Article

Managerial Competencies Critical for Enhancing Organisational Responsiveness and Agility in Digital Transformation of SMEs: A Qualitative Study

Philipp Boateng iD

Comenius University Bratislava, Faculty of Management, Bratislava, Slovak Republic

Cecília Olexová iD

University of Economics in Bratislava, Faculty of Business Economics with seat in Košice, Slovak Republic

Abstract

This research aims to identify and categorise the key competencies required for managers to effectively lead small and medium-sized enterprises (SMEs) through the digital transformation process. Utilising a qualitative approach, the study employs Mayring's content analysis to examine semi-structured interviews with ten SME representatives in Germany. The findings reveal that agile leadership and the integration of innovative technologies are crucial for enhancing organisational responsiveness and agility. However, significant gaps in standardising systems and processes remain a challenge. The study underscores the importance of adaptive leadership and the strategic use of digital tools to foster a resilient organisational culture. The insights provided contribute to the broader understanding of how SMEs can effectively implement digital transformation, highlighting the need for specialised leadership competencies to drive this change. The significance of the study lies in its potential to guide SME managers and policymakers in developing strategies that support sustainable digital growth and innovation.

Introduction

The rapid digitalisation of business processes and integration of technologies into products has generated expectations of continuous change, which are a consequence of the ongoing development of the technologies and organisational adoption of them (Hansen et al., 2011). Consequently, the techniques employed in traditional change management have very limited effectiveness, leading to uncertainty regarding suitable approaches and fear of failure. A new type of leadership model, which adopts markedly different leadership paradigms, is required to manage the agile change, which is associated with successful digital transformation in companies (Kupiek, 2021). The appropriate leadership to shape the agile change, which is linked to digital transformation in SMEs, has been indicated empirically by Fachrunnisa et al. (2020). However, the recognised forms of agile leadership were not found to be fully appropriate in the context of digital transformation by Plekhanov et al. (2023). Nevertheless, Kohnová et al. (2023) have noted a company-wide transformation trend into an agile platform. Agile complexity leadership was the most appropriate because digital ecosystems were Complex Adaptive Systems (CAS). This finding highlights the even more significant gap in current knowledge of CAS and complexity leadership regarding organisational systems in the business context. Both remain poorly understood and relatively neglected in research (Uhl-Bien et al., 2018) despite the work of the Santa Fe Institute in the 1990s (Waldrop, 1992; Gell-Man, 1995) and more recently Krakauer (2023) and other early academic practitioners in this specialist field such as Stacey (1995) and Uhl-Bien (2007). Therefore, the major objective of this research is to determine management competencies which leaders must acquire to fully exploit the power of digitalisation, considering its CAS characteristics and long association with Complexity Science on which the concept of complexity leadership is based (Stacey, 1995). The approach will comprise three factors: how to enhance organisational agility and agile leadership initiatives to fully implement empowerment of teams and to support decision-making for effective digital transformation within SMEs.

Corresponding author:
Cecília Olexová, Faculty of Business Economics with seat in Košice, University of Economics in Bratislava, Tajovského 13, 041 30 Košice, Slovak Republic
Email: cecilia.olexova@euba.sk

Managers are facing new challenges for which they need to adapt their competencies. Existing theoretical sources and research studies dealing with digital transformation and new managerial competencies will be analysed. The research will focus on SMEs in Germany (as in Germany, more than 99%, are SMEs) to obtain relevant data. The results of this research could be useful for managers who need to improve their skills and adapt to current trends related to digital transformation. The research could also contribute to professionals in the field of research and education in management and digital technologies. The findings from the qualitative study, which was initially conducted as a pilot study, will generate the variables and hypotheses for the subsequent quantitative survey.

Literature Review

Contemporary Organisational Dynamics
The profile of organisational change in the 21st century, which is presented by Kotter (2012), is of continuous rapid change, which is not likely slow and is the consequence of the incessant development of digital technologies. Digital transformation, which initiates changes in business operations, stimulates change at four levels in the organisation: the process, organisational, business sector and societal level, according to Parviainen et al. (2017). At the process level, the use of digital tools has two interrelated key effects: manual stages are reduced, resulting in more efficient, rationalised processes, whilst at the organisational level, the firm can offer new products and services or existing products/services in new formats (Parviainen et al., 2017).

Many empirical studies have indicated that one of the major reasons leaders are so often unable to effectively implement digitalisation/digital transformation in their organisations is their fundamental status as CAS. The digital computer was recognised as a CAS more than 30 years ago, an example of an evolving structure that was both difficult to understand and to control (Holland, 1992).

A study of digital transformation in German SMEs was conducted by Deutsche Bank Group in 2022 (Rapp, 2022) with the purpose of evaluating how well the German Federal Government States had implemented the three main aspects of the German Government's Digital Strategy. The German Government was fully aware that Germany must rapidly transition to a high-performance data economy to become a 21st-century, competitive information society (Rapp, 2022). The three major strategic objectives were to accomplish a networked digitally autonomous society; a digitally driven innovative economy, workplace and science and research; and a learning digital state administrative system facilitating, for instance, digital identities and personal identity documentation. Two specific digital projects were devised to encourage SMEs to adopt Artificial Intelligence (AI) technologies: a Centre for Trusted Artificial Intelligence that would enable debate regarding the safe use of AI and support its development and a funded project named Kik-Start that would encourage SMEs and Start-ups to gather and employ digital data and AI applications (Rapp, 2022).

The study also highlights the advances made by European countries such as the United Kingdom (UK), which established a Public Data Institute in 2012 to improve data usage by means of networked data rooms in science, research, business, administration and society, a facilitator which German continues to lack (Rapp, 2022).

In exploring traditional, hierarchical organisational structures within digital transformation, recent studies highlight the need for frameworks that integrate structured decision-making processes alongside agile, adaptive methods. While agile methodologies emphasise flexibility and rapid response, adapting these principles to hierarchical models can enhance coordination and control in larger, more rigid organisations. This approach balances agile responsiveness with the stability and oversight inherent to hierarchical systems, enabling organisations to navigate complex digital landscapes more effectively (Uhl-Bien et al., 2018; Parviainen et al., 2017; Attar et al., 2020).

According to the Digital Economy and Society Index (DESI) 2022, Germany exhibits lower levels of connectivity, integration of digital technology, and digital public service applications compared to most Nordic countries, Ireland, Malta, and several Central European states. A systematic literature review of 243 media articles selected from a small range of reputable German Newspapers published between 2001 and 2021 was conducted by Schmid and Welter (2023). The studies emphasise the perceived importance of the rapid, effective implementation of digitalisation in the German and EU economies. They also confirm the importance of the research since the digital transformation of SMEs is not feasible without the appropriate leadership to drive it forward.

Leadership in Complex Adaptive Systems: Integrating Agile Approaches and Managerial Competencies
Effective complexity is associated with a system that lies between total order and total disorder (Gell-Man, 1995). The concept and development of CAS are attributed to the Santa Fe Institute, whose members sought to create a collective theoretical model for complexity, which would facilitate more profound knowledge and understanding of spontaneous, self-organising entities (Waldrop, 1992). Many examples of CAS were identified in diverse human-related entities, for instance, biological evolution, learning and thinking, how the body´s immune system operates and how computers are programmed to develop strategy (Gell-Man, 1995; Krakauer, 2023). Hence, complexity science has been traditionally linked to understanding non-linear and network feedback systems in natural or scientific contexts (Stacey, 1995).

This results in self-organisation occurring spontaneously with the outcome that old organisational models are

replaced by completely new concepts and working practices in the manner of creative destruction (Stacey, 1995) as envisaged by Schumpeter (1942). Traditional strategic processes assume that cause and effect links occur in an environment of organisations so that negative feedback assures that they remain in equilibrium with it; in other words, the future is predictable (Stacey, 1995; Holland, 1992).

Agile methodology, originating from software development principles, has been increasingly applied to organisational design and management. Derived from agile software development methodologies, agile organisational structures aim to enhance adaptability and responsiveness to external changes without sacrificing operational stability. Decentralisation, therefore, is a crucial trait where decision-making authority is spread throughout the organisation, enabling teams to make swift, autonomous decisions tailored to immediate circumstances (Mnkandla and Dwolatzky, 2004). The organisational structures and processes are designed for flexibility, being modular and easily reconfigurable to swiftly adapt to external changes. Agile organisations are also committed to continuous learning and improvement, ensuring that both their products and internal methodologies evolve to better meet challenges. Furthermore, they rely on cross-functional teams, which break down disciplinary barriers to enhance communication, foster innovation, and speed up problem-solving processes. These characteristics collectively enhance an organisation´s ability to respond quickly and effectively to new challenges and opportunities (Chan and Thong, 2009).

As indicated by Kupiek (2021), traditional leadership theories are unsuitable for managing in the context of CAS, where the capability to manage agile change is a requirement (Kupiek, 2021) because traditional leadership is focused on production and profit outcomes rather than driving innovation within the firm (Uhl-Bien et al., 2018; Fachrunnisa et al., 2020).

Agile Complexity Leadership integrates principles of complexity science with agile methodologies to address dynamic and interconnected systems. These skills and strategies are essential for effective leadership in increasingly volatile, uncertain, complex, and ambiguous (VUCA) business landscapes. In response to rapidly evolving market conditions and technological advancements, leadership theories have increasingly emphasised the need for agility and adaptability in organisational settings (Bäcklander, 2019). Agile Complexity Leadership emerges as a pivotal approach in Leadership Science, designed to equip leaders with the capabilities to manage and thrive in complex adaptive systems. This leadership paradigm is rooted in the understanding that organisational challenges are often non-linear, unpredictable, and multifaceted, requiring a departure from traditional hierarchical and rigid management styles. Originating from the study of complex and adaptive systems, complexity science offers insights into how interconnected components spontaneously self-organise and evolve. In leadership, this perspective helps understand organisational dynamics beyond linear cause-and-effect (Attar and Abdul-Kareem, 2020). Agile approaches emphasise adaptability, continuous feedback, and iterative progress in project management and software development. When applied to leadership, these principles encourage responsiveness, stakeholder engagement, and resilience (Spiegler et al., 2021). As core components of Agile Complexity Leadership, an adaptive decision-making process, distributed leadership, fostering innovation, and a system thinking-process must be mentioned. Agile Complexity Leadership offers, therefore, a robust framework for understanding and navigating the intricacies of modern organisations. It represents a shift from authoritative command-and-control models to more fluid and flexible leadership practices (Boateng and Olexová, 2023), including strategic decision-making. Strategic decision-making in CAS requires recognising that traditional models, such as the rational decision-making model, which assumes decision-makers act with complete information, may not fully capture the nuances of real-world situations (Elbanna, 2006). Instead, models like Herbert Simon's bounded rationality or the intuitive decision-making approach, which rely on available information and personal experience under conditions of uncertainty, are often more applicable. Moreover, frameworks like Snowden's Cynefin Framework and the Stacey Matrix provide valuable tools for distinguishing between different types of complexity and guiding decision-making processes in complex and chaotic environments (Snowden and Boone, 2007; Stacey, 2000; Stacey, 2001). These perspectives underscore the necessity for agile, adaptive leadership capable of making strategic decisions that align with the dynamic nature of contemporary organisational challenges.

These perspectives underscore the necessity for agile, adaptive leadership capable of making strategic decisions that align with the dynamic nature of contemporary organisational challenges. In this context, traditional theories often distinguish between leadership and management as two separate competencies: Leaders are required to develop a vision of the organisation in a future state, what its characteristics will be and the skills and abilities that employees will need to accomplish the future organisational objectives; managers are tasked with achieving short term objectives, managing all resources, controlling the use of resources and ensuring legal obligations are met. In summary, leaders create new business focus or transform old businesses to cope with the new environment, whilst managers are tasked with maintaining the status quo (Kotter, 2012). However, in periods of substantial uncertainty as to how the future will be shaped, both aspects of the leadership role become more difficult to accomplish. As science becomes more complex, so does technology, so organisations evolve and need to be able to continue to thrive in constantly changing circumstances to cope concurrently with stability and instability, adapting known practices to new conditions in their markets (de Smet et al., 2018). The inference is that one

individual as a leader has a lower chance of making the appropriate choices to ensure survival in this complex environment, where the future is unknowable and new forms of leadership are necessary (Stacey, 1995). Although academics and practitioners have recognised these concepts of agile organisations, agile leadership and complexity, the gap in identifying the appropriate actual leadership competencies to drive innovation in turbulent environment conditions remains unresolved (Stacey, 1995).

Methods

The following section of the study outlines the methodological approach employed to address the research questions:

1. How does applying the principles of complex adaptive systems generate organisational responsiveness in the context of agile leadership?

2. Which leadership attributes and competencies will reduce the organisational agility gaps identified as related to dynamic decision-making and autonomous team improvisation?

The qualitative content analysis evaluation method was used to evaluate semi-structured expert interviews with ten representatives of German SMEs.

The selection of companies was based on several key criteria: industry relevance, diversity and representation – companies of varying sizes across different sectors, including geographic diversity, availability and willingness to participate. The decision to use a smaller sample size aligns with best practices in pilot studies, which prioritise gathering rich and nuanced data to inform future, more extensive research. SMEs, particularly micro-enterprises, often have structures and strategies that differ significantly from those of larger organisations. This necessitates a focused, qualitative approach that emphasises depth over breadth at this early stage. While findings from a small sample may offer limited generalisability, they can still provide valuable insights that are relevant to similar SMEs. These initial insights can serve as a foundation for generating hypotheses and identifying broader trends that will be examined in subsequent studies.

Identifying Participants: Key stakeholders within each company were identified. This included executives, managers, and employees with relevant experience or insights.

Demographics: The average age of the experts, where specified, is 44 years. One of the individuals is female, while the other nine are male.

Qualifications: The participants' qualifications include five Master's degrees, two diplomas equivalent to a Master's degree, one MBA, one Bachelor's degree in Business Informatics, and one "Master Professional of Technical Management" qualification, which is equivalent to a Master's degree but non-academic. Collectively, these qualifications demonstrate a strong foundation in higher education, with a concentration of advanced degrees and professional certifications.

Industry Representation: The companies represent various industries, including consulting (financial services), publishing (traffic and technology), consulting (sales consulting and services), marketing (digital and creative agency), consulting (retail and consumer research), consulting (software engineering), automation (industrial and manufacturing), consulting (financial services, software engineering, cybersecurity), and consulting (IT and business strategy). The high-level breakdown is as follows: consulting (6 companies), marketing (2 companies), publishing (1 company), and automation (1 company).

Professional Experience: On average, the experts have 12 years of professional experience in their respective companies.

Company Size: Based on the analysis of the number of employees across the ten interviewed firms, it is evident that there is a diverse range of company sizes. The most common employee range is between 11 and 50, representing 40% (n = 4) of the companies. This indicates that the sample predominantly consists of small to medium-sized enterprises. Additionally, 30% (n = 3) of the companies have between 51 and 100 employees, suggesting a moderate presence of slightly larger SMEs. Two firms (20%) have between 1 and 10 employees, highlighting micro-enterprises' inclusion in the data. Only one firm (10%) falls within the range of 101 to 249 employees, suggesting a limited representation of larger SMEs. However, all the companies are categorised as SMEs according to the EU Commission definition (European Commission, 2020).

Organisational Structure: Of the ten companies, eight have a relatively flat hierarchical structure, characterised by minimal management layers and direct communication channels between leadership and employees. In these organisations, responsibilities are allocated according to areas of competency rather than rigid reporting lines. Conversely, two companies, one with 51–100 employees and the other with 101–249 employees, operate with a matrix structure, enabling them to align skills and resources across various functions and projects.

Roles and Responsibilities: Roles vary but often include managing operations, sales/business development, technology/development, and strategic planning. Eight out of ten of the interviewed participants are managing

directors. They oversee high-level functions such as finance, human resources, and risk management. Some of these leaders specialise in areas like IT consulting, project management, or creative services. Their roles encompass a broad range of responsibilities, including client work, internal initiatives, and organisational coordination.

Data Collection Methods: Interviews were scheduled with the participants. Semi-structured interviews were conducted via mobile phone and Microsoft Teams to allow for in-depth discussions while maintaining some consistency across interviews. The interviews were held between January and February 2024. Questions were designed to elicit information relevant to the research codes, such as qualifications, roles in the company, and employment history. With the consent of the participants, the interviews were recorded.

Coding and Analysis: Interviews were transcribed, and segments were coded according to predefined categories (as seen in the dataset).

Quality Assurance: The coding process involved multiple reviewers to ensure reliability and validity. Discrepancies in coding were discussed and resolved through consensus.

The dataset shows coded segments from interviews, indicating that the research involved qualitative analysis. Each segment is tagged with a specific code, such as "Qualification", "Role in Company", and "Number of years of employment", which suggests the areas of focus in the interviews. The segments were likely analysed to conclude the qualifications, roles, and experiences of individuals within the selected companies. The research aims to provide a well-rounded and comprehensive analysis of the selected companies by following these steps, ensuring the findings are robust and meaningful.

The successive approach is based on content analysis rules of psychology and linguistics so that both content-related statements as well as latent meaning and subjective meanings can be recorded (Mayring and Fenzl, 2019). This methodology captures qualitatively oriented texts and is, therefore, particularly suitable for evaluating transcribed interviews that are analysed based on an inductive category system. Inductive categories are formed directly from the collected material in a generalisation process (Mayring, 2010). This approach goes hand in hand with the advantages of openness so that subjective biases and preconceptions on the part of the researcher can be prevented. The present, anonymised transcription of the collected data material is paraphrased or reduced to the essential content to conduct an inductive categorisation. This creates a manageable corpus, which functions as an image of the basic material (Mayring, 2010). A deductive categorisation can produce key terms in advance based on the interview guide and serve as a comparison (Vogt and Werner, 2014). The coding, i.e. the meaningful assignment of the text passages to the categories, is conducted based on the categorisation. The coding of the categories is subject to pre-defined coding rules, which are illustrated here as an example according to Kuckartz et al. (2007): coding takes place in units of meaning, i.e. in sentences or paragraphs, and factually identical information is only coded once per interview. If the validity of the categories formed during paraphrasing is not confirmed, the process is repeated iteratively in the form of a feedback loop until validity is achieved. The evaluation of the qualitative content analysis is category-based. The categorised text passages are summarised and interpreted based on the theoretical foundations established in the work so that the research questions can be answered (Vogt and Werner, 2014). Deductive codes will be used: organisational responsiveness, agile leadership, organisational agility gaps, leadership attributes, leadership competencies, decision-making and autonomous team improvisation.

In the next step, sentiment analysis was conducted to determine the emotional tone of the text, following this procedure: All interview texts were loaded and prepared for analysis. The texts were segmented into individual sentences to analyse sentiment at the sentence level. Given the research objective, we defined three main factors based on a combination of deductive and inductive approaches to qualitative content analysis (Mayring and Fenzl, 2019). Deductive categories, such as organisational agility, agile leadership, and decision-making, were predefined based on theoretical frameworks and research objectives. The inductive approach enabled the derivation of associated keywords directly from the transcriptions, ensuring their relevance to the meanings expressed by respondents.

- Organisational Agility within the Objective: enhancing organisational agility (How organisations improve their ability to respond quickly to changes). Keywords: 'describe your company,' 'main activities,' 'organisational structure,' 'digital technologies,' 'implementing digital transformation.'

- Agile Leadership and Team Empowerment: initiatives focused on fostering team empowerment and responsibility within agile leadership. Keywords: 'strategies do you use,' 'main tasks,' 'leadership practices,' 'drive the change,' 'participate in the change.'

- Support for Decision-Making in Digital Transformation: decision-making processes that enable effective digital transformation. Keywords: 'decision-making process,' 'decision-making model,' 'complex or chaotic,' 'tools and enablers,' 'decision context.'

We performed the sentiment analysis using the TextBlob tool. Sentiment scores for each sentence ranged from -1

(very negative sentiment) to 1 (very positive sentiment). The average sentiment score for each factor was calculated based on all relevant sentences, providing an overall overview of the respondents' sentiment in the respective area.

The standard deviation (std) indicates how much the sentiment values deviate from the mean, with a lower value indicating less variability and a higher value indicating greater variability.

The results are visualised using histograms created with the Matplotlib library, which show the distribution of sentiment for each of the three factors, with a line indicating the average sentiment.

Results

The analysis of the interview documents highlights several key aspects within the issue:

1. Increasing organisational agility

Organisational Responsiveness

Organisational responsiveness requires a bottom-up approach that engages employees and allows them to see the added value of initiatives. Top-down directives often fail, as employees become reluctant and resistant. Fostering interdisciplinary collaboration and exchange across departments is crucial, facilitated by open office layouts and regular meetings. Organisations should also seek external input through lectures, networking, and leveraging existing materials to stay informed about new developments and identify areas for optimisation. This holistic, participatory approach helps organisations become more responsive to changing needs and opportunities.

Organisational Agility Gaps

The passages highlight the tension between organisational efficiency and the need for agility and continuous development. While efficient processes are crucial for delivering timely services to customers, an overemphasis on efficiency can stifle innovation and prevent an organisation from adapting to changing market demands. The passages suggest that a balance must be struck, where regular, incremental changes are made to existing processes to allow for introducing the latest ideas and rethinking established ways of working. However, this balance is challenging to achieve, as it requires overcoming obstacles such as mistrust, hasty decision-making, and a lack of coordination among management. The passages also identify a conflict of objectives, where the drive for efficiency may clash with the need for ongoing development and adaptation. The summary suggests that organisational agility is essential for long-term success, but it must be carefully balanced with the maintenance of efficient operations.

The results of the sentiment analysis are presented in Table 1 and Fig. 1.

Table 1. Results of sentiment analysis for agility.

Number of sentences analysed	62
Average sentiment	0.170
Standard deviation (std)	0.187
Minimum sentiment	-0.075
25th percentile	0.000
50th percentile (median)	0.149
75th percentile	0.300
Maximum sentiment	0.910
Total sentiment (sum)	10.511

Source: own processing.

The sentiment range in relation to organisational agility was from -0.075 to 0.910, indicating a high variability in sentiment and, therefore, a diversity of opinions among respondents. Most respondents displayed a positive attitude toward the topic, with the highest sentiment score being very close to 1, indicating a strongly positive stance. The average sentiment was 0.17, which means it was predominantly positive.
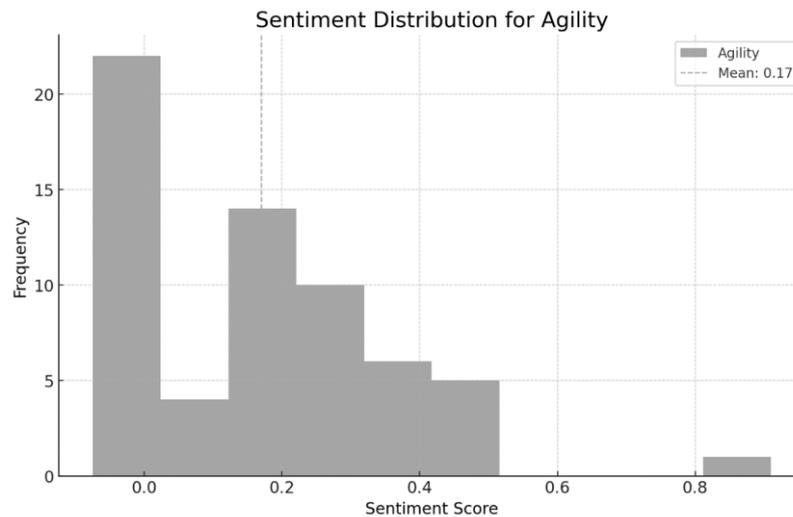
Fig. 1. Sentiment distribution for agility.
Source: own processing.

2. Agile leadership for the full implementation of team empowerment

Leadership Attributes

Leadership attributes for successful digital transformation include a strong understanding of digital technologies and their connections, the ability to communicate complex topics clearly, and a willingness to experiment and learn from mistakes. Leaders must be proactive in driving digital initiatives, reconciling financial and innovation goals, and fostering an open, agile culture that encourages employee participation. Key practices involve setting clear goals, providing necessary resources, and leading by example through the active use of new digital tools. Effective leaders also demonstrate flexibility, curiosity, and the courage to challenge the status quo. They view digitalisation as a collaborative endeavour, not a top-down mandate, and empower employees to contribute ideas and shape the transformation process. Transparency, such as using OKRs, helps build buy-in and accountability. A step-by-step, iterative approach is often more successful than attempting a "big bang" implementation. Overall, the most critical leadership attributes are a digital-forward mindset, strong communication skills, and the ability to balance operational demands with the need for innovation.

Autonomous Team Improvisation

As derived from interviews, several critical elements contribute to organisational agility and effectiveness. Key characteristics include flexibility and adaptability, which enable teams to respond swiftly to market changes and seize emerging opportunities. Empowerment and decision-making are essential, as teams are granted the authority to act independently, accelerating decision-making and fostering ownership and accountability. Collaboration and communication are crucial for effective improvisation. Rapid and efficient information sharing ensures coordinated actions and aligned efforts. Team members' diverse skills and continuous development enhance their capacity to address complex challenges creatively. Trust and psychological safety are fundamental, allowing team members to express ideas and take risks without fearing negative consequences, thereby fostering creativity and experimentation.

The respondents highlighted several key points regarding their processes and strategies in the interviews. They confirmed the use of SharePoint as a collaborative platform within their organisation. Additionally, they emphasised the significance of their (high-tech) workshops or hackathons, which serve as a crucial space for gaining specific know-how. The challenges faced in these workshops contribute to valuable insights and knowledge. Furthermore, the respondents mentioned an effort to be more selective and focused when choosing technologies, aiming to improve their overall approach and efficiency.

Leadership and guidance remain essential within autonomous teams. Leaders provide vision, strategic direction, and support by removing obstacles and facilitating access to resources. Resource availability is vital for implementing ideas and sustaining efforts. Continuous feedback and a commitment to learning from experiences improve team performance, allowing for regular refinement of approaches. Effective autonomous team improvisation integrates flexibility, empowerment, collaboration, skill development, trust, leadership, resource availability, and a learning-oriented mindset. These elements collectively enable teams to navigate complexities, innovate, and achieve organisational success in a dynamic environment.

The results of the sentiment analysis are presented in Table 2 and Fig. 2.

Table 2. Results of sentiment analysis for leadership.

Number of sentences analysed	57
Average sentiment	0.120
Standard deviation (std)	0.137
Minimum sentiment	-0.100
25th percentile	0.000
50th percentile (median)	0.167
75th percentile	0.213
Maximum sentiment	0.383
Total sentiment (sum)	6.838

Source: own processing.

The sentiment regarding agile leadership was slightly positive. Although some negative attitudes were also present, the slight positive deviation with the majority of sentiment ranging from -0.100 to 0.383, as well as the overall average sentiment of 0.12, suggests a generally positive perception of this area. A leader must possess certain attributes and competencies to effectively implement agile principles and support teams in their autonomy. These abilities are crucial for a successful digital transformation.
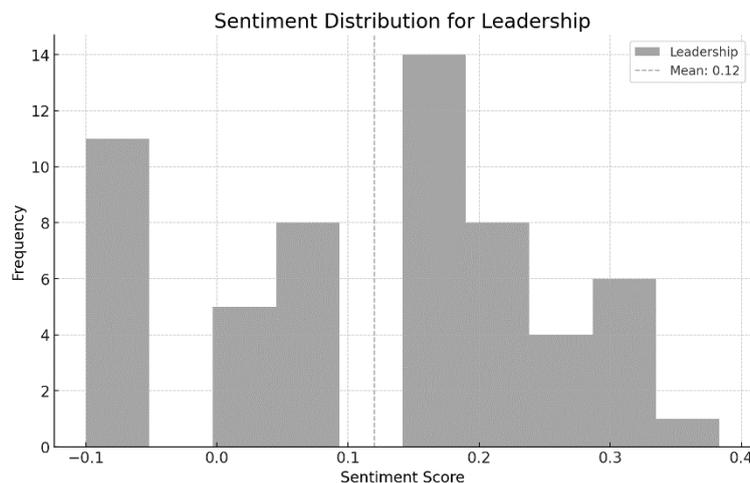
Fig. 2. Sentiment distribution for leadership.
Source: own processing.

3. Supporting decision-making for effective digital transformation

Decision-Making

The decision-making process for digital transformation in these companies involves several key aspects. Firstly, the management team plays a central role, as they are responsible for making the final decisions and allocating the necessary resources. However, the process also involves input and participation from various stakeholders, including employees, customers, and sometimes external experts. The companies approach digital transformation pragmatically and iteratively, often starting with simple problems or needs and then gradually increasing the complexity as they gain more experience and understanding. They use a combination of top-down and participatory decision-making, aiming to promote acceptance and buy-in from the entire organisation.

The decision-making process is influenced by both internal and external factors. Internally, the companies seek to optimise efficiency, automate processes, and address challenges such as skills shortages. Externally, they are driven by the need to maintain their credibility and competitiveness in the market, as well as to meet the evolving demands of their customers. The companies do not follow a specific decision-making model but rather adapt their approach based on the complexity of the problem at hand. For simple problems, the decision-making process is more straightforward. At the same time, for more complex or chaotic situations, the companies engage in a more iterative, experimental, and collaborative approach, involving multiple stakeholders and prototyping to find the best solutions. Overall, the company's decision-making process for digital transformation is characterised by a balance between strategic vision, operational efficiency, and a willingness to adapt and learn as they navigate the challenges and opportunities presented by the digital landscape.

The prerequisites for making good decisions are knowledge and its management. The key types of knowledge discussed in the passages include industry and market knowledge, customer information and understanding of

customer processes, employee skills and competencies, and knowledge of new and emerging technologies. Industry and market knowledge is crucial for developing products and services that meet customer needs. Customer information, such as contact details and an in-depth understanding of their processes and pain points, enables the organisation to provide tailored solutions. Maintaining an awareness of employee skills and competencies, and actively developing these through training and knowledge sharing, is vital for delivering high-quality work. Remaining up-to-date with new and emerging technologies is crucial, as the technological landscape is continually evolving. The organisation must ensure it can implement the most suitable solutions for its clients. The passages highlight the importance of outward-facing knowledge, focused on the customer and market, and inward-facing knowledge, centred on the organisation´s capabilities and processes. Effective knowledge management requires balancing these two perspectives to drive innovation and meet customer needs.

Digital Technologies

Digital transformation brings a number of challenges, such as a lack of standards and interfaces, insufficient knowledge, unwillingness to change, and a focus on day-to-day business rather than long-term digital initiatives. To address these challenges, companies have implemented various strategies, including providing 1-on-1 support, fostering a culture that embraces mistakes, using agile methods, and involving employees in the decision-making process. The key is to find the right balance between technical and human aspects, as well as between efficiency and acceptance.

Specific digital tools and technologies that companies have adopted include cloud computing, mobile device management, CRM and ERP systems, and AI-powered tools for tasks like email summarisation and marketing text generation. The selection of these tools is often based on a careful evaluation of functionality, cost, and value creation. In some cases, companies have even developed their own custom CRM and HR systems to better fit their specific needs and processes. This requires a strong in-house technical team and a willingness to invest in long-term digital initiatives.

Overall, the successful implementation of digital technologies requires a combination of technical expertise, change management, and a culture that embraces continuous improvement and adaptation to changing market conditions.

The results of the sentiment analysis are presented in Table 3 and Fig. 3.

Table 3. Results of sentiment analysis for decision-making.

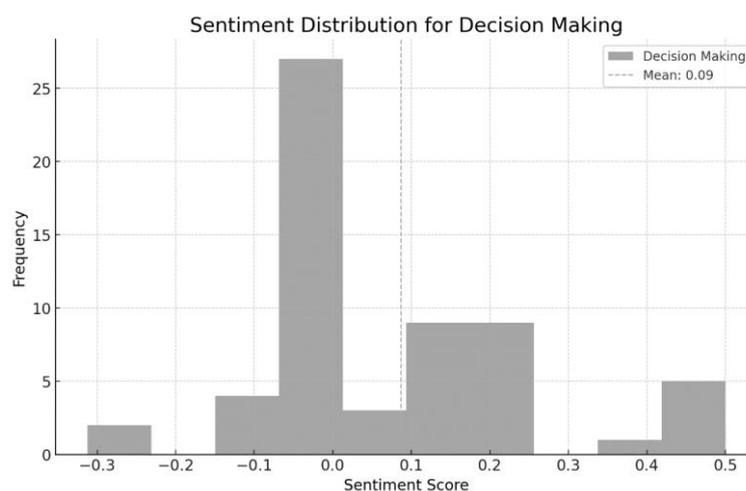| Number of sentences analysed	60
Average sentiment	0.087
Standard deviation (std)	0.174
Minimum sentiment	-0.313
25th percentile	0.000
50th percentile (median)	0.000
75th percentile	0.180
Maximum sentiment	0.500
Total sentiment (sum)	5.193

Source: own processing.

Fig. 3. Sentiment distribution for decision-making.
Source: own processing.

The sentiment regarding decision-making support was predominantly neutral to slightly positive, with an average sentiment of 0.087. The sentiment range indicates that respondents had mixed feelings about this topic, which may suggest a need for further improvement in this area. Decision-making shows the greatest neutrality with a median of 0.0 and a maximum of 0.500, indicating that sentiment is divided between neutral and slightly positive.

Discussion

Applying the Principles of CAS

By linking theoretical knowledge with our findings, we can state that applying the principles of CAS within the context of agile leadership significantly enhances organisational responsiveness by fostering a culture of flexibility, decentralisation, and continuous adaptation. In a CAS framework, decision-making is decentralised, empowering teams to make autonomous decisions. This autonomy enables organisations to respond swiftly to changes in their environment without waiting for approvals from higher levels of management. Empowered teams are thus able to quickly adapt to shifting market demands and internal challenges, which is essential for maintaining a competitive edge.

The self-organising nature of CAS promotes a dynamic form of adaptation where teams can independently reconfigure their processes and structures. Networked feedback loops, integral to CAS, play a critical role in maintaining responsiveness by continuous monitoring and real-time feedback. Agile leadership leverages this constant flow of information to refine processes and strategies, ensuring that the organisation remains flexible and responsive to its goals and market dynamics. Furthermore, CAS principles advocate for increased interaction and collaboration across different organisational units. CAS also emphasises the need for flexibility and the capacity to adapt to changing conditions. Additionally, the integration of digital tools and technologies is facilitated by CAS principles, which are crucial for enhancing responsiveness.

Organisational Agility

The identified gaps in organisational agility, particularly in integrating recent technologies and standardising systems, echo the challenges outlined by Parviainen et al. (2017). However, our study introduces the practical aspect of continuous learning and cross-departmental collaboration as crucial for maintaining agility, which is somewhat underexplored in the existing literature.

Agile Leadership and Complexity Theory

Our findings affirm the critical role of agile leadership within SMEs, as posited by Fachrunnisa et al. (2020) and Kupiek (2021). The emphasis on leadership attributes such as decisiveness, adaptability, and the ability to communicate complex issues aligns with Uhl-Bien et al. (2018), who argued that modern organisational environments necessitate a shift from traditional hierarchical structures to more flexible and dynamic leadership models. The role of communication is highlighted as an effective communication is also a strong motivational factor of employees, including white-collar employees (see e. g. Hitka et al., 2019). Our research extends this by demonstrating that in the context of SMEs, agile leadership facilitates digital transformation and enhances organisational responsiveness, corroborating the adaptive nature of leadership in CAS, as noted by Stacey (1995). To point out the potential limitations of agile methodologies in complex organisational structures, we could emphasise that while agile methodologies foster adaptability and responsiveness, they may encounter challenges in larger or more intricate organisational settings. In complex structures, the reliance on cross-functional teams and decentralised decision-making could lead to coordination issues, misalignment of objectives, and duplicated efforts. Furthermore, hierarchical and matrixed structures may resist agile practices, where traditional authority and rigid role delineation can clash with agile's need for flexibility and empowerment at all levels (Dorairaji et al., 2012; Conboy and Fitzgerald, 2010; Boehm and Turner, 2005; Campanelli and Parreiras, 2015; Dikert et al., 2016).

Decision-Making in the Context of Digital Transformation

Our results suggest that effective decision-making models, such as those incorporating elements from the Cynefin framework (Snowden) and Stacey's matrix, are indispensable for SMEs to navigate the complexities and uncertainties inherent in digital transformation. The quality of decisions also depends on the knowledge management models used. The review results by Valencia-Arias (2024) also indicate that SMEs acquire value in the contemporary context precisely through knowledge and its management. This approach supports innovation and enhances the SMEs' ability to adapt to rapid technological changes, which is a critical aspect of digital transformation. Our findings extend the discussion on leadership competencies by illustrating the importance of technical knowledge and the ability to manage complex processes in advancing digital transformation. This aligns with Kupiek (2021) and Uhl-Bien et al. (2018), who emphasised the evolving nature of leadership competencies in the digital era. The practical insights gained from our study indicate that SMEs can benefit from leveraging digital tools to streamline processes and enhance decision-making capabilities, which is consistent with the findings of Kotter (2012) on the barriers to organisational change.

By framing agile leadership within theoretical perspectives like CAS, the findings highlight that agile approaches

require more than just process adaptation; they demand a cultural shift and a rethinking of leadership roles to thrive in dynamic environments. This theoretical integration supports the observed need for adaptable leadership and emphasises that fostering an agile culture is essential but challenging in established complex structures. Aligning with Stacey's (1995) notion of balancing stability with innovation in CAS, the findings indicate that SMEs adopting agile practices benefit from a fluid structure that large organisations may struggle to implement due to inherent structural inertia and entrenched bureaucratic practices.

Recommendations for SMEs

To address these challenges, SMEs should consider the following recommendations. First, fostering a culture of open communication and change readiness is essential to reduce resistance and facilitate a smoother transition to agile practices. Providing regular training on agile principles can help employees at all levels understand and embrace the agile mindset. Second, SMEs should aim to implement agile incrementally, beginning with pilot projects to refine the approach before scaling it organisation-wide. This gradual integration allows teams to adapt gradually and helps the organisation to manage resource allocation more effectively. Third, SMEs can benefit from leveraging digital tools designed for agile project management, which can enhance transparency, streamline workflows, and improve cross-functional collaboration. Finally, to mitigate resource strain, SMEs should prioritise projects and focus on incremental improvements, which will help them maintain agility without overwhelming their teams.

Therefore, SMEs should prioritise building organisational agility by promoting a culture of continuous learning and cross-functional collaboration. Implementing regular training programmes and workshops and adopting flexible workspaces can facilitate rapid adaptation to market changes. Moreover, integrating digital tools such as ERP and CRM systems can streamline operations and enhance the organisation's responsiveness, as evidenced by our findings. For SMEs, the adoption of agile and complexity leadership principles in this context can lead to significant improvements in managing digital transformation. Leaders should be trained in agile methodologies and complexity theory to better understand and navigate the uncertainties of digital transformation. This can involve tailored leadership development programmes that focus on fostering adaptability, strategic decision-making, and effective communication skills.

Finally, the integration of digital tools not only supports operational efficiency in the context of digital transformation but also provides a platform for innovation and strategic decision-making. SMEs should invest in technologies that enhance data management, improve customer relationship management, and support agile project management. Encouraging knowledge sharing through direct interactions and digital platforms can facilitate the conversion of tacit knowledge into actionable insights, thereby supporting innovation and continuous improvement. This approach can also help SMEs maintain a competitive edge in an increasingly digitalised business environment.

Conclusion

Our research outlines key findings on digital transformation in SMEs, offering actionable recommendations for SME leaders and identifying areas for future investigation to fill existing gaps. The study has shown that implementing agile methodologies within SMEs offers significant benefits, particularly in terms of flexibility, responsiveness, and team empowerment, which are crucial for digital transformation. However, SMEs may also encounter specific risks and challenges when adopting these approaches. Key risks include potential resistance to change from employees accustomed to traditional hierarchical structures, as well as the possibility of misalignment between agile practices and existing workflows. Additionally, agile methodologies may inadvertently create resource strain, as SMEs often lack the same level of technical and financial resources available to larger firms. The iterative nature of agile can lead to scope creep and increased pressure on team members, especially when agile principles are not well understood or fully integrated across the organisation.

Theoretical implications

To effectively address organisational agility gaps associated with dynamic decision-making and autonomous team improvisation, certain leadership attributes and competencies are crucial. Agile leadership is paramount; it emphasises adaptability, continuous feedback, and rapid decision-making in a fluctuating environment. Leaders who embrace agile leadership foster a culture that supports swift decision-making and empowers teams to function independently and innovate spontaneously. The slight positivity in sentiment regarding agile leadership indicates that while leadership practices are recognised as important, there is still potential for improvement. Essential competencies include communication to emphasise expectations for digital transformation and understanding how people's work contributes to this transformation, team empowerment and providing autonomy, and talent development within teams. Managing complexity is another critical competency. Finally, resilience and adaptability are essential qualities of a leader. A leader must be capable of managing rapid changes and uncertainties, demonstrating flexibility in their approach, and adjusting strategies as needed to maintain organisational agility. These qualities ensure that a leader can effectively navigate the complexities of the modern business environment and foster a resilient and adaptive organisational culture. Together, these leadership attributes and competencies address the current gaps in organisational agility and pave the way for a more flexible, innovative, and responsive

organisation capable of thriving in a rapidly changing world.

Limitations and future research directions

Leadership that embraces agile principles fosters a culture that enables quick decision-making and empowers teams to operate independently and innovate spontaneously. We acknowledge that the pilot study included selected representatives of SMEs in Germany, and it is not possible to generalise the research results definitively. However, the study aimed to identify which competencies need to be focused on for effective digital transformation and to explore these in depth in future research. Future research should continue to explore the practical applications of these concepts, particularly in the context of varying industry sectors and organisational sizes.

To address these identified limitations, particularly the small sample size, it is essential to acknowledge how this factor may affect the generalisability of the findings. The current study employs a qualitative, exploratory approach involving interviews with a limited sample of SME representatives in Germany. Although this approach yields in-depth insights, the small sample size restricts the ability to generalise findings across diverse SME contexts and geographies. This limitation implies that the conclusions, while foundational, are tentative and should be interpreted as an initial exploration rather than definitive evidence.

Therefore, future research should, in a broader view, aim to mitigate this constraint by expanding the sample size and incorporating SMEs across varied industries and regions. Additionally, employing a mixed-methods approach, combining quantitative surveys with qualitative interviews, could enhance the study's generalisability and provide a broader understanding of the managerial competencies essential for digital transformation in SMEs. This multi-faceted methodology would allow researchers to test the preliminary hypotheses generated here on a larger, statistically representative sample, offering a more robust basis for the observed trends and competencies.

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