5 Conclusion

5.1 Summary of research findings and limitations

> *"The dynamic advances in IT are not only central to the technological changes surrounding us, but also driver and mediator of societal and economic changes. Businesses need to react to these changes in concerted and organized ways,…"*
> (see: Teubner, 2013, p. 254)

The three essays in this dissertation support a structured approach to digital transformation in the context of SMEs on several levels. A digital transformation strategy along the four categories "use of technologies", "changes in value creation", "organizational aspects", and "financial aspects" should be the starting point for any firm-individual digital transformation endeavor. In order to realize benefits from technology absorption and to adapt to the increasingly digital business environment, components of a digital transformation control system covering cultural, planning, administrative, and performance indicator-based controls are derived as a promising measure. And last, a typology of 11 precisely characterized, empirically grounded innovation networks offer SMEs to expand own resources by external know-how, depending on individual targets, preferences and restrictions. The following paragraphs summarize the core implications of the three essays that form this dissertation and mention the incorporated limitations.

Essay I analyzes the view of SME owners on their journey of success through their individual digital transformation endeavors. I develop a digital transformation strategy framework that incorporates variations of the thoughts and actions that best practice SMEs ran through on their individual pathways of digital transformation. Scholars and practitioners get a comprehensive and systematic view on examples of successful digital transformation in seven cases of SMEs. The experiences of the people responsible for these developments are summarized in strategic questions in the four categories "use of technologies", "changes in value creation", "organizational aspects", and "financial aspects". My findings allow researchers to analyze, compare, discuss, and understand digital transformations across company sizes and sectors. The results thereby complement existing literature on digital business strategies (Bharadwaj et al., 2013) and expand exist-

ing knowledge on digital transformation from single-industry, large-company backgrounds (Hess et al., 2016; Matt et al., 2015; Wiesböck et al., 2017) toward the specific features of SMEs. Based on the results, SME representatives can manage digital transformation more systematically and address inherent business challenges along the four presented categories more effectively. In the format of a structured questionnaire, I lead SME managers along elementary elements of their business and raise questions they should consider while structuring their digital transformation efforts comprehensively, thereby increasing the likelihood of success.

All cases under analysis are SMEs from the skilled craft sector, situated within a 100-kilometer radius around Munich. Although the cases cover urban and rural areas and I am therefore confident that infrastructure aspects do not make a difference regarding the strategic management considerations, the sample is biased regarding its geographic setting. Furthermore, the focus on companies from the skilled craft sector, despite covering various professions, incorporates a sectorial bias. Applying a qualitative approach incorporates an array of limitations. Seven cases are not representative and limit the validity of the results to the presented contexts. SMEs are confronted with only limited disclosure requirements, which makes information availability for triangulation a critical issue. I matched facts from the interview data as far as possible with publicly available sources, i.e., SMEs' websites, social media channels, books written by the owners, company brochures, and media articles. Nevertheless, a reconfirmation of all statements was not possible. Furthermore, I am unable to determine directions of causality as well as the level of intention of the interviewees, and I focus on critical, successful cases only.

Essay II develops a digital transformation control system from the actions, experiences, and opinions of the proprietors and managers of digitally leading SMEs. Routed in the "management control systems as a package" conceptualization by Malmi & Brown, 2008, I find a selection of various measures among the categories of cultural controls, planning, administrative controls, and performance indicator-based controls that may support SMEs to control their digital transformation efforts. Trial-and-error as a representative, agile, controlling measure is incorporated in the concept. All identified measures are consciously or unconsciously applied by the decision makers in the case studies under analysis. I thereby elaborate the existing literature on MCS by incorporating controls with a special focus on digital transformation (Malmi & Brown, 2008; Merchant & Van der Stede, 2012; Simons, 1995), and combine it with recent claims for more agility (Schäffer & Weber, 2016). For SME managers, the digital transformation

control system yields a starting point for connecting existing MCS to the era of digitization or for establishing a MCS in response to the increasing business complexity resulting from digital transformation. Based on the obtained results, I want to encourage and guide decision makers in SMEs to control and track digital transformation initiatives based on cultural, planning, administrative, and performance indicator-based controls to realize benefits like increased performance or faster adaption to the digital environment that scholars ascribe to MCS usage in SMEs (e.g.: Amat et al., 1994; Laurinkevičiūtė & Stasiškienė, 2011).

The limitations of essay II are comparable to those of essay I. All SMEs under analysis stem from the skilled craft sector and are covered by a 100-kilometer radius around Munich. Also, the applied methodologies are comparable, incorporating a similar set of limitations, although the number of 11 cases is slightly higher. The lack of information availability was even more tangible as I had to rely completely on data and observations provided by the owner-managers of the firms. Many observations are subject to interpretation by me, as control measures are in use unintentionally or informally. To eliminate some degree of subjective interpretation, I invited junior researchers to join the interview situations and onsite visits with the companies as often as possible. Their observations were mobilized twofold. They helped to prepare company reports as a basis for the case descriptions, and they were engaged as second coders. Again, directions of causality are not deducible and essay II as well relies on successful cases of digital transformation only.

Essay III introduces a typology of formal, inter-organizational innovation networks. We find 11 distinct, generic, clearly defined and delineated network types by applying an exploratory sequential mixed method approach (Täuscher & Laudien, 2018). Therefore, our typology of innovation networks is based just as much in previous theory as in specifically collected, empirical data. We conduct a directed content analysis to compile a comprehensive data set and use HAC, involving the Ward D2 linkage method. Existing literature regarding network characteristics and features (e.g., Killich, 2011; Sydow, 1992) serves as input for our content analysis, where we manually collect and code the attributes of initially more than 400 networks. The resulting, numerical results of 300 networks in the final dataset are then processed within hierarchical agglomerative clustering to derive the first comprehensive generalizable network typology. We identify *Avid Persuaders*, *Value Chain Drivers*, *Collective Facilitators*, *Niche Specialists*, *Lateral Thinkers*, *Transnational Opportunity Seekers*, *Financially Resilient Connectors*, *Local Trend Sponsors*, *Regional Activists*, *Associated Industry Sup-*

porters, and *Dynamic Research Groups* as 11 generic types of networks and we discuss them extensively based on existing literature. This makes us the first to develop a universally valid typology that is based purely on empirical observations and is independent of specific objects of observation. Therefore, we see our model to be the ideal basis for further research, e.g. comparing network performance or benefits. It also gives guidance to practitioners from corporate or political backgrounds. Corporate decision makers can search for involvement in network types that fit his preferences, while political institutions can foster networks that support their respective agenda.

Our approach still yields some limitations. We identify all networks for our analysis from the online listing provided by "Clusterplattform Deutschland" (BMWi, 2020), which may incorporate possible exclusions of network types. This also implies a geographic limitation. The selection of network characteristics and features as well as the coding process within the qualitative content analysis underlie subjective elements. To reduce subjectivity in coding, critical codes were counter-tested by the co-authors. Furthermore, we excluded networks during the coding process, as not enough data were accessible through publicly available sources. By only considering publicly available sources, we may lack information that would provide additional insights. And last, cluster analysis is subject to several critical limitations. If the data, the selection process, the number of clusters, or the underlying algorithm were changed, it could affect the outcome as well as the final typology. We follow a structured process to select the cluster variables, the clustering method, and the optimal number of clusters to ensure high-quality results (Backhaus et al., 2018; Everitt et al., 2011).

5.2 Avenues for further research

Though digital transformation on an individual company level should be a temporary phenomenon, the dynamics of digitalization and necessary transformational activities will probably become part of everyday life for companies to counter the incorporated opportunities and risks. Therefore, it might be a promising path of research to analyze digital transformation from a longitudinal, process-oriented standpoint. Furthermore, the results of my study can be modeled as input variables to investigate variance in the mid- to long-term financial and nonfinancial benefits from digital transformation, at a single company or even societal level. Addressing the

incorporated limitations of my study, a similar study with an extended geographic as well as sectorial coverage might yield interesting results to confirm and discuss my findings. Even a variation in environmental and infrastructure issues might be useful to deepen our understanding of strategy development in digital transformation. So far, most studies on digital transformation journeys are single or multiple case studies, including my study. The thereby generated qualified hypothesis can promote quantitative studies of the phenomenon of digital transformation to strive for generalization across the boundaries of sectors and industries, or even countries. A key issue in the context of SMEs will be data availability, so surveys and/or large-scale interview panels might be options to generate valuable data sets. In discussions of my work at conferences, a key issue raised was whether my results empower SME representatives to handle digital transformation and develop a digital transformation strategy from the provided framework? Reviewers doubted the capabilities of average SME representatives to answer the presented questions in a fruitful, value-creating way. As I develop the framework inductively from the data I gathered, I can say that there are SME managers who can develop a digital transformation strategy successfully. To put it bluntly, I only wrote down what my interview partners had done and achieved. But as I am only relying on data from successful examples, it would be interesting to contrast my results with examples of failure, as well as to test my results regarding their user friendliness for average SMEs.

In my study of potential management control measures useful throughout digital transformation, I try to be as "neutral" as possible regarding connectivity to related academic concepts, i.e., management control conceptualizations as well as explicit constructs such as the balanced scorecard (e.g., Craig & Moores, 2005). Yet the combination of dedicated instruments of management control with fields of action in digital transformation, especially in the context of SMEs, still offers an almost unlimited exploration ground for further research. In line with existing research on potential benefits from management control measure usage, studies of the advantageousness of digital transformation control implementation regarding digital transformation performance would greatly advance academic knowledge as well as support practitioners in the decision on whether or not to allocate SMEs' scarce financial and personal resources to digital transformation control efforts. In this context, a contrast with less successful companies in terms of digital transformation would also yield interesting insights, in terms of both digital transformation control system design as well as expected benefits. Comparable to essay I, the limited geographic

and sectorial coverage of my study offers opportunities for repetition across countries, industries, regions, etc., in order to challenge and refine my results and strengthen the foundations of digital transformation control systems. The inclusion of less digitally successful case studies would contribute to a better understanding of actions and measures of digital transformation control. Large-scale descriptive studies promise knowledge on dissemination and application of control measures during digital transformation journeys. Another viewpoint for further studies is the existence and roles of further agile methods. My study creates a first empirical connection between agile control in the form of trial-and-error and MCS. Further agile working methods are spreading in the course of digitalization. I consider their relationship to MCS concepts as a highly promising field of research.

Regarding networks and their estimated, crucial role in innovation and digital transformation strategies as well as their influence on economic ecosystems, we suggest focusing on an analysis of performance and effectiveness among different types of networks. Furthermore, the influence of specific characteristics and attributes on network performance is of interest, as this might contribute to steer network outcomes in targeted directions. To give an example, we propose an analysis of the identified network types in terms of their relevance and benefits for SMEs. Especially for company and policy representatives, findings in this field would be of great value when initiating and promoting certain network types. In our analysis, we only rely on publicly available data. Private information from networks could validate our findings and provide valuable insights for refinement of our typology. Another interesting area of research emerges from our geographic limitation to Germany. Data on networks from European or worldwide countries might yield a conformation of our findings, geographic foci of selected network types, or even additional network types emerging from the current, dynamic era of digitalization.