Digital Transformation in SMEs—Lean Management + Industry 4.0

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Contents

Abstract

Digital transformation will considerably change the technical production environment and the way of working in the industry. This change will take place primarily in the larger conglomerates, but will soon affect small and medium-sized enterprises (SMEs). In Germany, particularly SMEs are of high importance, as they constitute a substantial part of the overall firm population. The initiative Industry 4.0, based on the high-tech strategy of the German federal government, is also a research platform focused on driving the digital transformation process in the German industry. As digital transformation is not only a technical but also a managerial and cultural challenge, many companies have already formulated some strategic digital transformation ideas. In practice, however, only selected and very innovative (often larger companies) have

First, I would like to thank my former student Christoph Wunderlich who gave generous support by conducting several interviews with selected companies and putting the respective results into the right display format.

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implemented first solutions. These solutions often concentrate on production improvement as cost reduction, flexibility, and quality. The creation of new products and particularly new business models is still a distant prospect. Due to the specific cultural and managerial framework, most SMEs are especially challenged. The digital transformation process in these companies requires substantial changes in leadership and management behavior as well as conduct. Hence, a structured holistic change project, using established methods of the Lean Management Approach, is a prerequisite for a successful digital transformation process. Lean management and Industry 4.0 form a compulsory symbiosis.

4.1 Introduction: Current Status of Industry 4.0 Within German Industry

The term Industry 4.0 is a research platform established by the German government and first mentioned publicly on the Hannover fair in 2011. It mainly comprises:

- Men-machine communication by IoT
- Generation and Transparency of information
- Virtual reality
- Decision support and autonomous decision-making systems

Various studies have evaluated the current situation of Industry 4.0 initiatives. They show that particularly in small and medium-sized enterprises (SMEs) in Germany these initiatives often concentrate on cost reduction, flexibility enhancement, and quality improvement in production. To enhance productivity and to improve the competitor position has already been the focus of the companies in recent years. In the 90s, most companies made use of the project-oriented methodology of Six Sigma. Later the more holistic approach of lean six sigma or lean management was preferred. Therefore, empirical studies show the predominance of investments into initiatives to increase production efficiency. In Fig. 4.1 it becomes obvious, that about 90% of the current initiatives concentrate on production and related functions like production planning and internal logistics.

Maintenance services and R&D still play a minor role, although Industry 4.0 offers huge potential based on predictive maintenance, predictive analytics, or asset life cycle management. Product life cycle management (PLM) tools can increase the efficiency in R&D. The time to market can be enhanced by 3D simulations, virtual and augmented reality, as well as virtual prototyping.

Currently, manufacturers of intelligent hard- and software solutions are pushing the Industry 4.0 applications. They offer solutions for communication between machines, machine and product as well as men-machine interfaces. A prerequisite for these offerings are intelligent algorithms and big data analysis. In practice, many companies still do not have the capability to generate such an amount of data because the existing machine structure and established MIS are limited with respect to data quality and volume.

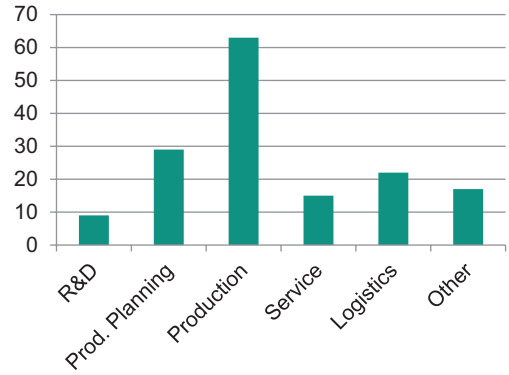

Fig. 4.1 Functional focus of industry 4.0 investments. (*Source* Based on Horvath & Partner 2015)

Figure 4.2 shows that projects that generate real value, based on new services and business which enhance revenue, are still very limited.

Hence, particularly in SMEs, the transformation process proceeds slowly. In addition to the above mentioned major obstacles, this poses security issues. Enterprise as well as private data protection and intellectual property are restricting the penetration of Industry 4.0 applications. Furthermore, a substantial cultural challenge of the organization is required to accept the changes of the digital transformation process in the industry.

4.2 Challenges and Implementation Requirements for SMEs

To evaluate the changes and risks of the digital transformation process in SMEs an empirical study was conducted by Christoph Wunderlich in the context of his Master thesis "Chancen und Risiken der digitalen Transformation der Organisationen kleiner und mittlerer Unternehmen in Deutschland" based on selected explorative interviews

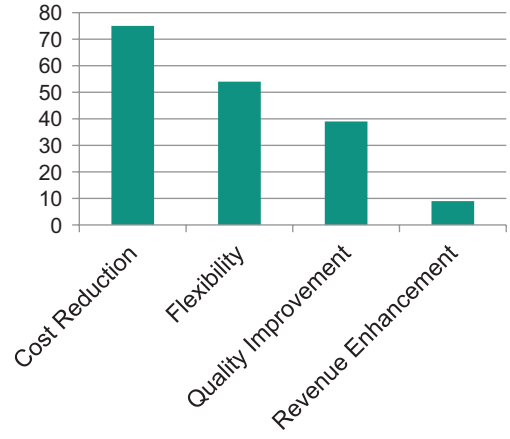

Fig. 4.2 Benefits of industry 4.0 investments. (*Source* Based on Horvath & Partner 2015)

with senior and top managers in different industry segments. Referring to the organizational Management Model of St. Gallen (Rüegg-Stürm, J. 2005) different aspects of the digital transformation process were mirrored against the organizational framework. This framework comprises five aspects, the organizational structure, the supporting systems required, the resources (primarily personnel), the culture within the company, and finally the strategic orientation of the management.

The Digitalization aspects include based on the above-mentioned concept (Fig. 4.3):

- connect: connectivity between machines, machines, and product as well as man-machine interfaces
- analysis: big data analysis and interpretation as well as simulations
- automate: self-learning and autonomous decision making
- mobilize: organizational and cultural change, advanced leadership characteristics
- secure: enterprise and private data security

Figure 4.4 shows that the organizational structure of SMEs is characterized by flat hierarchies, often limited management resources and a concentration of power e.g. with the owner. Limited IT infrastructure poses restrictions regarding controlling processes and

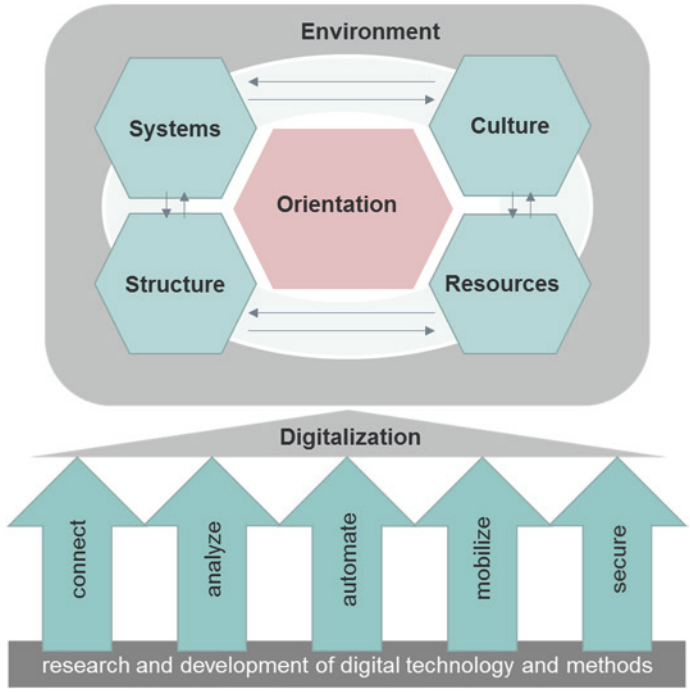

Fig. 4.3 Concept for evaluating digital transformation impacts on SMEs. (*Source* Own adapted figure. Kind usage permission by Christoph Wunderlich)

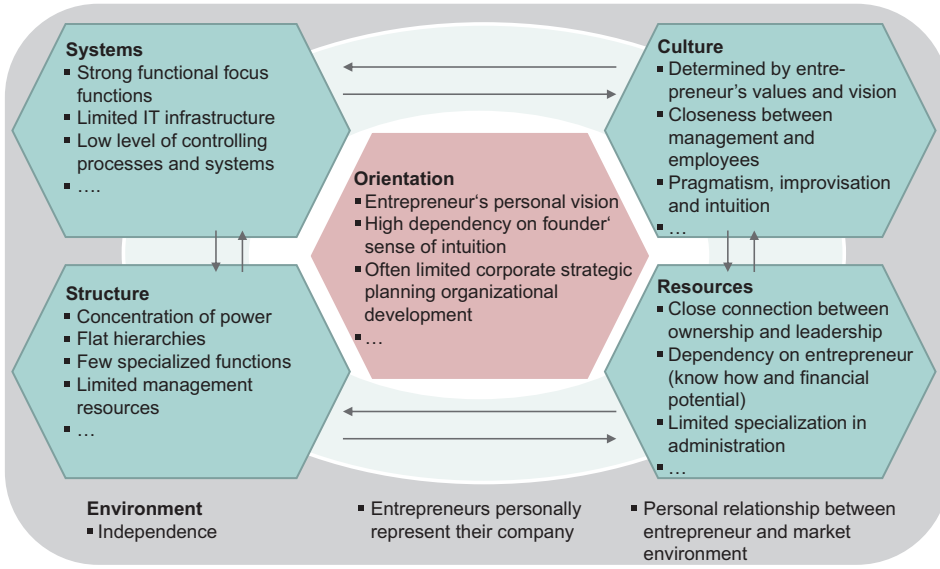

Fig. 4.4 SME organizational model. (*Source* Own adapted figure. Kind usage permission by Christoph Wunderlich)

systems. The culture is dominated by values and vision of the entrepreneur. Pragmatism, improvisation, and intuition are more relevant than in larger companies. Know-how and financial potential of the company is dependent on the standing of the entrepreneur or owner. Leadership and ownership are closely related.

The study indicates that digital transformation will enhance productivity and flexibility of production. The collaboration among employees will increase. The externalization of implicit knowledge will be pushed. Employer attractiveness will alleviate the recruitment of employees. Corporate culture will be determined by the ability to change. Competences, particularly in transformation management, become more important than expertise.

Figure 4.5 illustrates the challenges of the digitalization process in SMEs.

Digital transformation enhances collaboration between employees and pro-active knowledge exchange but requires a transformation manager who can counter-balance the claim for leadership of the entrepreneur. Charisma and know-how can strengthen his or her position.

Digital transformation skills of employees will outrank long experience in the company. This could lead to considerable frictions within the company. The change in values could lead to misplaced gratitude and threaten organizational peace.

The higher complexity will challenge the knowledge of the management and require resources. Considerable investments will be needed in IT infrastructure and thus respective trainings of employees.

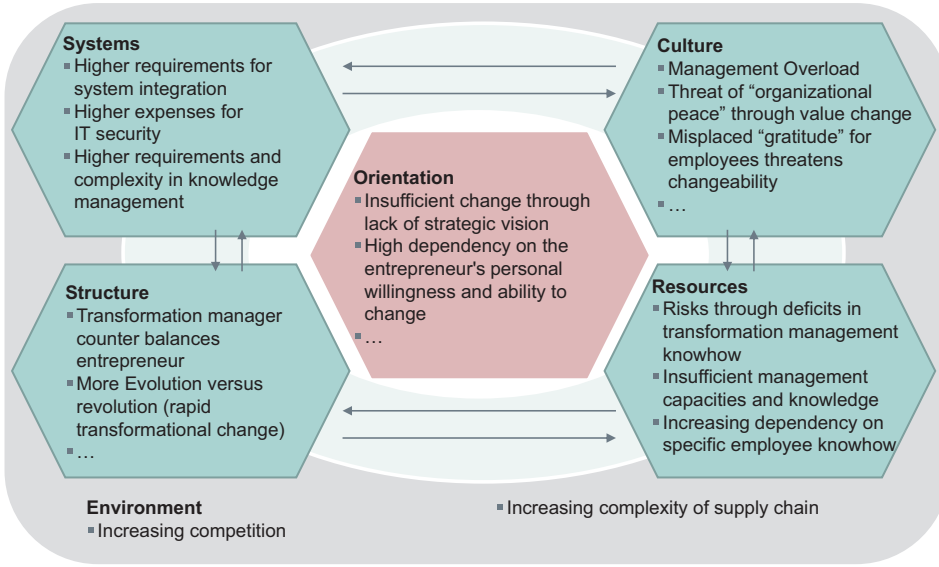

Fig. 4.5 Challenges of the digitalization process in SMEs. (*Source* Own adapted figure. Kind usage permission by Christoph Wunderlich)

4.3 Conclusions

Only with clear and active support of the top management, the digital transformation process will be successful. Similar to Six Sigma or Lean Management projects, rigid project management is essential. Openness for external knowledge and the usage of benchmarks of other successful transformed companies will facilitate the required change (Fig. 4.6).

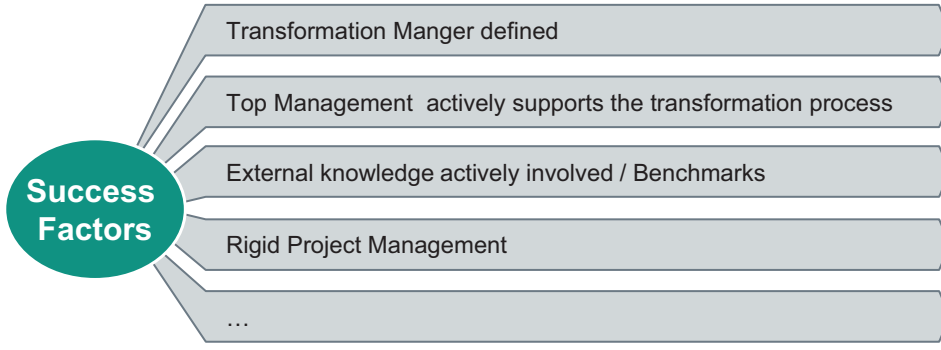

Fig. 4.6 Success factors of a digital transformation process. (*Source* Own adapted figure. Kind usage permission by Christoph Wunderlich)

While large companies are, to a considerable extent, already investing in digitalization projects and respective transformation requirements, SMEs are still at an early stage respectively. The overall focus is currently very much efficiency oriented; technical aspects and IT structures predominate the mutual understanding. Nevertheless, ecosystems based on platform technologies generating new business concepts and opportunities are the future, for larger companies as well as SMEs. These will lead to even greater challenges within the organizations regarding leadership, management, and corporate culture change.

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