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Cooperation of start-ups and SMEs in Germany: Chances, challenges and recommendations

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IW-Policy Paper 19/2020

Cooperation of Start-ups and SMEs in Germany

Chances, Challenges and Recommendations

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Köln, 22.09.2020

INSTITUT DER DEUTSCHEN WIRTSCHAFT

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JEL-Classifikation:

L14 – Transactional Relationships, Networks
L23 – Organisation of Production
L26 - Entrepreneurship

Executive summary

The cooperation between established SMEs and innovative start-ups offers considerable opportunities for the respective companies and the German economy. New business models can be adopted, and innovative products can be jointly developed. In particular, the digitalisation of the 'German Mittelstand' could receive a boost through collaboration with digital start-ups. This could lead to an increase in the demographically induced declining growth potential of the German economy. In order to exploit the full potential of cooperation, cultural differences between the two types of company must be overcome and in case of different regional focal points, the initiation of contacts must be facilitated. Based on expert interviews in start-ups, SMEs and associations, this policy paper identifies opportunities to strengthen cooperative relationships between established SMEs and the growing start-up scene. The paper concludes with ten policy recommendations.

1 Introduction

Germany is not yet among the pioneers when it comes to the digitisation of companies, the development of new business models or the use of artificial intelligence (AI). Possible reasons are the slow development of the digital infrastructure, regulatory constraints and uncertainties, the reluctance of established companies, and an insufficient number of innovative start-ups (Azkan et al., 2019; Demary et al., 2016; European Commission, 2019; Röhl, 2016).

In recent years, however, innovative start-ups have led to a growing potential for digital solutions in existing production processes. In addition, new business models are emerging, for example in the platform economy (Demary/Rusche, 2018a) and the use of Artificial Intelligence (AI). Still, studies show that small and medium-sized enterprises (SMEs) continue to lag behind in the implementation of digital concepts for Industry 4.0 (Demary et al., 2016; IW/IW Consult, 2016; BMWi, 2018). Despite a growing German start-up scene with digital orientation, neither the potential for developing new business models nor the possibilities to digitalise existing value chains have been sufficiently used so far. The reasons for the slow diffusion of digital technologies are heterogeneous. The digitisation and digitalisation of the economy is a multifaceted and complex undertaking (Demary et al., 2016). It simultaneously deals with diverse topics such as

- (further) automation of production,
- digitisation of interfaces to other companies along the value chain,
- use of digital technologies to change and refine existing business models, and
- development of completely new, disruptive business models resulting from digitalisation.

This policy paper, which is based on an IW analysis by Engels and Röhl (2019) on cooperation of established SMEs and start-ups, aims to highlight the opportunities of cooperation for the participating companies and start-ups and to present proposals for better exploitation of cooperation potentials. To this end, the paper presents conclusions drawn from expert discussions and the evaluation of available studies. In addition, it presents the results of a special evaluation of the cooperation survey in the context of the BDI Family Business Panel will be presented. The policy paper concludes with policy recommendations, highlighting the growing role of platforms, but also the importance of policy changes in a variety of areas ranging from digital infrastructure to bureaucracy impeding the foundation of new companies.

2 Study design and definitions

Following the common international definition, the term "start-ups" in this analysis refers to young companies that were founded within the last ten years and that use an innovative technology or use a new business model, pursuing high growth.

The term small and medium enterprises (SMEs) is used very broadly in the present analysis, encompassing the German “Mittelstand”. Start-up partners can be SMEs in the classical sense with less than 250 employees and a maximum turnover of 50 million euros as well as family businesses and mid caps that exceed these size limits. The latter are characterised by the unity of ownership and management (IfM, 2019; Röhl, 2018).

Digitisation means the process of change from an analogue to a digital form, extending from the idea, the order, the development and production, over the delivery of a product to recycling and its related services. The availability of all relevant information in real time through the networking of all entities involved in value creation and the ability to generate the optimal value-added flow from this data is crucial (Lichtblau et al., 2015, 11).Digitalisation, by contrast, refers to the development and usage of digital business models.

In order to examine the status quo and potential of cooperation between SMEs and start-ups, the research methodology combines the results of existing empirical studies with an econometric evaluation of the BDI Family Business Panel from autumn 2018 (BDI/IfM, 2018). In this wave of the panel survey, larger family businesses were asked about their cooperation and cooperation experiences with start-ups. In addition, eleven expert interviews were conducted with owners of medium-sized enterprises, start-up entrepreneurs and experts from business associations. An overview of the experts and the companies and institutions they represent can be found in Engels and Röhl (2019, 10).

3 Advantages and potentials of cooperation

Many of the potentials offered by new technologies, new business models and the digitisation of economic life result from cooperation with other companies. They often arise from other industries or can only be fully exploited with partners, for example in the context of digital platforms. In addition, the capacities of SMEs to develop new skills in the various dimensions of digitisation and Industry 4.0 are subject to tighter limits than it is the case for large companies. Digital start-ups offer technological know-how or new business models that can be particularly interesting for established SMEs. Due to the complete digitisation of the value chains within the framework of Industry 4.0, the boundaries between traditional industry and services are becoming increasingly blurred. Many start-ups operate in this border area of industry and (data) services. Cooperative ventures enable established companies to benefit from the disruption which originates from start-ups.

Network effects

Cooperation and integration into company networks offer numerous advantages for innovation projects as well as for production, sourcing and sales. Innovative companies maintain close relationships with their suppliers and customers, but often also with competitors, to accelerate the development of new products and processes (Fritsch et al., 2019). By making use of the know-how available in the network, SMEs succeed in acquiring competences which they could not, due to their size, pick up on their own. The connection to start-up networks can be an advantage for them. Knowledge of the partner and trust in his or her abilities are central to stable networks (Röhl, 2001, 116). This is one reasons why classical networks offered by associations or personal contacts, still dominate in the initiation of contacts between start-ups and SMEs despite the spread of digital platforms. Business networks are often particularly stable and successful when their actors cooperate in regional clusters or innovative milieus (Lichtblau et al., 2005; Röhl, 2019; Röhl, 2001, 120 ff;)

Complementarity of skills

Established medium-sized companies and start-ups have different competence profiles, which can stimulate and complement each other. Start-ups can test new ideas on the market more easily, while established companies must act more cautiously because of their reputation and the loyalty of their long-standing customers. When implementing Industry 4.0 technologies, SMEs can draw on the digital know-how of start-ups if they lack the necessary expertise. Furthermore, the lack of qualified personnel on the labour market (Anger et al., 2018) can be partially compensated for by cooperation with the expertise of start-ups.

Access to new technologies, markets, networks and capital

Closely related to the exploitation of complementary skills is the access to new technologies and (online) markets or platforms, which existing SMEs can gain by cooperating with start-ups (Leitner et al., 2019, 7). In return, cooperating start-ups gain access to networks of their partners and often to equity capital that they need to finance further expansion. Likewise, partner start-ups can be interesting investment targets for established companies (Leitner et al., 2019, 9), although this applies especially to larger medium-sized and large companies.

Increasing the ability and speed of innovation

Constant innovation is a prerequisite for the survival of medium-sized companies. This is particularly true for medium-sized industrial companies that are highly competitive in the international arena. But studies show that the economy's growing innovation expenditure is increasingly concentrated on large companies and mid caps with 1,000 to 3,000 employees, while the share of continuously innovating SMEs - the innovator rate - is declining overall (Behrens et al., 2017; Röhl, 2018). At this point, the involvement of start-ups in innovation projects of SMEs could lead to an expansion of the innovation potential.

In return, the start-ups benefit from access to the extensive product and process know-how of the established companies. However, the advantages of innovation cooperation between SMEs and start-ups are limited by differences in the innovation culture and speed, which need to be overcome for successful cooperation (see Chapter 4.2).

4 SMEs and start-ups: Different worlds?

The advantages of cooperation with start-ups mentioned above are confronted with challenges which, if not overcome, can become disadvantages or at least hinder the exploitation of the advantages. Therefore, cultural differences and other divergent characteristics of start-ups and established medium-sized companies are analysed, which may act as an obstacle to intensifying cooperation between the two types of companies. Increased awareness of these potential barriers to cooperation can help to overcome them more easily.

4.1 Cultural differences

At first glance, cooperation between established companies and innovative start-ups appears to be very useful for both sides. However, the increased cooperation between SMEs that have already been active on the market for a long time and start-ups that bring new technologies and business ideas faces a number of hurdles. These include cultural differences resulting from the different business, market and personal situations and different stages of development (Leitner et al., 2019). In a study on cooperation, Deloitte (2017, 6) calls this the "cultural fit", which initially often does not seem to exist between established SMEs and start-ups. In the survey of family businesses by BDI/IfM (2018, 14), which is analysed more deeply in Chapter 5.2, almost one third of the companies with experience of cooperation stated that cultural differences were a problem - this was by far the most frequently mentioned challenge (Figure 4-1).

Figure 4-1: Potential problems in the cooperation with start-ups from the perspective of family businesses

Data in percent

N = 213, multiple answers possible

Source: BDI/IfM, 2018, 7

Germany's 'Mittelstand' consists to a large extent of family businesses with a long tradition, especially in manufacturing. There appear to be considerable differences between the corporate culture of established SMEs with a long tradition and that of innovative start-ups:

- Family businesses are characterised by a high degree of continuity in their structures and working methods. Entrepreneurial prudence is essential for remaining successful on the market for decades (Röhl, 2008). Start-ups and their founders, on the other hand, are geared to high-speed decisions and disruptive implementations (Leitner et al., 2019, 18).

- The development from a locally or regionally operating SME to a globally positioned hidden champion is mainly driven by retained earnings in family businesses, which is reflected in high - and since 2000 rising - equity ratios of SMEs (Deutsche Bundesbank, 2018). Start-ups, on the other hand, are dependent on external financing sources to generate equity for their rapid expansion (Röhl, 2010; Bienert et al., 2018).

- The established SMEs are mostly companies that are strongly anchored in their regional environment and whose owner-managers have a mindset similar to the people of their home regions, which often have a rural structure (Kempermann et al., 2020; Röhl, 2018). In contrast, the founders of start-ups are so-called digital natives living in an urban environment (Kollmann et al., 2018, 22 f., 33).

The culture of start-ups is far less based on continuity than is the case in established SMEs. With new digital business models - such as AI or platforms - the newly founded companies initiate disruptive changes in the economy, whereby failure is often already considered as a possible early exit option for the founder(s): If the business idea was not successful after all, the company is liquidated as quickly as possible in order to pursue alternative options, start something new again with the experience gained and be more successful next time (Röhl, 2019, 134; OECD, 2013, 7). This uncertainty about the long-term existence of the potential partner can be an obstacle to cooperation for established medium-sized companies.

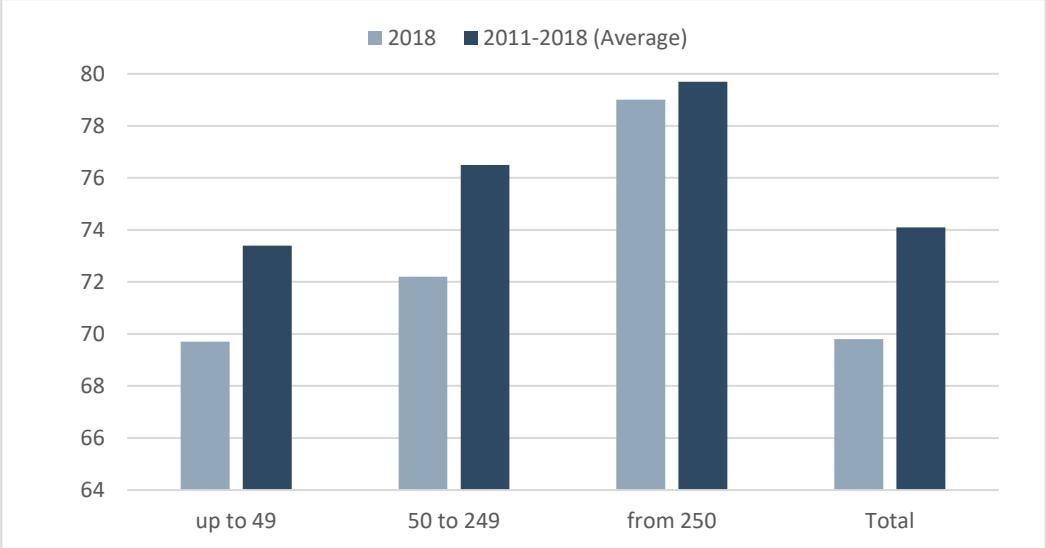
The striking differences in corporate culture are also influenced by the different age structures of the respective decision-makers. In 2013, the majority - 52 percent - of medium-sized entrepreneurs were already more than 50 years old and a good fifth were already over 60 (KfW Research, 2015). In contrast, start-up founders are on average 35 years old (Kollmann et al., 2018, 33). The average age difference of about one generation can contribute to markedly different views and behavioural patterns among SME owners compared to the managers of start-ups.

4.2 Differences in innovation behaviour

An important difference in innovation between the majority of incumbents and start-ups can be summarised under the terms 'incremental innovation' versus 'disruption through new technologies or business models'. One of the special features of German industrial SMEs is their cautious innovation behaviour: While fundamental innovations are tackled rather hesitantly, companies are focusing on continuous improvement of products and processes (IW Consult/Santiago, 2015, 20) that are usually closely geared to customer wishes (Figure 4-2).

Figure 4-2: Cooperation with customers by company size

Figures by number of employees, in percent



N (2018) = 1.125

Source: IW-Zukunftspanel, survey waves 2011 to 2018

The importance of customer cooperation is also confirmed by a study by KfW Research (2019) on the innovation paths of SMEs. According to this, the companies of the 15th wave of the KfW SME panel can be assigned to three groups with different innovation behaviour: relatively innovation-weak companies that closely orient product and process improvements to their industry-specific application knowledge (20 percent), companies with their own research that innovate on the basis of knowledge (37.5 percent), and as the largest group with over 42 percent companies that closely orient innovations to their sales market, i.e. cooperate with their customers. The customer-oriented innovation model has contributed to the export strength and thus to the worldwide success of German industry. It is partly responsible for the fact that Germany has over 1,300 'hidden champions' (Röhl, 2018; Simon, 2014).

However, the incremental innovation model is coming under pressure in times of digitization (Bienert et al., 2018). The rather slow adoption of Industry 4.0 technologies and the continuing difficulties in finding suitable skilled workers for this purpose in a very tight labour market point to the limits of the incremental innovation strategy and to growing problems in the implementation of digital innovations (IW Consult, 2018; Lichtblau et al., 2015; Anger et al., 2018, 56). In order to survive against increasingly strong international competition in the future, the ability of established medium-sized companies to make leapfrog innovations in new technologies and business fields must therefore be urgently increased. Unfortunately, available data on the innovation behaviour of German companies point in the opposite direction. Possibly also due to rising R&D costs, fewer SMEs operate their own R&D departments. The declining rates of innovators in SMEs and mid-sized companies up to 1,000 employees, according to the innovation surveys of the Centre for European Economic Research (ZEW) (Behrens et al., 2017), can be seen as an alarm signal for the future viability of German industry and the business location as a whole (Röhl, 2018). Not least for this reason, a closer cooperation between established medium-

sized companies and innovative start-ups is desirable and highly relevant in order to promote digital innovations and the development of new business fields.

4.3 Differences in spatial distribution

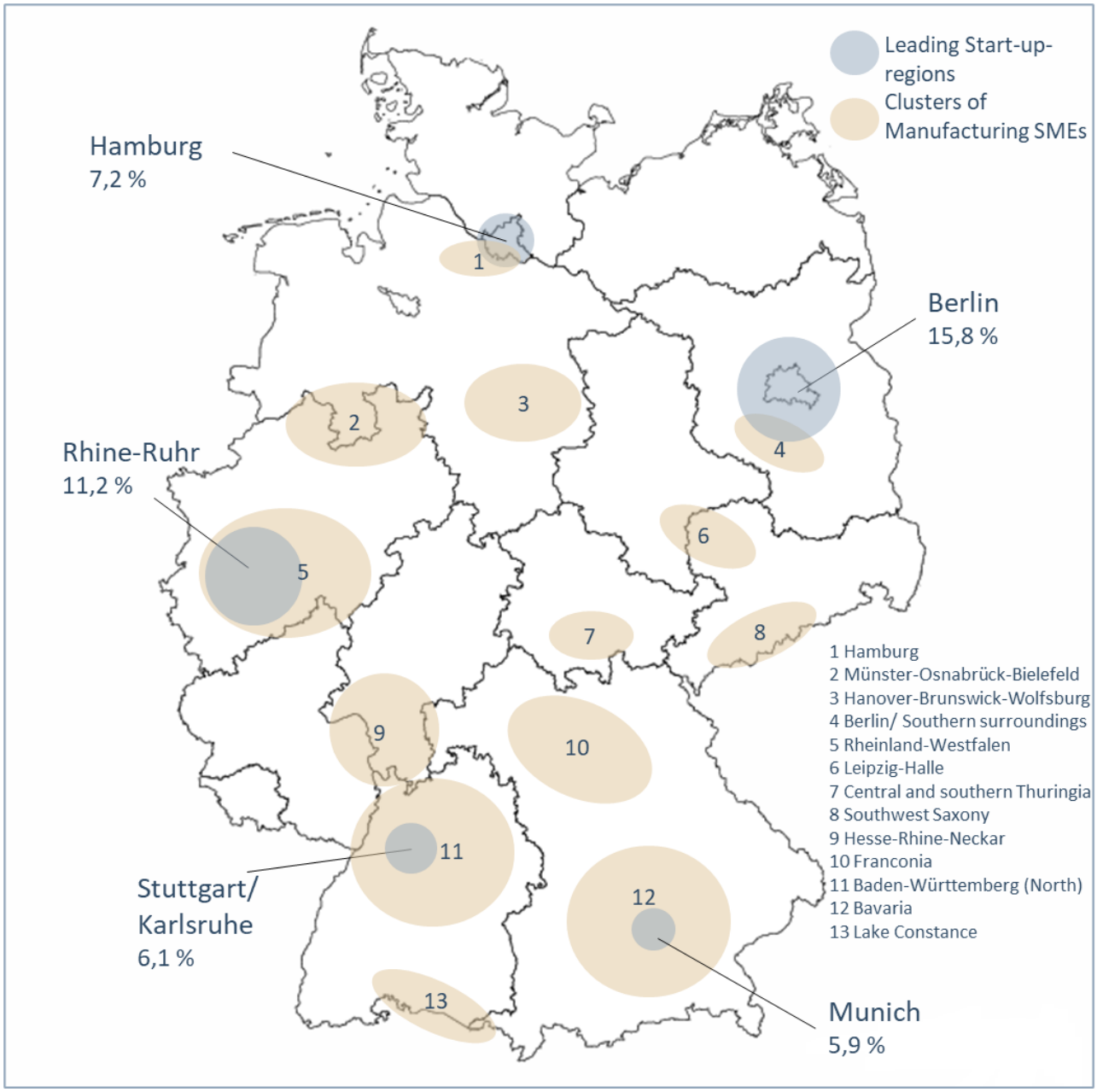
In addition to the differences in corporate culture and innovation behaviour, another potential hurdle for cooperation between the German “mittelstand” and start-ups results from the different geographical focuses of their locations in Germany. The still young German start-up scene, some of which is still in its infancy, and the medium-sized company landscape that has grown over a long period of time show clear differences in their spatial distribution. This discrepancy is particularly serious in the industrial sector. A large proportion of start-up founders are located in urban areas. The German start-up strongholds are the country's metropolises, with Berlin and Munich standing out as locations with the largest number of new start-ups of innovative companies and the highest investment sums (EY, 2019). In general, the largest German conurbations Berlin, Munich, Hamburg as well as the Rhineland (Cologne and Düsseldorf), the Ruhr area, Frankfurt and Stuttgart are also the leading centres of the start-up scene (Kollmann et al., 2018). In contrast, the established medium-sized companies are more evenly distributed across the country. Many medium-sized companies are located in smaller towns and rural areas.

Industrial SMEs and mid-caps have a high spatial concentration in southern and western German regions, some of which have a more rural structure and are located far from German start-up centres (Röhl, 2018). Figure 4-3 shows the leading German start-up strongholds and the regional focus of medium-sized manufacturing companies. In general, despite the regional clusters, medium-sized industry is spatially far less concentrated than the start-up landscape. Munich, as a leading location for B2B start-ups in the high-tech sector, plays a central role for Bavaria's strong manufacturing sector. But the start-up-landscape in Baden-Württemberg, which is also characterized by regions with many medium-sized manufacturing companies, has only recently developed in a similarly positive way. As a result, close physical proximity between medium-sized companies and start-ups as a prerequisite for establishing contacts on a personal level was hardly given here. In the meantime, however, the Stuttgart-Karlsruhe region has caught up and, according to the German Startup Monitor, is among the top 5 locations in Germany with a good 6 percent of the start-ups recorded in 2018 (Kollmann et al., 2018, 23).

Berlin as the leading German start-up generator shows a below-average stock of medium-sized companies. Manufacturing industry in particular is only weakly developed. This means that there is a lack of industrial companies as potential partners for the city's many start-ups: In 2018 alone, 443 newly founded start-ups were identified (IIT/Startupdetector, 2019, 43). With 70 identified start-ups in the AI field, Berlin also is the leading centre ahead of Munich with 34 start-ups specialised in AI (Goecke/Thiele, 2018). The capital region thus offers a high potential for cooperation in this future-oriented field of development with numerous points of contact in various economic sectors.

Figure 4-3: Spatial focus of start-ups and medium-sized manufacturing companies

Shares of the 5 leading start-up centres of start-ups covered in 2018, in percent, and clusters of industrial SMEs



Source: Kollmann et al., 2018, 23 (for start-up centres), expertise of the authors (manufacturing clusters)

In the interviews with experts from SMEs, start-ups and associations, the hindering effect of the divergent spatial distribution was assessed differently. However, the major role of personal contacts and thus spatial proximity was predominantly confirmed. The initial concentration of the start-up scene in Berlin is seen as an essential prerequisite for successful cluster formation. The location's strong focus on the B2C segment reduces the significance of the lack of industrial companies in the capital. Recently, more and more start-ups in the B2B sector are emerging in other locations such as Munich, Stuttgart, Hamburg or in the metropolitan areas of North Rhine-Westphalia, so that the spatial fit between start-ups and SMEs is increasing

4.4 Legal barriers

Among the potential obstacles to cooperation between SMEs and start-ups are also legal hurdles. Especially the flexibility often desired and the absence of detailed formal contracts can lead to legal disputes later. In the three interviews conducted with start-up entrepreneurs, legal aspects of cooperation and the drafting of contracts turned out to be important to very important. The question of non-competition clauses, access to ideas and patents from the cooperation results, and the distribution of any resulting profits must be contractually fixed at an early stage (Deloitte, 2017, 26), even if this could possibly restrict the flexibility of the cooperation and a corresponding contract would cost time and management capacities.

Exclusivity rules which, when working with a large customer, exclude working for its competitors, are hardly feasible for start-ups. They have to act quickly in a changing market and develop their product further with regard to new customer groups. In the survey of start-ups and medium-sized companies (Deloitte, 2017, 26), both groups cited trust as the most important basis for successful cooperation. However, 62 percent of the start-ups and as many as 67 percent of the SMEs considered well-drafted written contracts to be important. The importance of legal issues and clearly defined contracts was also stressed in the expert interviews.

In addition to legal issues, the difficult to define cooperation goals and the divergent speed of business decisions and their implementation can also lead to problems. Leitner et al. (2019) cite as a potential obstacle the different speeds of decision making, decision implementation and also changes of strategy.

5 Development of cooperation between SMEs and start-ups: empirical results

5.1 Key findings of current studies

A rising interest in cooperation between start-ups and SMEs can be seen in the growing number of events and studies dealing with this topic in recent years. Trade associations are also dealing with the topic much more intensively than two to three years ago, as the VDMA's ‘Startup Machine’ shows, for example (VDMA, 2019). In addition, there is now a variety of platforms that serve the ‘matchmaking’ of established and newly founded companies.

From the point of view of start-ups, cooperation with medium-sized companies is surveyed in the German Startup Monitor (DSM), with 1,550 participating Start-ups in 2018, growing to 1.933 in 2019 (Kollmann et al., 2018; 2019).

At the end of 2018, the Rationalisation and Innovation Centre of the German Economy (RKW) published a study with the results of a survey of SMEs on their cooperation with start-ups (Wallisch, 2018). One of the most important findings is that only a small percentage of SMEs specifically look for suitable start-up cooperation partners. This result corresponds to the still significant role of spatial proximity in contact initiation (see chapter 4.3). While digital platforms

can crucial in the targeted search for partners, spatial proximity considerably increases the probability of chance contacts, e.g. at events. Often, personal recommendations from third parties also lead to initial contact. About a third of the companies surveyed by RKW (Wallisch, 2018) stated that they were not aware of a single start-up from their business environment. Only rarely is a targeted search for start-up partners carried out without such a personal element.

The high importance of previous acquaintance with the partner is confirmed by a Deloitte study (2017, 10) on the success factors for cooperation between start-ups and medium-sized companies. According to the VDMA/EBS (2019) company survey, SMEs in particular rely on existing networks in their search for partners: 94 percent of the companies obtain recommendations from their network (customers, suppliers, partner companies, employees, associations, research institutions). Thus, despite the constant increase in digital networking over the past 25 years, relatively little seems to have changed in the high relevance of spatial proximity, which is reflected in so-called agglomeration advantages (Fritsch et al., 2019; Röhl, 2001, 114). This might change now with the inhibition of personal contacts in the wake of the Covid19 pandemic.

About a third of 250 SMEs surveyed by Wallisch (2018) have already gained experience in cooperation, with SMEs from the information and communication technology (ICT) sector particularly often cooperating with (digital) start-ups. Companies with a good business situation cooperate more often with start-ups than those with a negative assessment of their situation. Technological developments and innovation are the main reasons for working with start-ups (Wallisch, 2018, 7). This is in line with the results of the BDI Family Business Panel (BDI/IfM, 2018, 10; see below). A Bitkom (2019a) survey from spring 2019 revealed a particular bottleneck for medium-sized companies: Two-thirds of the participating companies with 20 employees or more did not cooperate with start-ups, and 53 percent of those who did not cooperate cited the lack of time to take a closer look at start-ups and their potential as one reason for this. In contrast, 80 percent of start-ups worked with established companies (Bitkom, 2019b).

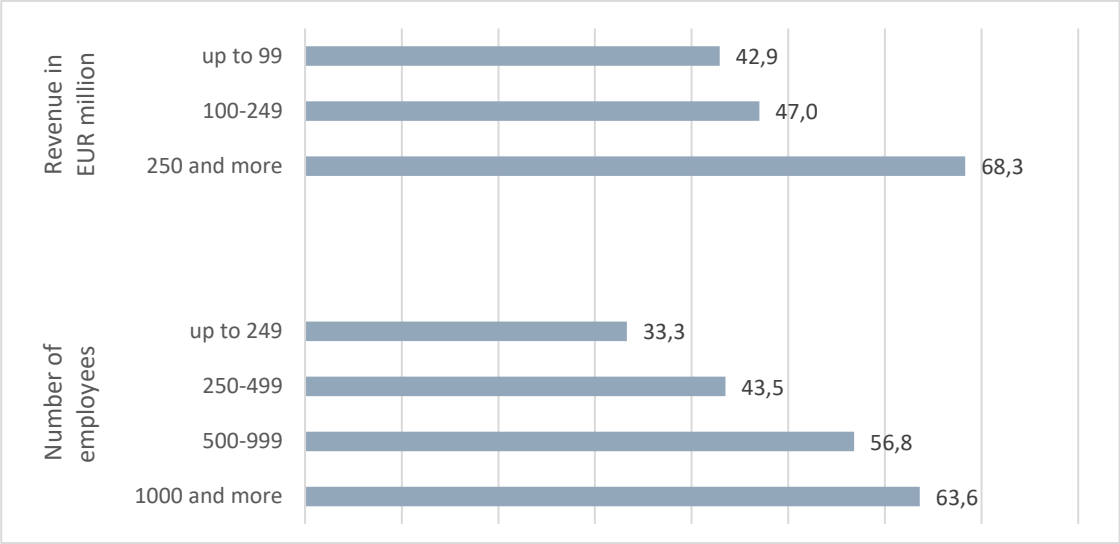
5.2 Evaluation of the BDI Family Business Panel

In order to provide empirical evidence of the status quo of cooperations between start-ups and SMEs in Germany, an econometric evaluation of the company survey of the BDI Family Business Panel 2018 (BDI/IfM, 2018) was carried out for the study by Engels and Röhl (2019). 66.2 percent of the 248 family businesses can be assigned to industry, 23.2 percent to trade and 10.6 percent to the service sector. In 2017 they had an average of 2,200 employees (median: 560) and generated sales of 512 million euros (median: 120 million euros). The descriptive evaluation of the company survey (BDI/IfM, 2018) has been expanded to include econometrics. However, the econometric analysis was limited due to the relatively small number of cases.

In total, nearly 48 percent of the companies surveyed were cooperating with start-ups at the time of the survey; on average, these companies had four cooperations. However, the cooperation is strongly dependent on company size : A good 68 percent of companies with annual sales of more than 250 million euros had cooperations with start-ups, but only just under 43 percent of SMEs with sales of less than 100 million euros (Figure 5-1). The situation is similar when looking at the number of employees (BDI/IfM, 2018, 7).

Figure 5-1: Cooperation of family businesses according to size classes

Percentage of family businesses that cooperated with start-ups in 2018



Source N = 248.

Source: BDI/IfM, 2018, 7

With regard to the motives for cooperation, the development of new technologies (54 per cent) and the organisation of digitisation as well as the development of products and services (50 per cent each) are leading before access to new markets (BDI/IfM, 2018, 10). A logistic regression analysis is used to investigate which company characteristics influence the probability that a company will cooperate with a start-up. This is intended to highlight which companies are more likely to be pioneers in this area. The dependent variable is the binary variable "Company cooperates with start-up(s) Yes/No". Two models are estimated.

In both models the digital maturity of the company is a control variable. A company is considered to be digitally mature if it answers the question ‘How do you see your company positioned in the process of increasing digitization?’ with good or very good. Another control variable in both models is international orientation. A company is classified as internationally active if the share of exported products in total sales is positive. In Model I the turnover of the enterprise is also a control variable, whereas in Model II the number of employees is used instead. Due to possible multicollinearity of turnover and number of employees, they are not included together in one model. In order to interpret the results not only qualitatively but quantitatively, odds ratios are used. The regression results show which factors statistically significantly increase the probability that a company cooperates with start-ups. Key results are:

- The probability that a company will cooperate with start-ups doubles when the company is digitally mature.
- According to Model I, the probability of a company cooperating with start-ups doubles if the company is internationally active.

- In Model II, internationality has no significant effect, but the number of employees has. From 500 employees upwards, the probability to cooperate with a start-up increases 2.3-fold. But given the limited number of observations, results should be interpreted with caution.

Despite these limitations, the results allow the following conclusions to be drawn:

- Digital companies are more willing to cooperate with start-ups than non-digital companies. Since start-ups often tend to be digitally oriented, it can be assumed that digital companies and start-ups are a good match and that there are fewer frictions for cooperation. Moreover, digital firms are also likely to be younger than the business average and thus closer to their own start-up phase.

- International activity and company size tend to have a positive effect on the probability of start-up cooperations. It can be assumed that larger companies (which also tend to be more internationally active than small ones; KfW Economic Research, 2012) have more financial and human resources to initiate and maintain cooperations.

The cooperation between family businesses and start-ups can be very different. The possible forms of cooperation, which were investigated in the study, include customer-supplier relationships, project-related cooperation, joint ventures (founding of a joint venture), incubator or accelerator programs, minority shareholdings and takeovers. This results in differences in the length, legal definition and intensity of the cooperation. The descriptive evaluation by BDI/IfM (2018) shows that the most frequent form of cooperation is project-related (approximately 31 percent of cooperating family businesses). The second most common form is the customer-supplier relationship, at just under a quarter. This is slightly less than in the case of start-ups: According to the results of the German Startup Monitor (Kollmann et al., 2018), framework supply agreements are concluded in almost one third of their cooperations. Joint ventures and minority shareholdings play a certain role in BDI/IfM's Family Business Panel (2018, 8), each of which has about one tenth of the companies, while takeovers and incubator or accelerator programmes are rare, each accounting for about 7 percent. Larger companies are more active in all forms of cooperation, with holdings, joint ventures, takeovers and incubator or accelerator programs being particularly concentrated on family businesses with more than 1,000 employees.

Chi-square tests show which companies with which characteristics use certain forms of cooperation more frequently than companies that do not have these characteristics (Table 5-1). Digital companies are more likely to carry out project-related cooperation than non-digital ones, companies with high turnover more so than companies with low turnover, companies with more employees are more likely to cooperate in projects than those with smaller staff, companies with international operations are more likely to have these cooperations than those without and companies with positive export expectations are more likely to cooperate than those with constant or negative export expectations. Customer-supplier relationships are more likely to be maintained by digital than by non-digital companies, and more likely to be used by companies with many employees than by smaller ones. Joint ventures with start-ups are more likely to be digital, high-turnover, high-employee companies. Incubators or accelerators are more likely to be used by large (high-turnover, high-employee) companies than small ones, and also more likely to be used by companies that expect rising sales and have positive export prospects.

Table 5-1: Forms of cooperation with start-ups according to company ownership

Results of Chi-square tests

	Project-oriented cooper-ation	Cooperation with costu-mers and suppliers	Joint ventures	Minority interest in the start-up	Takeover of start-ups	Incubator or accelerator programme
Share of cooperation form, in percent	**31,2**	**24,5**	**11,0**	**10,1**	**7,2**	**6,8**
Digital maturity	+*	+**	+***	=	+*	=
High turnover	+*	=	+***	+***	+**	+***
Number of employees	+***	+**	+**	+***	+**	+***
International activity	+**	=	=	=	=	=
Service sector	=	=	=	=	=	=
Retail sector	=	=	=	=	=	=
Manufacturing sector	=	=	=	=	=	=
Good current situation	=	=	=	=	+**	=
Positive Outlook	=	=	=	=	=	=
Turnover growing	=	=	=	+*	+**	+**
Export share increasing	+*	=	=	=	=	+**
Investments growing	=	=	=	+*	=	=

***/**/*: Significance at the 1/5/10 percent level; Chi-square tests for a difference between the mean values of different subsamples (Line variable value 1 or 0: the enterprise falls into the respective category or not); +: Enterprises with the relevant characteristic cooperate significantly more often with start-ups in the relevant form than enterprises without the relevant characteristic (- accordingly means that there is a negative correlation); =: There are no statistically significant differences in the likelihood of a company cooperating in this particular form. Depending on whether the company characteristic applies or not, multiple answers are possible

Source: BDI/IfM (2018); own calculations

Minority shareholdings are more likely to be pursued by large companies than by the small ones, as well as by those with a more positive development of sales and investments. Start-ups are more likely to be taken over by companies that are digital, large, or that assess their situation as good or are growing. These results are supported by the results of Wallisch (2018). Chi-square tests were also conducted to analyse the motives for cooperation. The development of new technologies was cited as a motive for cooperation significantly more often by high-revenue, high-employee companies, which assess their current and future situation and their export development as positive. Other topics gaining importance such as product and service development, access to new markets and digitisation were also mentioned more by large, successful companies as motives for cooperation. Overall, it was these future-oriented topics that led companies to cooperate with start-ups, which was also reflected in the interviews. But almost half of the surveyed companies with experience of cooperation stated that the different corporate cultures posed potential problems in cooperation with start-ups (BDI/IfM, 2018, 14).

The evaluation of the company survey by the BDI Family Business Panel (BDI/IfM, 2018) shows that cooperation with start-ups takes place above all when companies are digital and interested

in future-oriented topics. The cooperation with start-ups that tend to be digitally oriented seems to be of particular benefit to similarly oriented companies. More than 70 percent of the companies are satisfied or very satisfied with the cooperation, only about 3 percent are dissatisfied (BDI/IfM, 2018, 16). From the perspective of the start-ups, cooperations are even more often a success. According to the German Startup-Monitor (Kollmann et al., 2018), three quarters of the start-ups are satisfied with the success of past and current cooperations with established companies, while only 7.4 percent are not satisfied. The results suggest that cooperation with start-ups should be further encouraged in order to extend it to less digitised companies.

6 10 Recommendations for better cooperation between SMEs and start-ups

Based on the empirical evaluations and expert interviews, ten recommendations for strengthening the cooperation of established medium-sized companies and start-ups can be derived. An increasingly important instrument in this context is the growing platform economy.

1. Increased use of cooperation platforms by Start-ups and SMEs

Platforms can be an important instrument to bring together SMEs and start-ups. A growing number of digital platforms have been established to facilitate networking, including platforms aiming at SMEs-start-up cooperation. A digital platform is a company that uses the Internet to enable or simplify advantageous interactions between two or more user groups (Demary/Rusche, 2018a, 8). As enablers of networking, digital platforms are a core business model of digitalisation. Their user benefit increases disproportionately with the number of other users (Evans/Schmalensee, 2007). A central benefit is the reduction of transaction and information costs. In the context of contact and cooperation initiation, it can be timesaving for companies to use platforms to find out about potential partners and get in touch with them.

Recently, business associations increasingly initiate cooperation, in some cases using platforms. For example, the German business association of mechanical engineering VDMA founded the 'Startup-Machine' in 2017, a platform that connects mechanical engineering companies and start-ups. The digital business association Bitkom as well as other associations also work on networks of established companies and start-ups. Platforms also become part of or complement business models of industrial companies. However, their use requires prior engagement with cooperation preferences and the platform itself, creating a market for intermediaries.

2. Use of Intermediaries and combination of digital and analogue formats

Platforms are by no means a panacea for strengthening cooperation between established companies and start-ups. For example, there is often an inhibition threshold for use - due to lack of time, lack of knowledge of the offer or because the user interface seems difficult to understand. As the interviews have shown, personal contact and the existing networks of the actors play an important role in the initiation of contacts. In general, intermediaries with extensive networks both in the field of established companies and in the field of innovation and start-ups are suitable for bringing together SMEs and start-ups with complementary offers. In addition to business

associations, consulting firms could also be helpful, some of which already work intensively with start-ups. A combination of digital platforms and traditional events for contact initiation such as trade fairs, pitches and networking events can be useful to create cooperation opportunities.

3. Overcoming the boundaries between industry and services through cooperation

The traditional division into industry and services is becoming obsolete as the boundaries between industry and services are becoming increasingly blurred by digitisation. German industrial companies, for example in the mechanical engineering sector, are now also service providers - they offer the performance of reliable production with machines that are always ready for use through comprehensive services such as training, monitoring, maintenance and repair (IW Consult, 2015). Due to the ongoing digitalisation and development of Industry 4.0, the sectoral boundaries will become even more blurred in the future. In consequence, manufacturing companies should actively engage in digitisation and new service-oriented business models based on data they generate (digitalisation). Often, start-ups can deliver valuable input in this context.

4. Improvement of digital infrastructure

Broadband coverage and the availability of mobile networks outside the big cities are considered to be insufficient by the interviewees. Cooperation in product development, for example, requires very high bandwidths for data exchange - preferably in real time. This is not guaranteed in Germany even in regions with above-average coverage, while many rural regions have major deficits in their digital infrastructure (Demary et al., 2019, 221 f.). By 2025, the German government aims to achieve nationwide coverage with high-quality network and mobile data transmission. However, the expansion targets set so far have been missed. Investment in broadband infrastructure is rising only slowly despite the availability of federal programmes containing more than 10 billion euros. Planning and approval procedures should be streamlined to facilitate more public and private infrastructure investment. This also holds for the implementation of 5G cellular networks. To eliminate ‘white spots‘ not served sufficiently, providers should be allowed to cooperate and share their infrastructure in rural areas (Demary/Rusche, 2018b).

5. An environment conducive to innovation and cooperation

In order to promote the start-up landscape and cooperation activities between start-ups and SMEs, the expert interviews call for the creation of appropriate framework conditions on federal and state level. These include support measures such as

6. Increasing start-up training in engineering and computer science studies

A higher emphasis on start-up culture and entrepreneurship at universities could lead to more start-ups in fields related to the manufacturing industry, facilitating more start-ups with technologies relevant to manufacturing SMEs.

7. Public financing instruments to promote more start-ups

Despite a growth of start-up-clusters in leading German agglomerations, business foundations in general are decreasing and innovative start-ups are scarce in many regions, especially in rural areas and Eastern Germany. Economic policy should do more to overcome these deficits.

8. Strengthening of cooperative research

A strengthening of cooperative R&D-schemes encompassing established companies, research institutions and start-ups can help to make cooperation with start-ups more 'normal' for incumbent companies.

9. Reduction of bureaucracy

However, measures to reduce the bureaucratic hurdles for business start-ups also appear important, for example through the introduction of online procedures for starting a business digitally without personal appearance at public offices (Bertenrath et al., 2019).

10. Integrated concepts required in economic policy

Barrier-free cooperation between start-ups and SMEs, which often come from different economic sectors, requires an end to pigeonhole thinking in economic policy as well. Industrial, SME and start-up policy should therefore be understood as a single economic policy unit in order to meet the challenges of the future and strengthen Germany as a business location.

7 Conclusions

As the analysis of the company survey by the BDI Family Business Panel shows, cooperation with start-ups is much more intensive for companies that are already digital than for those SMEs that cannot be labelled as digitally mature. The results show that both sides can better exploit the advantages of cooperation by overcoming cultural hurdles and defining common goals. Cooperation with start-ups appears to be necessary in order to be competitive in an increasingly digitalised world in the future.

Aside from the recommendations mentioned above, cooperation between medium-sized companies and start-ups is making progress in Germany: More and more established companies have begun to enter into project-related cooperation with start-ups in recent years. Particularly against the background of progressive digitisation, cooperation with start-ups is seen as beneficial. Cultural differences, which have long acted as a barrier between start-ups and medium-sized companies, are increasingly being overcome, but remain significant. But cultural differences are not the only challenges in the relationship between start-ups and SMEs: the lack of physical proximity often prevents both parties from making contact with each other. While established SMEs rely heavily on personal contacts, start-ups are mainly digitally focused. As the expert interviews have shown, established companies have to open their culture to flexible newcomers and start-up entrepreneurs need to seek more personal contact. Despite the increasing importance of digital networks and platforms. Digital formats do not replace physical exchange, but complement and expand it. This could partly explain why the spatial concentration of start-up activities - whether in Silicon Valley or in Berlin - is still high despite ever-improving digital means of communication. This aspect must also be taken into account when supporting cooperation between SMEs and start-ups: A combination of classic networking formats such as trade fairs and pitches with digital cooperation platforms is most likely to be most effective.

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Zusammenfassung

Kooperationen von Start-ups und Mittelstand in Deutschland: Chancen und Herausforderungen

Die Zusammenarbeit von etabliertem Mittelstand und innovativen Start-ups bietet erhebliche Chancen für die jeweiligen Unternehmen und für die deutsche Wirtschaft insgesamt. Neue Geschäftsmodelle können übernommen und innovative Produkte gemeinsam entwickelt werden. Die Digitalisierung des Mittelstands könnte durch Kooperationen mit digitalen Start-ups einen Schub erhalten. Das demografisch bedingt nachlassende Wachstumspotenzial der deutschen Wirtschaft könnte so gesteigert werden. Um die Kooperationspotenziale zu nutzen, müssen jedoch die kulturellen Differenzen zwischen den beiden Unternehmenstypen überwunden und die Kontaktanbahnung bei unterschiedlichen regionalen Standortschwerpunkten erleichtert werden. Dieses Policy Paper zeigt den Stand der Kooperationsbeziehungen anhand verfügbarer Studien und einer ökonometrischen Auswertung des BDI-Familienunternehmenspanels. Basierend auf Experteninterviews mit Entscheidern aus Start-ups, Mittelstand und Verbänden werden Potenziale zur Stärkung der Kooperationsbeziehungen zwischen etabliertem Mittelstand und der wachsenden Start-up-Szene aufgezeigt. Das Paper schließt mit zehn wirtschaftspolitischen Empfehlungen, die der Stärkung und Erleichterung von Kooperationen dienen.

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