infotainment [19]. Connected vehicles offer safety benefits through real-time traffic monitoring and support functions such as remote vehicle diagnostics and over-the-air software updates [20]. This connectivity transforms how vehicles are used and maintained, creating new business opportunities for companies specializing in data analytics and mobility services.

Autonomous driving is another major aspect of digitalization. The development of self-driving cars depends heavily on advancements in artificial intelligence (AI). Depending on the level of automation, autonomous driving has the potential to revolutionize vehicle ownership and usage by accelerating mobility services such as car-sharing and driverless transport systems [20].

This shift leads directly to the shared mobility trend. The concept of shared mobility disrupts the traditional vehicle ownership model. With increasing urbanization, the demand for car-sharing, ride-pooling, and mobility-as-a-service (maas) platforms such as Uber or Miles is growing [20]. Urban residents, who prioritize flexibility and do not own or require a personal vehicle, increasingly rely on maas solutions. Shared mobility reduces the need for individual vehicle ownership and shifts the automotive industry's business models toward service-oriented and digital offerings.

The last CASE trend is the transition to electric powertrains. As mentioned earlier, this shift is driven by the need to reduce CO_2 emissions and comply with stricter environmental regulations. Advancements in battery technology, decreasing battery costs, and the widespread availability of charging infrastructure are increasing EV adoption, a trend that continues to grow over time. The compatibility of EVs with digital technologies strengthens their role in shaping other mobility trends. While connectivity, autonomous driving, and shared mobility cannot exist independently, electric vehicles serve as the foundation upon which these mobility concepts can be developed.

In any case, the aforementioned mobility trends are not only influencing the car as a product, but also the automotive industry as a sector and are leading to significant changes in the traditional value chain, creating opportunities for new competitors [21]. The differences between the traditional value chain and the one influenced by mobility trends can be summarized as follows:

The traditional value chain focuses on the car as a product and its physical components, modules, and systems, which are supplied by tiered suppliers. In this approach, the car is considered a finished product whose value is defined by the composition of these physical parts. In contrast, the emphasis in the *New Mobility* value chain shifts partially away from the physical product [19]. Instead, digital aspects and the provision of complementary services (such as mobility services) take center stage. Digitalization and the use of the car as a platform for various services are becoming increasingly important.

Another key difference is the organizational structure and control over the value chain. Traditionally, automotive manufacturers have maintained full control over the entire process - from production to marketing and lastly sales. In the era of *New Mobility*, however, decision-making power and company positioning are increasingly distributed within the value chain itself [21].

Finally, the two approaches also differ in terms of key players. In the traditional value chain, automakers and Tier-1 suppliers, who provide essential vehicle systems, dominate. However, in the *New Mobility* value chain, com-

panies specializing in autonomous driving, connectivity, and shared mobility are gaining influence [21]. These players are often technology or mobility service providers operating in areas such as networking, AI, data analytics, or sharing platforms. As a result, technology providers and mobility service companies now stand alongside OEMs, which no longer sit at the top of the classic supplier pyramid that defined the traditional value chain.

With the dissolution of the hierarchical structure and the closer collaboration of involved stakeholders, suppliers of CASE-related components will take on a greater share of the vehicle's value creation in the future [22]. OEMs are attempting to counteract this development. As explained earlier, a common strategy among automakers is to acquire startups or establish subsidiaries to gain knowledge and expertise in these emerging trends. As the need for IT expertise, essential for autonomous driving and digital services, continues to grow, OEMs are working to become less reliant on suppliers [14]. The goal is to shift responsibility and a larger portion of the vehicle's value creation back to the OEMs in the long run.

3.2. Literature Search

3.2.1. Process Failure Modes and Effects Analysis

The first procedure that has been identified is the 'Process Failure Modes and Effects Analysis', or PFMEA for short. This is based on the FMEA approach, which is primarily used as a risk analysis tool for products. It is used to identify potential errors and recognize correlations with the resulting consequences. The use of FMEA reduces repeat errors. Furthermore, the standardized approach enables a common language with all project participants so that project members and interface partners understand which structural and functional relationships exist with potential product defects [23]. PFMEA extends the application of FMEA to include the process aspect and therefore focuses on processes that are carried out in the automotive sector, such as production, assembly or testing processes [24]. Moreover, PFMEA enables the evaluation of the potential errors so that final action can be derived.

3.2.2. Sustainable Business Model for Electromobility

The next approach that emerged from the analyzed literature is the "Sustainable Business Model for Electromobility" (SBMEM) [25]. SBMEM is directly related to the transformation of the automotive industry, as its name already indicates a specific focus on electromobility. Additionally, it incorporates the concept of sustainability by integrating its key components ecology, economy and society into the model. However, the SBMEM does not provide a step-by-step guide, as it does not describe a specific process. Instead, it should be understood as a mindset that reflects an approach or perspective when designing business models. The SBMEM approach builds upon the dimensions of a traditional business model triangle (value chain, revenue model, and value proposition) and links them to the sustainability dimensions. This creates intersections between sustainability and conventional business model elements, forming a business model matrix. By restructuring the traditional business model through the addition of sustainability dimensions, the SBMEM aims to facilitate adaptation to industry transformation and the shift toward electromobility. As the switch to electromobility is being made in the interests of sustainability, the SBMEM helps companies leverage these intersections to maintain economic success despite changing value chains while also meeting the ecological and social expectations of their customers.

3.2.3. SPALTEN

The third approach is SPALTEN, which was originally developed as a universal problem-solving approach [26]. Its name is an acronym and is made up of the first letters of its seven German-language process steps (situation analysis, problem containment, alternative solutions, selection of solutions, consequences analysis, make decisions, recapitulate/learn). SPALTEN is primarily used in the automotive context in terms of problem solving. Here, the approach is intended to serve as a guideline and support medium-sized companies in the automotive industry in the strategy process in the context of electrification [27]. A strategy template is recommended as an additional tool for using SPALTEN. The strategy template is to be understood as a project overview and contains the most important information for the strategy process and answers the following questions:

- Where do we stand today? (status quo)
- Where do we want to be in the future? (vision)

- How do we achieve these goals? (Strategy for achieving goals)

Various tools are also used throughout the SPALTEN process, e.g., SWOT. In addition, the continuous collection of ideas throughout the entire process is encouraged with the help of an idea repository.

3.2.4. Lean Six Sigma

The next approach is called Lean Six Sigma (L6S) and is composed of the concepts of Lean and Six Sigma [28]. Lean, or Lean Management, is a management philosophy focused on creating streamlined and efficient processes. This approach is often applied specifically in production environments to eliminate waste, such as excessive material usage or unnecessary process steps [29]. In such cases, it is referred to as Lean Production. However, Lean can also be applied in other areas, such as management, to optimize business processes. A key factor in this context is time efficiency. By implementing Lean principles, companies aim not only to improve financial efficiency but also to reduce process times, such as those related to decision-making. Essentially, the Lean approach seeks to optimize various business processes. In L6S, this process improvement strategy is combined with Six Sigma thinking. While Six Sigma also aims to enhance processes, it focuses less on waste reduction and more on improving the quality of both the process itself and its outcomes [28]. The integration of these two philosophies into the L6S approach results in process improvements on multiple levels. It minimizes the time required for delivering products or services while simultaneously enhancing their quality [28]. The goals of both approaches align and are achieved through the use of various management tools.

3.2.5. Action Research

Another approach is Action Research, which is used in companies to improve strategies, practices, and processes [28]. This approach is highly practical, actively involving employees and managers in the research and change process. Action Research consists of seven steps that are carried out iteratively in a cycle. It is also important to note that due to its repetitive structure, the improvement process does not end until a satisfactory result is achieved. Additionally, Six Sigma tools can be applied to further support continuous improvement.

3.2.6. Iterative Business Model Innovation

The next approach also utilizes an iterative approach. It is called Iterative Business Model Innovation (IBMI) and, like Action Research, is depicted as a self-contained process cycle. However, IBMI specifically focuses on the continuous change and adaptation of the business model. It is also an extension of Business Model Innovation (BMI), which, unlike other forms of innovation such as product or process innovation, requires a complete rethinking of how a company generates and captures value [30]. BMI helps businesses adapt to changing customer needs and evolving value chains, as static business models can lead to a decline in success [25]. To maintain competitiveness, companies must continuously renew their business models, making BMI inherently focused on modifying and adjusting existing models. Since business model innovation is not a one-time event but an ongoing process, the BMI approach is represented as a cycle with six steps to emphasize its iterative nature [31].

3.2.7. Approach to Transformation of Plants

The last approach aims at suppliers of the automotive industry and suggests a way to transform plants in the course of electromobility. The plant transformation approach consists of four steps [32]. The first step is to inspect the location portfolio. The aim is to check whether and when the products could be affected by the transformation and how this could impact the business results of the plant. Workshops and interviews with employees will then be carried out. This is intended to provide a snapshot of the current skills and knowledge at the site. A self-image and an external image of competences such as product expertise or technological expertise are also created. In the third step, the potential at the location is analyzed. The aim is to examine how the location can adapt its existing products and production methods to electromobility or whether new, future-relevant products can be included. In this step, external parties such as scientists or experts from other sectors can be consulted in addition to the company's own experts. Finally, after the three analysis steps, concrete measures are derived with the help of workshops.

Now that all the identified approaches have been presented, they are compared in **Table 1**. The overview summarizes their most important information. Five different characteristics are used for this purpose. Firstly, the

respective approach is described. It is then checked whether there is a connection to the transformation topic of the automotive industry and whether it is also related to SMEs. Then it is clarified where the focus of the approach lies, e.g., on a specific business sector. Finally, it is analyzed whether and which components of the respective approach could be useful for the subsequent design of the transformation approach.

Table 1. Comparison of Existing Approaches.

Approach	Description	Reference to Transformation /Automotive Industry	Reference to SMEs	Focus	Useful Components
PFMEA [24]	Approach for identifying and analyzing errors and estimating consequences	No	No	Technology Reference to product and process	Process diagram Composition of a project team
SBMEM [25]	Approach to redesigning the business model with sustainability in mind	Yes	No	Electromobility Sustainability	-
SPALTEN [26]	Problem solving approach	Yes	Yes	Generalistic	Strategy template Composition of a project team Step-by-step guide
Lean Six Sigma [28]	Process improvement philosophy	Yes	No	processes of any kind	Tool collection
Action Research [28]	Improvement cycle	No	No	Practices and processes of any kind	Iteration
IBMI [31]	Approach for continuous change	No	No	Business model Applicable to all industries/departments	Market analysis Tool collection for various processes
Transformation of plants [32]	Approach for site transformation	Yes	No	Identification of adaptation options at locations of major automotive suppliers	Involvement of employees through interviews to assess their self-image and competences

In conclusion, the comparison shows that the findings represent various types of approaches. While SBMEM and L6S are more of a philosophy or mindset towards a specific topic, the remaining approaches provide concrete steps. Action Research and IBMI, in particular, employ an iterative approach to enable continuous change or improvement.

Furthermore, the approaches examined differ in their objectives. PFMEA and L6S focus on improving a specific process or product, whereas SBMEM and IBMI aim to transform the entire business model on a strategic level. Except for SPALTEN, none of the approaches specifically address SMEs, and some do not explicitly relate to the topic of transformation.

Nevertheless, transferable ideas can be derived from the presented approaches, despite their lack of direct reference to transformation. Certain components appear useful for designing a transformation framework for SMEs. In particular, a collection of tools, as described in L6S or IBMI, could prove practical. Additionally, involving employees following the example of the procedure for site transformation or establishing a dedicated project team based on PFMEA and SPALTEN could be beneficial.

4. Conception of an Approach

The analysis of the status quo of the topic and the examination of existing approaches revealed that the literature does not yet provide a standardized approach to the topic of transformation. Accordingly, the following section, which forms the practical part of this work, will deal with the development of a possible approach for the transformation of SMEs. Existing elements from practice will be adopted or adapted and combined.

4.1. Introduction to the PIC Approach

As shown in **Figure 2**, the three phases of the approach are referred to as the 'preparation', the 'implementation' and the 'control'. The concept of this approach is also shortly referred to as the PIC approach. While the illustrated phases and their sub-steps are a concrete specification of the PIC approach, the execution of the steps is to be organized individually by each company itself. The process model provides the framework for this and guides the company through the transformation. The additional approaches presented are optional and can be applied or omitted as required. In addition, the process model is surrounded by a bracket. This is intended to represent the constant generation of ideas and their inclusion in the pool of ideas. This element is inspired by SPALTEN and allows employees at all levels to communicate their suggestions for improvement.

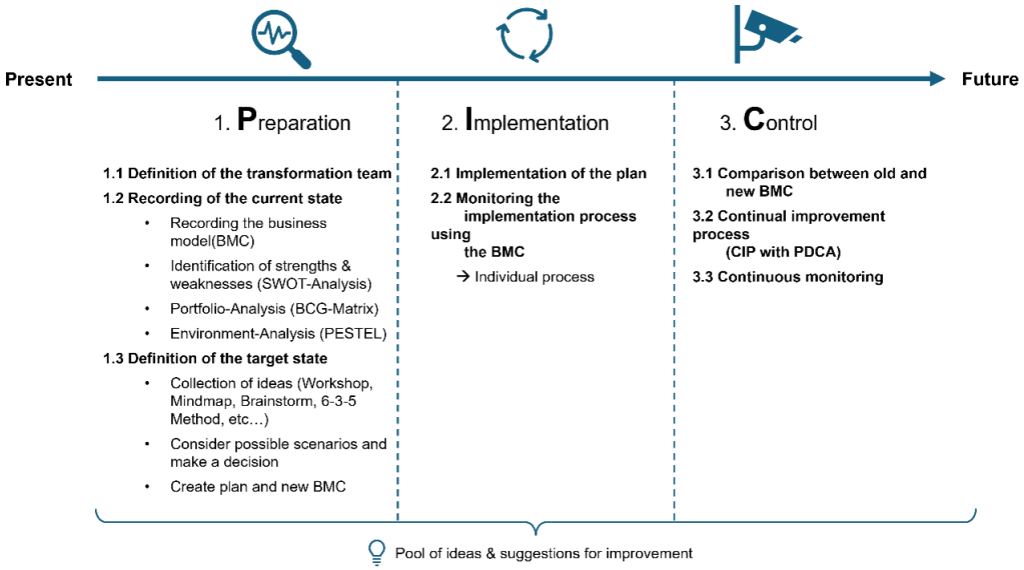

Figure 2. PIC Approach.

4.1.1. Phase 1: Preparation

At the beginning of the PIC approach, the preparation phase is carried out. This phase includes all activities that must take place before the transformation. Preparation is extremely important for the transformation process, as it prepares the ground for the actual transformation. There is also a sequence within this preparatory phase that must be adhered to in order to correctly complete the first block of the approach. This consists of the three sub-steps 'Definition of the transformation team, 'Recording the current state' and 'Definition of the target state' and also includes a range of tools that can be used in this section.

4.1.2. Phase 1: Step 1: Definition of the Transformation Team

The first step of the transformation framework is assembling a motivated project team. This measure is derived from PFMEA and SPALTEN and serves as the foundation for a successful transformation of the company. The transformation team is responsible for overseeing the transformation process, ensuring organization and structure throughout its implementation. It is advisable to involve senior management in the team.

Additionally, various competencies are required within the company, regardless of the assembled transformation team. In the context of digitalization, digital expertise related to disruptive technologies, as well as IT competencies, are particularly crucial [33]. If these skills are not already available within the company, selected employees must undergo appropriate training and development, or IT specialists should be recruited externally [34]. Another way to enhance competencies is by integrating suppliers into OEM training programs. This approach could enable OEMs to support their suppliers and strengthen collaboration with them [34].

This step also includes educating employees and raising awareness about transformation. Creating transparency across all levels of the organization fosters a transformation mindset among the workforce. Furthermore,

motivation and the right attitude are essential for successful transformation. It is also recommended developing a start-up mentality to support this process [20].

4.1.3. Phase 1: Step 2: Recording the Current State

In the second step of the preparation phase, the PIC approach calls for an analysis of the company's current state. This involves gathering information on existing business processes, offered products, competencies, partners, customers, etc., directly from the business model. PIC provides four different tools for this purpose:

- Recording the business model (BMC)
- Identification of strengths & weaknesses (SWOT-Analysis)
- Portfolio-Analysis (BCG-Matrix)
- Environment-Analysis (PESTEL)

(1) Recording the Business Model (BMC)

To present this information in a structured and clear manner, it is recommended to use both the business model triangle by Gassmann et al. (**Figure 3**) and the Business Model Canvas (BMC) by Osterwalder et al. (**Figure 4**) [35,36].

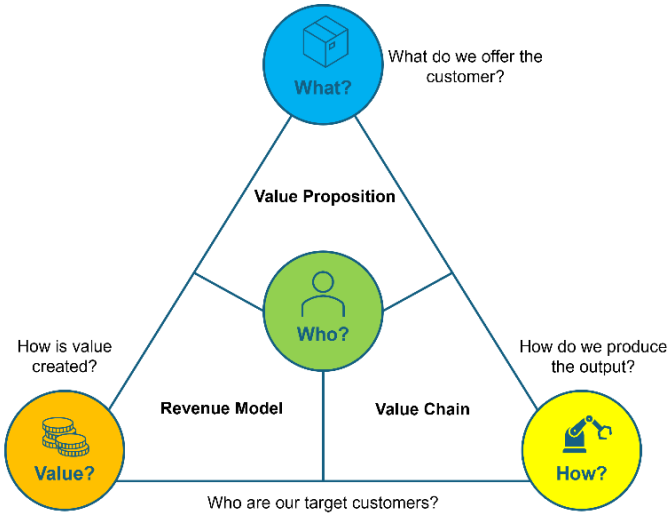

Figure 3. Business Model Triangle. Own Illustration Based on Gassmann et al. [35].

Figure 4. Business Model Canvas. Own Illustration Based on Osterwalder et al. [36].

The color differentiation of the dimensions in both figures illustrates the connection between the two business model representations. The BMC divides the four dimensions of the business model into a total of nine elements, allowing for a more precise evaluation. The transformation team should fill out the BMC block by block to document the current business model. The BMC blocks are structured as follows:

- **Value Proposition (blue dimension)**:
  The value proposition describes what is offered to customers to meet their needs. This dimension includes all products and services of a company.
- **Value Chain (yellow dimension)**:
  To achieve the value proposition, the company relies on three key elements of value creation:
  - **a)** Key activities such as production processes, procurement, sales, etc.
  - **b)** Key resources such as materials, energy, employees, etc.
  - **c)** Key partners such as suppliers, service providers, etc., with whom the company collaborates.
- **Customer (green dimension)**:
  According to Gassmann et al., the customer is always at the center of the business model. Osterwalder et al. further divide this dimension into three elements:
  - **a)** The "Customer Segments" block describes the different groups of individuals or organizations that the company aims to satisfy with its value proposition.
  - **b)** "Customer Relationships" explains the type of relationship the company wants to establish or has already established with each customer segment.
  - **c)** "Channels" refers to the communication, distribution, and sales channels through which the company reaches its customers.
- **Revenue Model (orange dimension)**:
  The final dimension is divided into two blocks and describes how the company operates economically:
  - **a)** The "Cost Structure" outlines all costs incurred by the company for operating its business model.
  - **b)** The "Revenue Streams" block describes how the company generates revenue by selling its products and services to different customer segments.

(2) Identification of Strengths & Weaknesses (SWOT-Analysis)

The PIC approach recommends recording the current business model using a BMC in order to obtain an overview of all business model elements. The use of the BMC is also important for the further course of the transformation in order to recognize a change between the old and the new, transformed business model in comparison.

In addition to using the BMC, conducting a SWOT-Analysis is also suitable for assessing the current state of the company. This is also included in the IBMI toolset [37]. The term SWOT is composed of the four dimensions that define the approach: strengths, weaknesses, opportunities, and threats. This tool helps identify these aspects within the company [20].

For the strengths and weaknesses categories, the transformation team should identify the current positive and negative conditions of the company. Strengths include all beneficial aspects, such as employee competencies, competitive advantages developed over the years, or lean production processes. Weaknesses, on the other hand, refer to existing shortcomings or areas that need improvement, such as high defect rates in manufactured products, delays in logistics processes, or declining revenues.

To identify a company's strengths and weaknesses, employee interviews can be conducted to incorporate internal assessments. This is derived from the site transformation approach by Schwarz-Kocher & Stieler [32]. By involving employees in the transformation process, the current-state analysis gains multiple perspectives.

Additionally, the SWOT-Analysis allows for an external evaluation of potential opportunities and threats. In the context of transformation, the opportunities section is used to explore possible transformation paths for the company, considering its current position. Threats include potential risks such as disruptive developments or increasing competition in the market.

(3) Portfolio-Analysis (BCG-Matrix)

With the BMC and SWOT-Analysis, the existing business, along with its positive and negative conditions or

influences, can be recorded. However, a closer examination of the value proposition, meaning the product itself, is missing. This is where the Boston Consulting Group (BCG) Matrix comes into play, as it focuses on the value proposition.

The BCG Matrix is a Portfolio-Analysis tool that compares a product's market growth rate with its relative market share in a graph (see **Figure 5**) [38]. These two dimensions create four quadrants, which can be understood as a sequence, symbolized by arrows in the diagram.

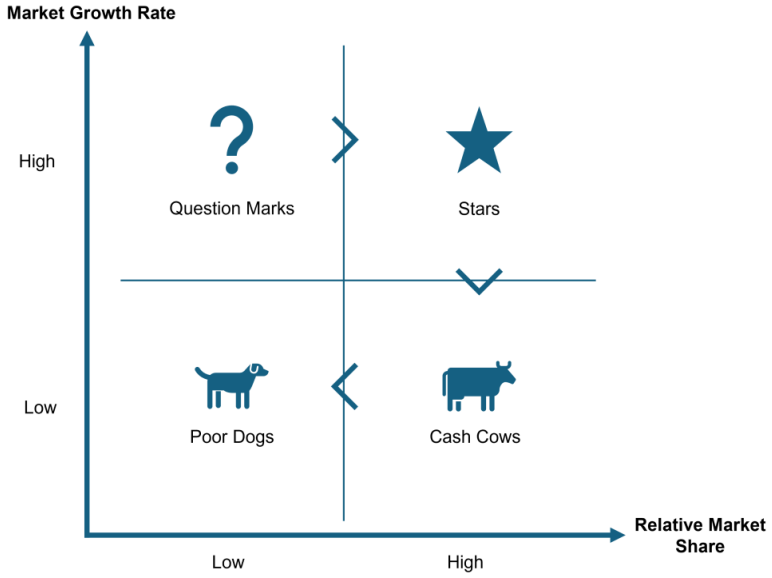

Figure 5. BCG-Matrix. Own Illustration Based on the Work of Huber et al. [38].

When a company introduces a new, innovative product, it initially has a low market share but high market growth rate due to its innovation. At this stage, the product falls into the first quadrant and is classified as a question mark. Depending on its success and the resulting increase in market share, the product evolves into a Star, moving into the second quadrant.

Over time, as more innovative competitor products enter the market, the product reaches a certain level of maturity. This reduces its market growth rate, but its market share remains high, shifting the product into the third quadrant as a cash cow.

At the end of its product life cycle, the relative market share also begins to decline, turning the product into a poor dog, which is no longer profitable for the company. At this stage, it is advisable for the company to discontinue the product.

By integrating the BCG Matrix into the PIC approach, a company can assess the market position of its products and determine whether a product is undergoing transformation. This also enables the company to decide how to manage its products. Depending on the product's life cycle phase, various response strategies are available.

As previously mentioned, poor dogs should always be phased out. For question marks and stars, the company should initially monitor their development and decide on appropriate measures over time. For cash cows, Osterwalder et al. recommend pursuing a dual-track strategy [39]. This approach involves maintaining both existing and new products within the portfolio. Existing products, the cash cows, are utilized until they reach the end of their life cycle, while new products introduced as a result of the transformed business model take on the role of a question mark.

Introducing a new product incurs high innovation costs, which cannot be offset immediately due to its initially low market share. With the dual-track strategy, a company can rely on existing cash cows to bridge the financial gap until the question marks establish themselves in the market and achieve star status.

Additionally, the dual-track strategy is scalable, making it applicable regardless of company size or the number of products offered. This makes the approach transferable to SMEs that specialize in a limited range of products and have fewer resources available.

(4) Environment-Analysis (PESTEL)

The previously introduced tools focus on analyzing the company's current state, but they do not yet consider the external environment of the organization. To gain an additional external perspective, the PESTEL-Analysis can be used. This analytical tool examines the business environment based on six different factors, which form the acronym of this approach. The analysis includes the following categories [40]:

- **Political Factors:**
  This category identifies political decisions and legislation that may impact the company. For large corporations, these factors play a crucial role in selecting international locations. For SMEs, this category is particularly relevant in terms of tariff policies, subsidies, or potential taxation.
- **Economic Factors:**
  This aspect examines the economic conditions and developments of a country that may influence the company. Examples include inflation rates, interest rates, or exchange rates.
- **Sociocultural Factors:**
  This category covers social trends and cultural aspects that may affect consumer behavior or workforce dynamics, such as consumption habits, lifestyle, or education levels.
- **Technological Factors:**
  This section analyzes technological advancements that could present both opportunities and risks for the company. Examples include CASE trends or the infrastructure within the company's environment (city, region, country).
- **Environmental Factors:**
  This category addresses sustainability and environmental concerns such as climate change, emissions, or environmental regulations.
- **Legal Factors:**
  The final category examines all legal frameworks and regulatory requirements that the company must comply with. Examples include safety standards, data protection laws, and labor regulations.

By utilizing this tool, the perspective on the company is expanded. Similar to the SWOT-Analysis, opportunities and risks are evaluated based on external influencing factors. The combination of the presented tools covers all necessary perspectives for a comprehensive current-state analysis, enabling the creation of a concrete transformation plan in the next step.

Finally, it is emphasized once again that the presented tools serve as recommendations and can be omitted or adjusted as needed.

4.1.4. Phase 1: Step 3: Definition of the Target State

In the final step of the preparation phase, the target state is defined based on the results of the current-state analysis. According to the PIC approach, ideas are first collected, then evaluated and refined through discussion. Additionally, ideas from the idea pool are considered. A workshop is well suited for the idea generation process, bringing together all members of the transformation team for collaborative development. Several well-known creativity techniques can be used to generate ideas, such as:

- **Brainstorming:**
  Allows for the generation of initial ideas within a group. The ideas produced are not immediately evaluated or criticized.
- **Mind Mapping:**
  Visualizes thoughts around a central topic. Relationships and connections between ideas are illustrated using linking lines.
- **The 635 Approach** [41]:
  Six participants each write down three ideas on a sheet of paper before passing it on to the next participant, who then expands on the existing ideas. This process continues in a circular manner until the original sheet returns to its author, meaning it is passed on five times. While the its name is based on six participants, it can

be adapted for different group sizes, as the principle remains the same.

The goal of idea generation is to develop as many ideas as possible, increasing the likelihood of discovering exceptional and innovative approaches [42].

To select from the generated ideas, different transformation scenarios must be distinguished. To gain an understanding of the company's starting position, the Ansoff-Matrix is a useful tool [43]. Similar to the BCG Matrix, this tool distinguishes four quadrants based on the interplay of two dimensions. In this framework, a company has four basic strategic options.

When applying this approach to the transformation context of the automotive industry, the dimensions and quadrants shown in **Figure 6** emerge. The matrix differentiates between new and existing markets (internal combustion engine market and electric vehicle market) and new and existing products. In the transformation context, all strategies related to the internal combustion engine market are excluded, as the focus is on the new market.

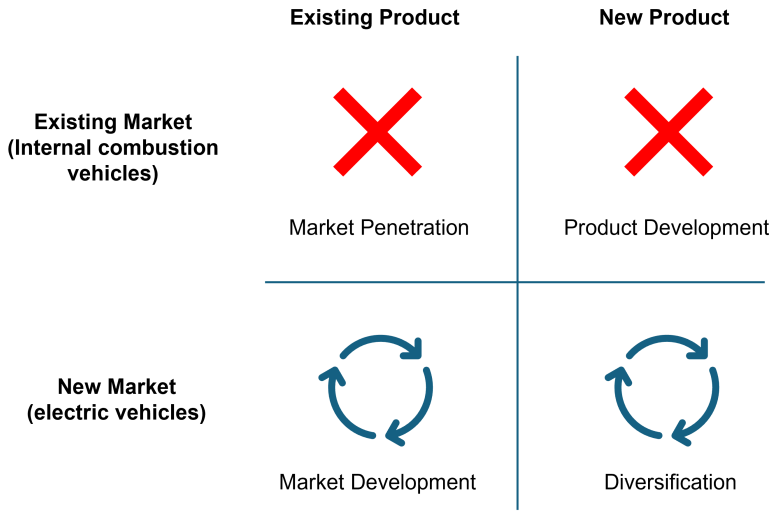

Figure 6. Ansoff-Matrix. Own Illustration Based on Schawel et al. [43].

As a result, the market penetration strategy, which focuses on selling an existing product in an existing market, is ruled out. Similarly, the product development strategy, which focuses on selling a new product in the existing market, is also eliminated. This leaves two remaining quadrants, meaning that the company has two strategic options for transformation. It can either introduce its existing product to the new market (market development strategy) or develop a new product to penetrate the new market (diversification strategy).

Based on this context, the following four transformation scenarios can be distinguished depending on the company's starting position:

- The company can **retain part of its product portfolio or adapt products** to changing needs using **existing production processes and competencies**. (Market Development Strategy)
- The company can **retain part of its product portfolio or adapt products** to changing needs using **new production processes and competencies**. (Market Development Strategy)
- The company cannot continue its existing product portfolio but can develop and manufacture **new products** using **existing production processes and competencies**. (Diversification Strategy)

The company cannot continue its existing product portfolio and must develop and manufacture **new products** using **new production** processes **and competencies**. (Diversification Strategy)

The fundamental factor in selecting a scenario lies in weighing the continuation of existing products and the further use of current production processes. In any case, it may be beneficial to follow the dual strategy mentioned in the previous section, provided that suitable products from the existing portfolio can serve as cash cows.

If a company insists on maintaining its existing competencies despite no longer offering products relevant to the automotive industry, a shift to a different industry should be considered.

The transformation team, together with company executives (if they are not already part of the team), should then evaluate possible options and make a final decision based on the insights gained from the current state analysis, the collected ideas, and the scenario assessment. Scientists or experts from other industries may be consulted for advice.

After this, a transformation plan is created, for which the use of a Business Model Canvas (BMC) is once again recommended. To align the decision with the new BMC, the following guiding questions must be answered:

- Which elements of the existing BMC can be carried over into the transformed BMC?
- Which elements of the existing BMC negatively impact the current business and should be changed as part of the transformation?

The new BMC documents the answers to these questions and also serves as the plan and foundation for implementing the transformation in the next step.

Additionally, it is advisable to subject the developed BMC to a scenario analysis. This systematically examines and evaluates potential future developments and their effects on the company. Various alternative future scenarios are considered, based on uncertainties, trends, and other influencing factors. Examples include the bankruptcy of a key customer or the outbreak of a pandemic. This approach results in multiple scenarios, including extreme cases, as well as best-case and worst-case scenarios. By doing so, the new business model is better prepared for potential opportunities and challenges in the future.

4.1.5. Phase 2: Implementation

With the completion of the first phase, all preparations are finalized. This is followed by the second phase of the PIC approach, which involves implementing the previously developed plan. All new components, such as processes, equipment, machines, materials, etc., that are required for the execution of the new business model are put into place.

However, the PIC approach does not prescribe a specific way of implementation, as the execution process varies in each company due to individual measures. Nevertheless, it is recommended to use the BMC of the new business model, which serves as a guiding framework during the implementation phase. Keeping a constant focus on the BMC and utilizing checklists ensure that all transformation-relevant aspects are properly executed.

4.1.6. Phase 3: Control

In the final "Control" phase of the PIC approach, the actual implementation of the transformation process will have already taken place. However, even in this last step, the Business Model Canvas (BMC) should be used. Here, the previously developed business models are compared. The old and the new BMC are analyzed side by side to highlight the differences. This comparison serves to confirm the implementation of the new business model and officially conclude the transformation.

The further focus then shifts to monitoring the new business model. To ensure its sustainability and continued development, the PIC approach emphasizes constant monitoring and evaluation of the business. For this purpose, the continuous improvement process (CIP) is particularly suitable [44].

CIP aims to continuously optimize processes, products, or services. These optimizations manifest small, incremental improvements over time. In this way, CIP leads to a state - of a process for example - that is better than the original but still requires further refinement. Since the new state is continuously improved, a cycle emerges. Therefore, the focus is not on one-time, major changes but on a recurring, iterative process of improvement.

This improvement cycle consists of four phases, known as the PDCA cycle, which is illustrated in **Figure 7** [45].

The PDCA cycle derives its name from the four steps it consists of [44]:

- **Plan:**
  At the beginning, as in the PIC approach, the current state is analyzed. This helps identify opportunities for improvement. Based on these findings, appropriate measures are planned.

- **Do:**
  The planned measures are implemented on a small scale and tested.
- **Check:**
  The results of the test phase are analyzed to determine whether the measures achieve the desired improvement.
- **Act:**
  The improvement is implemented as the new standard, triggering a new PDCA cycle in line with the CIP.

For CIP to function properly, it must be integrated into the company culture. Employees at all levels should be encouraged to continuously seek improvements, whether in processes or products. Additionally, CIP should be considered a part of daily work rather than a separate task. This ensures that the state of the company is continuously monitored and improved as needed following a transformation.

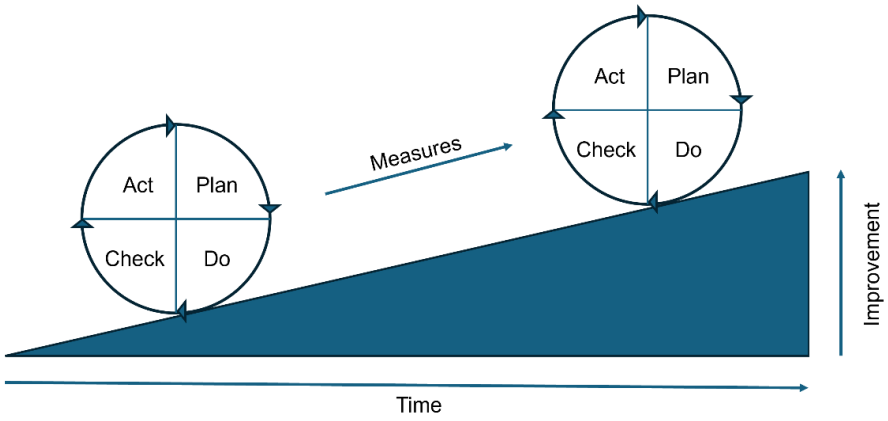

Figure 7. Continuous Improvement Process with PDCA Cycles. Own Illustration Based on Günther et al. [45].

4.2. Evaluation Based on a Fictitious Case Study

In this subsection, the application of the PIC approach is illustrated using a fictional example, thereby theoretically validating its use. The three phases are carried out step by step until the transformation is successfully completed. The following initial situation applies to this example:

MetallTech Automotive is a German family-run, medium-sized company located in the automotive region of Baden-Württemberg, employing 70 people. The company manufactures various metal components and follows a strategy primarily focused on producing clutch pressure plates, brake discs, and smaller metal parts. Its key customers include regional spare parts dealers, a regional OEM, and major automotive suppliers who integrate MetallTech Automotive's components into their own products, such as clutch or braking systems, before distributing them to other OEMs.

Due to automotive industry trends such as electrification and the growing demand for vehicles with automatic transmissions, sales of clutch pressure plates are declining, as clutches are not required in EVs or combustion-engine vehicles with automatic transmissions. As a result, MetallTech Automotive must undergo a transformation and utilizes the PIC approach as a guiding framework.

4.2.1. Phase 1: Preparation. Step 1: Definition of the Transformation Team

At the beginning of the PIC process, all necessary preparations for the transformation are made. This includes the formation of a transformation team. In this case, the owner of MetallTech Automotive, who also serves as the CEO, forms a transformation team consisting of seven members and leads it through the transformation process. For these positions, it is recommended to select leaders from various departments of the company. This ensures that different competencies and perspectives on the situation come together. Examples of the composition of the transformation team include the production manager, who brings technical knowledge, the head of the controlling department, who represents the financial perspective of the business, as well as an assistant who accompanies

and documents the transformation process. Once the transformation team has been assembled, all employees in leadership positions are tasked with informing their teams and departments about the topic of transformation, so that the entire workforce of MetallTech Automotive is made aware of and sensitized to the current developments.

4.2.2. Phase 1: Preparation. Step 2: Recording the Current State

(1) Recording the Business Model (BMC)

Now that the transformation team is in place, the next step focuses on assessing the current state of the company. For this, the team fills out the BMC with the characteristics of the current business model. The BMC of MetallTech Automotive is thus represented as shown in **Figure 8**.

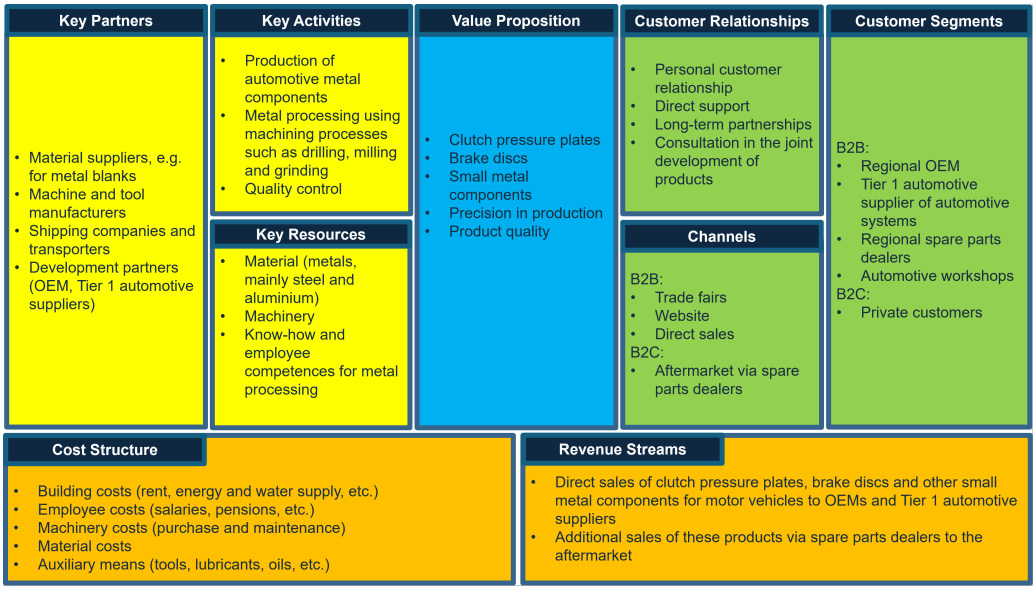

Figure 8. MetallTech Automotive's BMC.

As initially described, the company's value proposition is to provide automotive metal products. In addition to small components, the company mainly offers clutch pressure plates and brake discs. MetallTech Automotive is particularly known for its precise manufacturing processes and the quality of its products. To achieve this value proposition, the SME requires the right materials, primarily steel and aluminum blanks, as well as the necessary machines and the appropriate know-how from employees to operate them. The company specializes in machining processes such as drilling and milling. In addition to material and machine costs, including acquisition and maintenance, MetallTech Automotive also incurs building costs and personnel costs for employees. To counterbalance these expenses, the products are mostly sold through direct sales and partnerships to a regional OEM, as well as Tier-1 suppliers. Private customers also make up a customer segment of the current business model, with these customers being able to purchase the products in the aftermarket through spare parts dealers.

(2) Identification of Strenghts and Weaknesses (SWOT-Analysis)

Once the business model has been captured in the BMC, the analysis of the current state continues with the next analytical tool. Using the SWOT analysis, the current strengths and weaknesses of the business model are examined. Potential opportunities and threats are also discussed. The team involves employees from all levels and departments in the analysis. The opinions of the staff are gathered through employee interviews, complementing the transformation team's assessment with different perspectives. For MetallTech Automotive, the following results emerge from the SWOT tool:

- **Strengths**:
  - **Experience and specialization**: Long-standing expertise in manufacturing metal components, especially clutch pressure plates and brake discs.

- **Strong customer base**: Close business relationships with renowned customers such as a regional OEM and large automotive suppliers.
- **Location advantage**: Proximity to leading players in the automotive industry in the Baden-Württemberg region, a central automotive hub in Germany.
- **Quality**: Established reputation for precise and high-quality metal components.

- **Weaknesses**:
  - **Product portfolio**: High dependence on specific products (clutch pressure plates), which are in lower demand due to automotive trends.
  - **Lack of diversified customer base**: Strong dependence on a few large customers.
  - **Technological gaps**: Lack of experience in areas such as electromobility and digital technologies.
  - **Resource limitations**: As an SME, MetallTech Automotive has limited financial and personnel resources to implement a transformation.
  - **Sustainability**: Possible failure to adapt to changing requirements regarding CO2 reduction and eco-friendly production.
- **Opportunities**:
  - **Diversification**: Development of new products for the electromobility sector.
  - **Technological change**: Entry into innovative technologies such as manufacturing components for automated driving systems or sensors.
  - **Sustainability**: Transition to sustainable production to attract new customers and funding opportunities.
  - **Funding programs**: Utilization of government grants for SME transformation in the automotive industry and business supporting organizations (e.g., TraFoNetz).
- **Threats**:
  - **Declining demand**: Ongoing decrease in sales of clutch pressure plates due to the shift to electric vehicles and automatic transmissions.
  - **Competition**: Strong competition from larger companies or international suppliers with more cost-effective production capabilities (especially from China).
  - **Dependence on the automotive industry**: Industry-wide transformation could negatively affect the demand for traditional metal components.
  - **Rising costs**: Increasing raw material prices and energy costs could further strain profitability.
  - **Technological requirements**: Risk of falling behind in technological developments and new market demands.

(3) Portfolio-Analysis (BCG-Matrix)

Next, the product portfolio of MetallTech Automotive is examined more closely, with a focus on the two main products: brake discs and clutch pressure plates. Since brake discs are in constant demand regardless of the vehicle's drivetrain or transmission, this product holds a significant share of the market. Therefore, the status of brake discs is neither a poor dog nor a question mark. While the company offers high-quality brake discs, its lack of innovation in this area limits the market attractiveness. As a result, brake discs are categorized as a cash cow in the BCG-Matrix.

However, the demand for clutch pressure plates is weaker. Due to the aforementioned trends, their market attractiveness is declining, and thus their share of the market is also decreasing. Consequently, clutch pressure plates fall under the status of a poor dog. This means that for MetallTech Automotive, the production of clutch pressure plates will no longer be profitable in the future, and the manufacturing of this product should be discontinued.

(4) Environment-Analysis (PESTEL)

To conclude the recording of the current state, an environment analysis is carried out using PESTEL. This provides the company with the following analysis results:

- **Political Factors:**
  - **Environmental Regulations**: Stricter regulations for reducing CO2 emissions and sustainable production affect the company's requirements.

- **Subsidy Programs**: Government subsidies for the transformation of SMEs and the development of innovative technologies offer financial support.

- **Economic Factors:**
  - **Raw Material Prices**: Rising prices for metals and energy increase production costs.
  - **Inflation**: Increasing prices, interest rates, and wages lead to higher costs that affect profit margins.
  - **Labor Costs**: As a regional employer in Baden-Württemberg, the company is already impacted by high personnel costs.
- **Sociocultural Factors:**
  - **Sustainability Awareness**: Customers and end consumers are increasingly demanding more environmentally friendly products.
  - **Demographic Change**: The aging workforce may increase the need for training or new hires.
  - **Educational Level**: The automotive region of Baden-Württemberg hosts a large number of skilled workers with technical vocational training or technical university degrees.
- **Technological Factors:**
  - **CASE Trends**: Trends drive new technological requirements, e.g., for car electrification or digital products.
  - **Digitization**: The integration of Industry 4.0 technologies, such as automation or IoT, offers optimization potential. However, these require investments.
  - **Production Innovations**: The use of new manufacturing processes, such as 3D printing, can lead to optimizations in production processes, e.g., through efficiency improvements. Investments are also required here.
  - **Research and Development**: Collaborations with research institutes or universities can promote access to new technologies.
- **Environmental Factors:**
  - **Sustainability Requirements**: Customers, particularly OEMs, are increasingly demanding CO2-neutral production processes and sustainable or recyclable materials.
  - **Resource Scarcity**: The availability of resources such as metals may influence production planning.
  - **Energy Consumption**: Rising energy costs and the focus on renewable energy lead to more energy-efficient production processes.
- **Legal Factors:**
  - **Labor Law**: Compliance with legal requirements to protect employees, such as the implementation of workplace safety regulations, impacts production design.
  - **Environmental Regulations**: Strict adherence to emission limits.
  - **Product Liability**: High quality assurance requirements, particularly for brake discs, as they are safety-critical components.

With the completion of the PESTEL analysis, the assessment of the current state is finalized, enabling the definition of the target state based on these results.

4.2.3. Phase 1: Preparation. Step 3: Definition of the Target State

The preparation for the transformation is completed with the creation of the transformation plan and the new BMC. Before these can be defined, the transformation team must first discuss the analysis results and the company's current state in a discussion round to derive possible transformation scenarios. For this purpose, an idea workshop is held. Creativity techniques, such as brainstorming or the 635 approach, are applied to generate as many ideas as possible. In this fictional example, the workshop and consideration of the transformation scenarios lead to the following conclusion:

As part of the electrification process, the demand for clutch pressure plates drastically decreases and will disappear in the long term. However, the need for brakes remains unchanged. Consequently, clutch pressure plates must

be removed from the product portfolio and replaced. There are essentially two approaches to consider: a market development strategy and a diversification strategy (see **Figure 6**). Since clutch pressure plates, even in a modified version, are not suitable for EVs, the market development approach is ruled out. Thus, MetallTech Automotive is left with the step toward diversification. This involves introducing a new product to a new market. At this point, the company must decide which product it wants or can develop and produce to replace the clutch pressure plates. For the company in this fictional example, two possibilities arise. The first is the production of a product compatible with existing know-how and production methods. The second is the production of a new product by acquiring new skills and developing a new manufacturing process. One example of this is the production of electrical connections and cables for the EV charging infrastructure. The company does not consider switching to a different industry.

To weigh the ideas from a technical perspective, MetallTech Automotive consults the technology institute of a local university of applied sciences. This institute supports the company in exploring innovative manufacturing possibilities. The transformation team concludes that the company should pursue a diversification strategy based on existing competencies. Since the company already possesses machines and knowledge for metal processing, it looks for a metal product relevant to the production of EVs. The transformation team identifies the production of aluminum housings for electric motors and stators. These, like brake discs or clutch pressure plates, are also processed using machining methods, primarily through drilling. MetallTech Automotive could continue using its existing competencies in processing and machining aluminum and steel, even though the acquisition of new machines and the implementation of modified processes will be necessary. To offset the high investment costs for acquiring new machines and training employees, the company considers using a dual-track strategy. In this way, existing products, such as small metal components and especially brake discs as cash cows, are leveraged while new products, such as housings for electric motors and stators, are gradually introduced to the market.

Once this decision is final, the transformation plan is created. For this purpose, the company prepares both a budget plan and the new BMC. This is shown in **Figure 9**. The changes resulting from the transformation are highlighted in red.

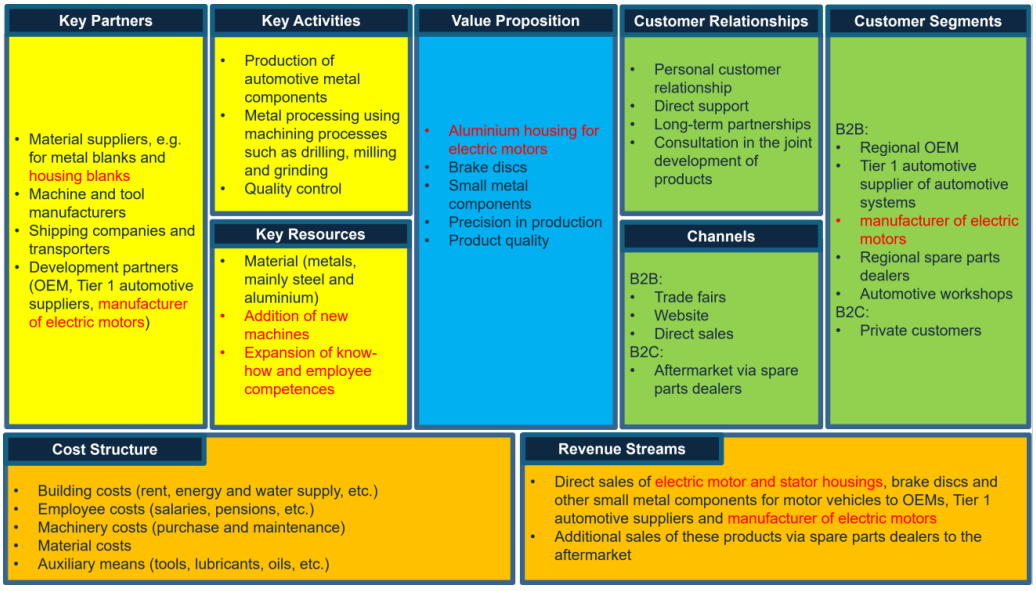

Figure 9. MetallTech Automotive's Transformed BMC.

In the transformed BMC, it is noticeable that by retaining the brake discs, a large part of the business model remains unchanged. The introduction of the new product therefore leads to an addition of the existing elements. For example, new suppliers are needed for the supply of housing blanks. Existing machines are also supplemented, and the know-how for using these machines is expanded. Finally, the customer base is also broadened. Buyers for electric motor and stator housings are required. In this case, manufacturers of electric motors are potential customers, and previous Tier-1 system suppliers can also be possible buyers.

4.2.4. Phase 2: Implementation

In the second phase of the PIC approach, the plan developed by the transformation team is put into action. In order for the company to realign itself, various new elements are implemented. These include processes, machines, working methods, organization, the assignment of employees, as well as the formation of new departments and teams. To ensure that all aspects are implemented simultaneously, responsibilities are distributed among the members of the transformation team. As a result, a transformation manager is assigned to each of the following areas:

- **Expansion of know-how**: Training and educational programs for acquiring the necessary competencies related to the new product and new machines are organized.
- **Reorganization of work areas**: The department for clutch pressure plates is repurposed and made responsible to produce metal housings. The production area is also restructured, with old machines replaced by new ones. Other departments remain unchanged.
- **Implementation of new processes**: Old processes are eliminated and replaced with new logistical workflows (e.g., delivery, production, packaging, shipping, etc.). Changes can also be made on the system side. In terms of digitalization and Industry 4.0, it makes sense to use IoT technologies (e.g., automatic tracking of batches or load carriers via sensors or the integration of a digital twin for new machines).
- **Acquisition of machines**: Unnecessary machines and tools that are no longer required due to the elimination of clutch pressure plates are sold. The budget for purchasing new machines is expanded through the sale of the old equipment. Potential candidates for the right machines are evaluated based on financial and qualitative aspects.
- **Expansion of supplier network and customer base**: New suppliers are needed for the supply of materials. As with machines, potential candidates are evaluated from a financial and qualitative perspective. Additionally, new buyers for the new products must be found. New logistical processes are implemented for both the new suppliers and partners, as well as for the new customers.

4.2.5. Phase 3: Control

Once the implementation of the new business model and all necessary changes has taken place, the BMC is used one final time in the concluding step. The transformation team compares the new state of the transformed MetallTech Automotive with the company's starting point at the beginning of the transformation. It will become apparent that the transformation process has been successfully completed. The transformation team will then inform the employees of MetallTech Automotive about the success and the upcoming monitoring of the business. Employees at all levels of the company will be called upon to contribute to the control and continuous improvement of the company by actively participating in CIP in order to gradually optimize any issues that arise. In this way, the success of MetallTech Automotive will be preserved even beyond the transformation.

5. Discussion

This section revisits the research agenda and systematically addresses each of the guiding RQs, followed by a critical evaluation of the proposed PIC approach. The discussion also incorporates a regional perspective, focusing on the specific context of small and medium-sized enterprises (SMEs) in the Northern Black Forest, a traditional hub of automotive suppliers in southern Germany.

The first RQ — *"What approaches exist to support companies in their respective transformation processes?"*— was examined through an extensive review of existing transformation models. The analysis revealed that while numerous frameworks exist, they tend to be either too abstract to offer practical guidance or too narrowly focused on specific technologies or corporate structures. Importantly, few address the sector-specific needs of SMEs within the automotive supply chain. Nonetheless, individual components from these models—such as process orientation or stakeholder integration—proved valuable and were selectively integrated into the structure of the PIC approach to ensure both theoretical robustness and contextual relevance.

The second RQ — *"Can these approaches be applied to SMEs in the automotive industry, and can they be combined?"*—was explored through a critical synthesis of existing methodologies against the background of SME con-

straints. The results confirmed that while no single model is directly transferable, elements can be meaningfully adapted and recombined to fit the SME context. This led to the development of a modular, flexible structure for the PIC approach that addresses common SME challenges, such as limited resources, constrained strategic capacity, and high dependency on larger OEMs.

The third RQ — *"Are there additional methods or tools that could strengthen existing frameworks?"*—was answered affirmatively by integrating principles from Continuous Improvement Processes (CIP), commonly used in operational excellence and lean management. This integration enhances the PIC framework by embedding feedback loops, enabling iterative learning, and fostering long-term adaptability.

The fourth and central RQ — *"What does a general approach for the transformation of SMEs in the automotive industry look like?"*—culminated in the design of the PIC approach, structured around three key phases:

- The **Preparation** phase lays the strategic foundation through team formation, situational analysis, and target definition.
- The **Implementation** phase supports company-specific transformation activities, tailored to the firm's capabilities, business model, and competitive environment.
- The **Control** phase ensures ongoing evaluation, continuous improvement, and institutional learning, primarily via CIP principles.

The applicability of the PIC model is particularly relevant to SMEs in the Northern Black Forest region, where the economy is heavily influenced by automotive supply chains. These companies are currently under intense pressure to modernize in the face of electrification, digitalization, and increasing international competition—especially from Chinese EV manufacturers. Unlike large OEMs, SMEs in this region often lack strategic foresight tools, struggle with succession planning, and have limited internal capacity to initiate transformation processes. Initial feedback from stakeholder engagements within the *TraFoNetz* project suggests that while the structured nature of the PIC model is appreciated, several challenges to adoption are evident:

- **Time constraints**: Day-to-day operational demands often prevent strategic reflection and planning.
- **Lack of internal transformation expertise**: Many firms do not have dedicated staff for innovation, project management, or change leadership.
- **Fear of failure and uncertainty**: Without guaranteed ROI or external pressure from OEMs, many firms delay or avoid transformation investments.
- **Dependency on OEM strategies**: SMEs are often reactive rather than proactive, aligning their actions with decisions made by larger customers rather than setting their own innovation agendas.

While the PIC approach offers a step-by-step framework that could mitigate these risks, its successful implementation depends on targeted support—e.g., through moderated workshops, expert mentoring, and public funding to bridge the resource gap. Addressing these regional SME-specific constraints is a critical next step in refining and deploying the approach.

Several limitations of the PIC model must be acknowledged. Most prominently, the approach is currently theoretical and has not yet been empirically tested in a real-world setting. Its practical effectiveness, scalability, and ease of application remain unvalidated. Furthermore, although it was developed with SMEs in mind, the model's general structure may be too abstract for firms that require detailed technical guidance or sector-specific tools. In addition, resource intensity—in terms of time, personnel, and knowledge—may pose adoption barriers for many SMEs, particularly those in rural or economically weaker regions.

The model also provides limited integration of external disruptive factors, such as global supply chain disruptions, evolving EU regulations, or fluctuating consumer demand. These macro-level uncertainties are increasingly shaping the transformation landscape and should be considered more explicitly in future iterations of the model. Given these limitations and contextual findings, several directions for future research are proposed:

- **Empirical validation** of the PIC model through pilot applications with SMEs, ideally in collaboration with initiatives like TraFoNetz. This would provide real-world feedback on usability, effectiveness, and challenges.

- **Comparative case studies** between companies applying the PIC model and those using other approaches, to evaluate measurable outcomes in transformation performance.
- **Development of support structures** (e.g., toolkits, coaching formats, digital platforms) to accompany SMEs in applying the model more effectively.
- **Integration of external dynamics**, such as regulatory frameworks, supply chain disruptions, and technological breakthroughs, to strengthen the model's robustness.
- **Regionally focused adaptations**, ensuring the model fits the needs of different industrial clusters and economic structures, particularly in traditional manufacturing regions like the Northern Black Forest.

6. Conclusions

This paper has addressed the urgent need for structured, SME-oriented methodologies to support business model transformation in the automotive supply industry—an industry currently undergoing fundamental change driven by electrification, digitalization, and increasing global competition. While numerous transformation models exist, the literature review revealed that few are explicitly designed to meet the specific needs of small and medium-sized enterprises. Most existing frameworks are either too generic or narrowly focused on individual use cases, offering limited applicability for SMEs with constrained resources and limited strategic capacity.

In response, this study introduced the PIC approach — Preparation, Implementation, Control — a conceptual framework tailored to support SMEs through structured transformation. Designed with flexibility in mind, the model offers a step-by-step process that guides companies from initial analysis to strategic goal setting, implementation of change measures, and continuous improvement through feedback mechanisms. The core steps of the PIC approach include:

- Forming a dedicated transformation team, ideally with external support (e.g., from initiatives like *TraFoNetz*);
- Conducting a situational analysis to understand current structures, capabilities, and gaps;
- Identifying transformation-relevant strengths, weaknesses, risks, and opportunities;
- Defining a strategic target state and formulating an implementation roadmap;
- Executing targeted transformation measures within the organization;
- Embedding monitoring mechanisms and continuous improvement processes (CIP) to ensure long-term impact.

While the PIC model provides a structured pathway, it remains a conceptual contribution and has not yet been empirically validated. Therefore, a key recommendation for future research is its practical application in real-world settings, particularly within SME networks such as those in the Northern Black Forest region. Pilot projects and moderated workshops would allow researchers to test the framework's feasibility, identify barriers to implementation, and refine the model based on feedback from practitioners.

Further comparative studies between firms that apply the PIC model and those that follow unstructured or alternative transformation strategies would yield valuable insights into its effectiveness and potential for broader adoption. In parallel, research should explore how external factors—such as regulation, market volatility, and technological disruption—can be more directly integrated into the framework to enhance resilience and strategic foresight.

Finally, this study reaffirms the strategic urgency of transformation in the automotive sector. As the industry shifts toward CASE (Connected, Autonomous, Shared, Electric) technologies and increasingly prioritizes sustainability and digital innovation, SMEs must proactively realign their business models to remain viable. The cost of inaction is high: a failure to adapt may not only erode competitiveness but threaten the survival of entire supplier ecosystems. This makes it all the more critical for SMEs—particularly those embedded in traditional industrial regions—to take immediate, structured steps toward future-readiness. The PIC approach offers a foundation for doing so, and with further development and validation, it may serve as a practical tool for driving regional and sectoral transformation.

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Conflicts of Interest

The authors declare no conflict of interest.

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