Corporate social responsibility as a driver of digital innovation in SMEs: the mediation effect of absorptive capacity

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Abstract: Currently, digital innovation is one of the biggest challenges facing small and medium-sized enterprises (SMEs). This study analyses how SMEs can achieve higher levels of digital innovation despite their lack of resources. Using a dataset consisting of 520 German SMEs, we propose and test a model in which corporate social responsibility enables knowledge-sharing and

supports SMEs in acquiring the resources needed for digital innovation development. As hypothesised, we found empirical evidence for a positive mediation effect in which absorptive capacity links corporate social responsibility and an SME's digital innovation output. In sum, this study helps to explain the relationship between corporate social responsibility and an SME's digital innovation, thus presenting far-reaching implications for SME research and the emerging scholarly debate on digital innovation in resource-constrained organisations.

Keywords: SMEs; small and medium-sized enterprises; boundary-spanning theory; digital innovation; corporate social responsibility; absorptive capacity.

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1 Introduction

Today, one of the most crucial challenges of small and medium-sized enterprises (SMEs) is maintaining competitiveness within a digital economy (Arendt, 2008; Nambisan et al., 2019; Quinton et al., 2018; Soluk and Kammerlander, 2021; Teece, 2018). The digital transformation of the economy increases production efficiency, shortens corporate innovation cycles, and results in a higher competitive intensity (Organisation for

Economic Co-operation and Development, 2018). While many new ventures today emerge from a digital entrepreneurial ecosystem (Elia et al., 2020; Le and Tarafdar, 2009; Sussan and Acs, 2017), most long-established SMEs have a competitive disadvantage because their businesses were founded and developed in a non-digital era (Arendt, 2008; Quinton et al., 2018; Soluk and Kammerlander, 2021). Considering that the adoption of digital technologies (including digital products, services, and processes) allows a firm to develop new and profitable businesses and market opportunities (Van Looy, 2021; Yoo et al., 2010), established SMEs face the challenge of adapting their pre-digital business to the new digital environment (European Commission, 2019). Innovation-related research has suggested that resource-scarce SMEs should open up their innovation processes to obtain external knowledge necessary for innovation development (Brunswicker and Vanhaverbeke, 2015; Grama-Vigouroux et al., 2020; Parida et al., 2012; Spithoven et al., 2013).

Chesbrough (2006) defines open innovation as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively" (Chesbrough, 2006, p.1). Since an open innovation process is more challenging to control than a closed innovation process, SMEs must have the ability to leverage external knowledge for commercialisation purposes (Grama-Vigouroux et al., 2020). Previous research has called this ability absorptive capacity (ACAP). However, ACAP can only be effective if information flows unequivocally between the firm and its stakeholders (Cohen and Levinthal, 1990; Lewin et al., 2011; Volberda et al., 2010; Zahra and George, 2002). Therefore, a company should find means of signalling trustworthiness to its stakeholders, motivating them to share their knowledge with the company (Bouncken, 2015). Corporate social responsibility (CSR) – a company's voluntary contribution to sustainable development, above and beyond any legal requirements (Carroll, 1999; Dahlsrud, 2008; Van Marrewijk, 2003) – is often used to this end (Hsueh, 2018; Su et al., 2016; Zerbini, 2017). CSR activities can strengthen the trust between the company and its stakeholders (Du et al., 2011; Spence et al., 2003; Vlachos et al., 2009; Voegtlin and Greenwood, 2016), which, in turn, can increase the firm's access to their stakeholder's knowledge (Bouncken, 2015). If firms can internalise this external knowledge, they can improve their innovation output (Bocquet et al., 2019; Martinez-Conesa et al., 2017; Wagner, 2010).

Although there is plenty of research on CSR, ACAP, and innovation within SMEs, researchers have not yet combined all three and studied the relationship and inter-relational dynamics between these three concepts. The same can be said for digital innovation, described as the creation of improved products, services, and business operations through digital technology (Fichman et al., 2014; Van Looy, 2021; Yoo et al., 2010). Examples of digital innovation would be streamlined operation processes based on automated analytics or enhanced user experience by optimising customer interfaces (Groberg et al., 2016). A crucial feature of digital technology is that digital data can be shared and combined with cooperation partners faster than through non-digital technology (Yoo et al., 2010). Consequently, digital innovation often has dispersed components, and its processes are frequently conducted with loosely organised external partners (Ciriello et al., 2018; Nambisan et al., 2017; Nylén and Holmström, 2015; Soluk et al., 2021b), thereby increasing the relevance of trust-building activities, such as CSR (Holmes and Smart, 2009), and poses the following research questions:

1 Which CSR activities affect digital innovation in SMEs?

2 Does ACAP mediate the relationship between CSR activities and an SME's digital innovation?

We derived a set of hypotheses based on Tushman's (1977) boundary-spanning theory to answer the research questions, explaining the exchange of knowledge across organisational boundaries. To better understand the relationship between CSR activities and digital innovation, we examined 520 German SMEs. We found an ACAP mediation effect between employee- or customer-related CSR and digital innovation, whereas community-related CSR seems to affect an SME's digital innovation directly. Together, these results contribute to SME research in several ways. Primarily, the results show that CSR is a strategic instrument that can be used effectively to achieve economic outcomes. The results also confirm Tushman's (1977) boundary-spanning theory explaining innovation-related issues in established SMEs. Our findings also contribute to the emerging discussion on how SMEs can overcome their resource constraints toward digital innovation by facilitating their network relationship ties with diverse external and internal stakeholders.

In the subsequent section, we discuss the current research literature and summarise the empirical findings of previous research on CSR, ACAP, and digital innovation in SMEs. Based on this review, we illustrate the theoretical framework and hypotheses we developed and then tested using the ordinary least squares regression. The final section discusses our findings and explains their theoretical and practical implications.

2 Theoretical framework

Tushman's (1977) boundary-spanning theory assumes that there is a constant exchange of information between different companies and that this exchange extends across the departmental boundaries within a company. Therefore, the theory has both an internal and an external perspective and suggests that people act as gatekeepers, linking the company with its stakeholders (Gould and Fernandez, 1989; Tortoriello et al., 2012). Consequently, they determine the flow of information across intra- or inter-organisational boundaries (Easterby-Smith et al., 2008), affecting the identification and integration of external knowledge within the internal innovation process (Aldrich and Herker, 1977; Fleming and Waguespack, 2007).

The key to acquiring external knowledge lies in knowing how to build better relationships with internal and external stakeholders (De Massis et al., 2018). CSR can then support these relationships (Hsueh, 2018; Spence et al., 2003; Su et al., 2016; Vlachos et al., 2009; Voegtlin and Greenwood, 2016; Zerbini, 2017) by acting as a boundary-spanning instrument. CSR is "the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life" (World Business Council for Sustainable Development, 2000, p.10). In implementing CSR, a company hopes to induce reciprocal behaviour patterns by positively influencing the relationship with stakeholders beyond economic interests (Niehm et al., 2008). El Akremi et al. (2018) distinguish three CSR activities: employee-, customer- and community-related CSR. Employee-related CSR activities aim to improve employee well-being and avoid discrimination (e.g., discrimination based on age, sex, ethnicity, or religion). Customer-

related CSR activities focus on product transparency and customer satisfaction above and beyond normal standards. Community-related CSR includes generalised activities, such as investments in humanitarian projects, financial help for social institutions, and even sponsoring the local sports club (El Akremi et al., 2018). By demonstrating good intentions via CSR, a stakeholder's confidence in a company can be strengthened considerably (Kervyn et al., 2012), thus increasing the probability that the stakeholders will share information and ideas with the company (Bouncken, 2015).

Hossinger et al. (2020) and Pütz et al. (2022) argue that CSR can create a knowledge-friendly environment, which, in turn, can increase a firm's ACAP, namely its "ability to recognise the value of new information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990, p.128). By following an open innovation approach, Holmes and Smart (2009) show that CSR is positively associated with linking internal with external knowledge and exploring innovation opportunities through idea exchange. It is often argued that CSR is a strong signal for meaningful cooperation (Hsueh, 2018; Su et al., 2016; Zerbini, 2017), and therefore, CSR activities improve the flow of information between stakeholders (Hoi et al., 2018; Ramachandran, 2011; Sen and Cowley, 2013). Consequently, CSR increases an SME's opportunities to acquire knowledge from external partners and utilise it beneficially (Holmes and Smart, 2009).

While little is known about the relationship between CSR and ACAP, previous research has already shown a positive link between CSR and innovation (Bocquet et al., 2019; Martinez-Conesa et al., 2017; Wagner, 2010). Martinez-Conesa et al. (2017) suggest that CSR leads to improved firm performance via higher innovation rates. According to Martinez-Conesa et al. (2017), CSR enhances recruitment quality, which is an essential contributing factor toward better firm performance. Wagner (2010) also maintains that companies with higher CSR can generate higher rates of socially sustainable innovation through improved recruitment. Technological innovations also seem to be positively affected and encouraged through CSR (Bocquet et al., 2019). Similar insights are revealed in studies with datasets of SMEs from the USA (Niehm et al., 2008) and Europe in general (Lasagni, 2012), indicating that ACAP plays a crucial role in the relationship between CSR and innovation processes within established SMEs.

It is essential to underline the roles of CSR activities and ACAP in digital innovation when considering its increasing relevance for an SME's long-term business success (Soluk and Kammerlander, 2021) and the idiosyncrasies that distinguish digital innovation from conventional innovation (Nambisan et al., 2019). In defining digital innovation, we follow Yoo et al. (2010, p.725), who conceptualise digital innovation "as the carrying out of new combinations of digital and physical components" to produce new products, services, and business operations (see also Fichman et al., 2014; Van Looy, 2021). Subsequently, digital innovation can also be a digitalised version of an earlier non-digital product, service, or process (Ciriello et al., 2018; Swanson, 1994). Yoo et al. (2010) argue that a characteristic of digital technology is that digital data and information can be shared and combined with cooperation partners more efficiently when compared to the sharing of analogue data and information. The nature of digital innovation allows for knowledge and expertise to be immediately gathered from multiple sources (Ciriello et al., 2018; Nylén and Holmström, 2015), which confirms the relevance of CSR's boundary-spanning effect.

3 Hypotheses development

The components necessary for digital innovation tend to be disseminated, as the digital innovation process is often conducted with loosely organised external partners (Ciriello et al., 2018; Nambisan et al., 2017; Nylén and Holmström, 2015; Soluk et al., 2021b), such as crowd-sourcing campaigns or ecosystems (Boudreau et al., 2011; Mollick, 2014; Nambisan, 2017), which make open innovation practices suitable for the development of digital innovation (Urbinati et al., 2020). Therefore, SMEs with scarce resources must open up their innovation process (Brunswicker and Vanhaverbeke, 2015; Grama-Vigouroux et al., 2020; Parida et al., 2012; Spithoven et al., 2013), shifting from a centrally planned innovation process to one decentralised and enriched with ideas, knowledge, and technologies from external stakeholders (Chesbrough, 2006). Despite limited resources, opening up the innovation process and adding information and knowledge from outside the business enables the firm to develop new technologies (Parida et al., 2012; Werner et al., 2018), which facilitates digital innovation processes and outcomes (Ciriello et al., 2018; Nambisan et al., 2017; Nylén and Holmström, 2015; Soluk et al., 2021a). An example of open innovation is developing software by applying open-source development processes. Firms doing this are more innovative than those using less collaborative development methods (Piva et al., 2012).

Given that an open innovation process requires the channelling of information from outside the organisation to the inside and vice versa (Chesbrough and Bogers, 2014), both internal (i.e., employees) and external stakeholders (i.e., community members) are relevant innovation resources for the firm (Gassmann et al., 2010). Some actors may have strong ties both within the company and with external stakeholders (i.e., customers), thus having a hybrid role. However, these exchange processes require trust between the collaboration partners (Ceci and Iubatti, 2012; Lowik et al., 2012). The stronger the firm's relationship with its internal and external cooperation partners, the better the information exchange (Lowik et al., 2012). Hence, generating a positive effect on a firm's innovation output is dependent on timely and efficient identification and management of relationship networks (Brunswicker and Vanhaverbeke, 2015; De Massis et al., 2018; Granovetter, 1983; Gurău and Lasch, 2011).

Therefore, the collaboration process with employees, customers, and the community in general (e.g., universities or local authorities) is of utmost importance in a digital innovation process. Employee-related CSR activities can be used strategically to acquire a decent reputation as an employer (Voegtlin and Greenwood, 2016), resulting in an increased willingness to share information and promote innovation (Ko and Choi, 2019). Customer-related CSR positively affects a customer's perception of a firm (Hur et al., 2014; Luo and Bhattacharya, 2006), encouraging interactive feedback and the development of new or improved products or processes (Cheng et al., 2014). Moreover, community-related CSR enables SMEs to establish valuable relationships with the community, allowing them access to the strategically relevant information they often lack (Niehm et al., 2008; Spence et al., 2003). Therefore, employee-, customer- and community-related CSR activities serve as instruments to facilitate trust among collaboration partners, enhancing information sharing in a digital innovation process. Consequently, we hypothesise the following:

H1a: An increase in employee-related CSR is positively associated with SME's digital innovation.

H1b: An increase in customer-related CSR is positively associated with SME's digital innovation.

H1c: An increase in community-related CSR is positively associated with SME's digital innovation.

Digital technological knowledge is a vital resource for companies wanting to enhance the development of digital innovation (Lyytinen et al., 2016; Tiwana and McLean, 2005). However, as SMEs have relatively low visibility compared to larger companies, their reputation is not as widely acknowledged, making them less desirable when recruiting highly qualified employees (Cable and Turban, 2003). Motivating employees working within the company, keeping fluctuation low, and presenting the company in a positive and employee-friendly light can make them more desirable. Furthermore, it is easier for smaller companies to form relationships with their staff than their larger counterparts (Wilkinson, 1999), which is particularly important when applying intra-organisational knowledge exchange (Maurer et al., 2011). Concerning the latter, Lin (2007) emphasises that a knowledge-sharing climate significantly impacts employees' willingness to share their knowledge with others.

Cohen and Levinthal (1990) argue that the ability to commercialise new knowledge relies on the availability of intra- and inter-organisational networks and on the ability to manage those knowledge streams. The latter's effectiveness is not merely determined by the potential access to outside knowledge but, more importantly, by the actual ability to acquire, assimilate, translate, and exploit it internally. While network relationships are the precondition for knowledge spillovers, ACAP is the determining parameter for the actual usage of this knowledge within the firm (Lichtenthaler and Lichtenthaler, 2009). In this context, the company must create a culture that promotes collaboration (Hossinger et al., 2020). Zahra and George (2002) suggest conducting activities (e.g., fostering social networks) to improve the social integration of internal and external stakeholders, which increases the firm's ACAP by lowering the knowledge-sharing barriers.

Employee-, customer- and community-related CSR activities can draw favourable attention to the firm, thus creating an image of trustworthiness (Du et al., 2011; Niehm et al., 2008; Spence et al., 2003; Vlachos et al., 2009; Voegtlin and Greenwood, 2016) and encouraging internal and external stakeholders to interact with each other and share their knowledge with the company (Holmes and Smart, 2009), thus actively contributing to the innovation process. Therefore, in line with earlier research (Hossinger et al. 2020; Pütz et al. 2022), CSR can help strengthen the SME's ability to acquire, assimilate, translate, and exploit external knowledge, thus positively influencing ACAP. We hypothesise the following:

H2a: An increase in employee-oriented CSR activities is positively associated with SME's ACAP.

H2b: An increase in customer-oriented CSR activities is positively associated with SME's ACAP.

H2c: An increase in community-oriented CSR activities is positively associated with SME's ACAP.

Digital innovation is a creative transformation of knowledge requiring appropriate adaptation to a firm's specific business environment and effective use and incorporation of different sources' knowledge and expertise. The decentralised nature of digital

innovation complicates the management of specific and diverse independent knowledge streams (Ciriello et al., 2018; Nambisan et al., 2017; Nylén and Holmström, 2015). A firm's acting individuals are required to integrate external knowledge into its digital innovation process to ensure successful knowledge transformation (Tiwana and McLean, 2005). Considering that the significant barriers to the digitisation of SMEs are not related to the availability of hard- and software but the shortage of skilled personnel (Arendt, 2008), it is particularly evident that ACAP is a crucial precondition to foster SMEs' digital innovation processes (Zobel, 2017).

Recent literature has shown that CSR can positively affect SMEs' technological innovation (Bocquet et al., 2019). Considering that there is a missing link between CSR and innovation outcomes, Surroca et al. (2010) find that CSR positively affects human capital, reputation, and the organisational culture of a firm, consequently increasing its financial performance. Similarly, Tang et al. (2012) theoretically use ACAP to explain the relationship between CSR and economic outcomes. Since ACAP enables a firm to adapt to changing market requirements more effectively, Kostopoulos et al. (2011) found empirical evidence that ACAP positively affects a firm's innovation performance. Transferring these findings to the phenomenon of digital innovation – which we understand as a new combination of digital and physical components (Fichman et al., 2014; Van Looy, 2021; Yoo et al., 2010) – we argue that the ability to acquire, assimilate, translate, and use external knowledge internally is a critical success factor and mediator toward digital innovation.

Looking through a boundary-spanning lens, we claim that investments in employee-, customer- and community-related CSR activities should positively affect digital innovation by utilising new external knowledge through ACAP. Specifically, we propose that the CSR activities in which SMEs have invested incentivise employees' interactions and involvement and encourage them to share their knowledge (Fernhaber and Patel, 2012), leading to a positive impact on digital innovation. Furthermore, the consideration of ACAP might lead firms to process novel information and knowledge derived from CSR activities more effectively, which might constitute a mediation concerning the role of ACAP in the CSR digital innovation relationship. Thus, we also follow Surroca et al. (2010) by positing that ACAP is an intangible asset and should at least partially mediate the relationship between CSR and digital innovation and propose the following hypotheses:

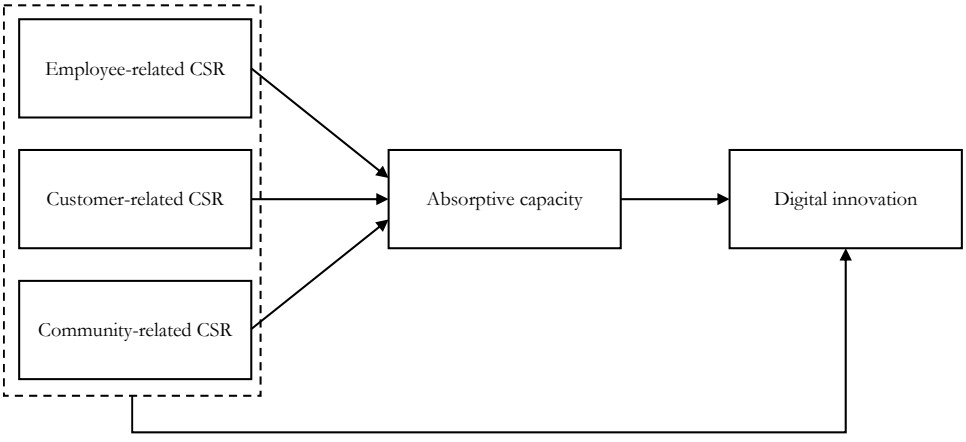
H3a: ACAP mediates the relationship between SME's employee-related CSR and digital innovation.

H3b: ACAP mediates the relationship between SME's customer-related CSR and digital innovation.

H3c: ACAP mediates the relationship between SME's community-related CSR and digital innovation.

The theorised relationships are depicted in Figure 1.

Figure 1 Conceptual model



4 Methodology

4.1 Measures

Dependent variable. The dependent variable derived from our hypotheses is digital innovation. According to Yoo et al. (2010) and Van Looy (2021), digital innovation is the implementation of new combinations of digital and physical components to create digital products, services, and operations. We used Groberg et al.'s (2016) method to measure an SME's digital innovation performance. This measurement consists of two subscales:

1 digital products and services

2 digital operations.

The first subscale comprises four items encompassing the breadth of digitised products or services, and determining whether digital goods are created by a firm (Groberg et al., 2016; Porter and Heppelmann, 2014). The second subscale also comprises four items and reflects the adoption of digital technologies that monitor, optimise, and automate a company's operational processes (Groberg et al., 2016; Porter and Heppelmann, 2014). In sum, we examined eight different items ranging from the development of digital products and services to the digitisation of processes along the value chain. Following Yoo et al. (2010), we used these subconstructs to identify digital innovation. We measured all items on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The standardised loadings for our digital innovation measure were all above 0.700. Cronbach's alpha referring to instrument reliability was $\alpha = 0.896$, and Raykov's factor reliability coefficient referring to composite reliability was $r = 0.898$. Moreover, confirmatory factor analysis showed that all items loaded significantly and resolutely on each subdimension and were associated with reasonable-to-good measures of model fit (CFI = 0.829; RMSEA = 0.195). Subsequently, we achieved satisfactory validity and reliability for our digital innovation measure. We averaged the individual items to obtain the score for our regression analysis.

Independent variables. The independent variables derived from our hypotheses are

1 employee-related CSR

2 customer-related CSR

3 community-related CSR.

We measured these CSR activities with El Akremi et al.'s (2018) established CSR scale. Employee-related CSR, encompassing seven items, deals with issues such as work-life balance, training opportunities, health and safety, discrimination, and employee company support. The way a company treats its customers is reflected by the customer-related CSR subscale, which includes five items. Community-related CSR, also comprising seven items, describes the extent to which a company is engaged in improving local social life in its region. All items were self-reported and measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Principal-component factor analysis showed that the 19 items of the overall CSR measure loaded on three components, with factor loadings of 0.520 or higher. The reliability coefficient Cronbach's alpha is $\alpha = 0.841$ for employee-related CSR, $\alpha = 0.679$ for customer-related CSR, and $\alpha = 0.861$ for community-related CSR. Raykov's factor reliability coefficient $r = 0.822$ for employee-related CSR, $r = 0.682$ for customer-related CSR, and $r = 0.860$ for community-related CSR. Confirmatory factor analysis showed that all items loaded significantly and resolutely on each subdimension and were associated with reasonable-to-good measures of model fit (CFI = 0.885; RMSEA = 0.072). Although Cronbach's alpha narrowly missed the recommended 0.700 threshold for employee-related CSR, the overall confirmatory factor analysis results indicated a reasonable degree of instrument reliability (Taber, 2018). The items were averaged to obtain a score for the various CSR activities.

Mediator variable. The mediator variable is ACAP, which organisational research defines as the ability to "acquire, assimilate, transform and exploit external knowledge" (Zahra and George, 2002, p.186) for commercial ends. ACAP's focus lies on knowledge creation (Matusik and Heeley, 2005) and the method of learning and utilising knowledge from external stakeholders (Lane and Lubatkin, 1998). Based on this definition, we built on the established ACAP construct designed by Jansen et al. (2005) and adapted by Fernhaber and Patel (2012). This construct consists of two subscales, measuring the potential (through nine items) and the realised ACAP of a company (through 11 items). All items of the subscales were self-reported and measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The standardised loadings for the overall ACAP measure ranged from 0.260 to 0.700, Cronbach's alpha was $\alpha = 0.867$, and Raykov's factor reliability coefficient was $r = 0.872$. Although the standardised loading on the overall ACAP measure was slightly below the minimum criterion of 0.300 in one item (0.260), the scale has been extensively tested and applied in quantitative business research. Moreover, confirmatory factor analysis (CFI = 0.787; RMSEA = 0.080) points to good reliability and fit for this study's purpose. All items were condensed using an average index for our empirical regression analysis.

Control variables. We considered several control variables that could simultaneously affect ACAP and digital innovation. We controlled various industry sectors such as manufacturing, construction, trade, services, and crafts. We expected that firms within the manufacturing and service sectors would naturally demonstrate higher levels of

innovation and ACAP than firms within the trade or crafts sector. We created six dummy variables, each representing a specific industry sector. If the company was part of the industry sector, the dummy value took 1; if the company was not part of the industry sector, the dummy value took 0. Then we controlled for the firm's size and age. In terms of size, previous studies indicate that a firm's size is positively connected with both a firm's capacity to innovate and its ACAP (Tsai, 2001; Jansen et al., 2005); therefore, we included the number of employees in the metric form. Likewise, previous studies indicate that older firms could have an advantage in experience over younger firms (Autio et al., 2000; Jansen et al., 2005); accordingly, we included the firm's age as a further control. We also controlled for innovation. Previous research indicates that central drivers of ACAP are internal research and development investments and conventional cooperation activities (Cohen and Levinthal, 1990; Mowery et al., 1996). Therefore, as a proxy for research and development activities, we controlled whether the company had introduced new products, services, or processes to the market within the last three years. Furthermore, we controlled for competitiveness. This control reflects a company's comparative competitive advantage. Consequently, we asked firms to provide information about how they assess their economic success, image, capacity for innovation, job security, and wage level compared to their closest competitor. Additionally, we controlled for a firm's business situation (Chih et al., 2010; Kashmiri and Mahajan, 2014) by asking firms to evaluate their current business situation in terms of total revenue, earnings before interest and taxes, and cash flow. Considering that a firm's awareness of digitisation is beneficial for both ACAP (Coronado-Medina et al., 2020) and digital innovation (Groberg et al., 2016), we also controlled for a firm's degree of digitisation. Moreover, as assessing a firm's CSR, ACAP, and digital innovation depend on a certain degree of a respondent's position and the related range of tasks within the firm, we controlled whether the respondent was a managing director, board member, or part of the remaining staff. Finally, we added university cooperation in innovation projects to control the firm's innovation engagement with external partners.

Table 1 describes the variables we used in our regression models.

Table 1 Descriptions of variables

Variable	*Description*
Digital innovation	Constructed Scale, 8 items, measured on a five-point Likert scale (1 = doesn't apply at all to 5 = entirely true), for a detailed descriptions of all items please see Appendix 1.
Absorptive capacity	Constructed Scale, 21 items, measured on a five-point Likert scale (1 = doesn't apply at all to 5 = entirely true), for a detailed descriptions of all items please see Appendix 2.
Employee-related CSR	Constructed Scale, 5 items, measured on a five-point Likert scale (1 = doesn't apply at all to 5 = entirely true), for a detailed descriptions of all items please see Appendix 3.
Customer-related CSR	Constructed Scale, 7 items, measured on a five-point Likert scale (1 = doesn't apply at all to 5 = entirely true), for a detailed descriptions of all items please see Appendix 3.
Community-related CSR	Constructed Scale, 7 items, measured on a five-point Likert scale (1 = doesn't apply at all to 5 = entirely true), for a detailed descriptions of all items please see Appendix 3.

Table 1 Descriptions of variables (continued)

Variable	*Description*
Manufacturing	Which industry does your company belong to? (1 = manufacturing, 0 = else)
Construction	Which industry does your company belong to? (1 = construction, 0 = else)
Trade	Which industry does your company belong to? (1 = trade, 0 = else)
Services	Which industry does your company belong to? (1 = services, 0 = else)
Crafts	Which industry does your company belong to? (1 = crafts, 0 = else)
Other sectors	Which industry does your company belong to? (1 = other sectors, 0 = else)
Firm's age	How many employees are currently employed in your company? (metric)
Firm's size	How old is your company? (metric)
Innovation	Has your company introduced new or significantly improved products to the market (i.e., product innovations) and/or has implemented process innovations in the last three years? (1 = yes, 0 = no)
Business situation	Constructed Scale, 3 items, measured on a five-point Likert scale (1 = very good, 5 = insufficient), How do you assess the current business situation of your company in terms of a) total revenue, b) total earnings and c) cash-flow?
Competitiveness	Constructed Scale, 5 items, measured on a five-point Likert scale (1 = much worse to 5 = much better), Please compare your company with your most important competitor in terms of a) economic success, b) image, c) capacity for innovation, d) job security, e) wage level.
Degree of digitisation	Please compare your company with your most important competitor in terms of the degree of digitisation. (Likert scale: 1 = much worse to 5 = much better)
Managing director	What is your current position? (1 = founder and managing director, 0 = else)
Board member	What is your current position? (1 = part of the executive board, 0 = else)
Staff	What is your current position? (1 = staff, 0 = else)
University cooperation	Were the product and/or process innovations introduced in the last three years developed in cooperation with universities? (1 = yes, 0 = no)

4.2 Sample and data

We based our empirical analysis on a dataset collected by surveying 73,023 privately-owned German companies between January and March 2019. We randomly selected all companies using the Bureau van Dijk's AIDA database in its full version. Out of the 73,023 companies we addressed via email, 70,714 did not participate. In total, we received responses from 2309 privately-owned companies, corresponding to a response rate of 3.16%. We excluded responses leaving the relevant questions unanswered. Furthermore, the SME's definition of the Institut für Mittelstandsforschung (IfM, 2016) Bonn, whereby the SME must employ less than 500 people and have an annual turnover of under 50 million Euros, led us to exclude those firms not complying with this definition, yielding a sample of 520 German SMEs to estimate the empirical models used to test our hypotheses.

To ensure the quality of the data, we employed well-tested scales from previous research and consulted independent experts in survey design and methodology. We comprehensively surveyed self-reported information provided by the companies regarding their current business and market situations, their ability to recognise, assimilate, and apply new knowledge for commercial ends, and their CSR activities. Since the survey was conducted in Germany, questions were first translated into German and then into English for this paper. To further ensure the data quality, we tested for potential non-response bias and common-method bias. Specifically, we tested for non-response bias by comparing the respondents' characteristics (e.g., number of employees and firm age) with those of the non-respondents and found no significant mean differences. We also tested for potential common-method bias by performing Harman's single-factor test (Harman, 1967). The results indicated an eight-factor solution with eigenvalues greater than one, cumulatively explaining 65.46% of the overall variance; the first of these factors accounted for 12.37% of the explained variance. Thus, we can disregard both non-response and common-method bias in this study.

4.3 Results

In terms of descriptive characteristics, the responding SMEs are, on average, 49 years old and have 68 employees. In terms of the industry sector, 38% of them are from the service sector, followed by the manufacturing (20%), trade (12%), construction (10%), and crafts (9%) sectors. The remaining 11% is from other sectors. Table 2 gives the descriptive characteristics of the variables used in the empirical analysis.

The pair-wise correlations among critical variables show only weak correlations between the independent variables. Moreover, the variance inflation factors range from 1.09 (lowest value) to 3.52 (highest value). Overall, these results suggest the presence of moderate multi-collinearity (Hair et al., 1998). Hence, the confidence intervals produce more reliable probabilities, and the statistical significance of the independent variables is not undermined in the empirical model. Table 3 shows the pair-wise correlations among key variables.

We tested our research hypotheses empirically by applying the multiple linear regression approach following Baron and Kenny's (1986) and MacKinnon et al.'s (2007) mediation analysis procedure. Therefore, we estimated five regression models: in Models 1 and 2, we examined the influence of the controls on a company's ACAP and digital innovation; then, in Model 3, we regressed the employee-, customer- and community-related CSR on ACAP; in Model 4, we examined the influence of the different CSR activities on the extent of digital innovation. Finally, in Model 5, we measured both CSR activities and ACAP on digital innovation. We present the estimation results of our five regression models in Table 4. The results show supporting evidence for hypotheses 1c, 2a, 2b, 3a, and 3b and the lack of it for hypotheses 1a, 1b, 2c, and 3c.

Table 2 Descriptive statistics and reliability

Variable	*Mean*	*Std. Dev.*	*Min.*	*Max.*	*Cronbachs α*	*Raykov's rel.*
Dependent variable						
Digital innovation	3.197	0.943	1	5	0.896	0.898
Mediator variable						
Absorptive capacity	3.732	0.503	2.143	4.85	0.867	0.872
Independent variable						
Employee-related CSR	4.097	0.686	1	5	0.841	0.822
Customer-related CSR	4.433	0.548	1	5	0.679	0.682
Community-related CSR	2.563	0.978	1	5	0.861	0.860
Controls						
Manufacturing	0.202	0.402	0	1	0	0
Construction	0.100	0.300	0	1	0	0
Trade	0.123	0.329	0	1	0	0
Services	0.381	0.486	0	1	0	0
Crafts	0.087	0.281	0	1	0	0
Other sectors	0.108	0.310	0	1	0	0
Firm's age	48.921	38.181	1	219	0	0
Firm's size	67.81	89.868	0	500	0	0
Innovation	0.617	0.487	0	1	0	0
Business situation	3.645	0.765	1.333	5	0.833	0.847
Competitiveness	3.554	0.546	1	5	0.706	0.713
Degree of digitisation	3.229	0.884	1	5	0	0
Managing director	0.302	0.460	0	1	0	0
Board member	0.535	0.499	0	1	0	0
Staff	0.163	0.370	0	1	0	0
University cooperation	0.060	0.237	0	1	0	0

Number of obs. = 520.

Regarding Model 2, we found that well-performing innovative SMEs with a more pronounced awareness of digitisation in the service sector increased their digital innovations. Interestingly, the SME firm size seems to have no significant impact on digital innovation. In Model 4, we found that employee-related CSR ($\beta = 0.11376$; p-value = 0.072), customer-related CSR ($\beta = 0.17696$; p-value = 0.027), and community-related CSR ($\beta = 0.08750$; p-value = 0.026) each provide a positive significant effect on an SME's digital innovation. Thus, following Model 4, hypotheses 1a, 1b, and 1c seem to be supported by the data. Furthermore, the results of Model 3 show significant positive effects for both employee-related CSR ($\beta = 0.23926$; p-value = 0.000) and customer-related CSR ($\beta = 0.20918$; p-value = 0.000) on SMEs' ACAP. These results confirm both hypotheses 2a and 2b. However, no significant effect was found for community-related CSR ($\beta = 0.00653$; p-value = 0.749), leading us to reject hypothesis 2c.

Table 3 Correlation matrix

		I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*	*XI*	*XII*	*XIII*	*XIV*	*XV*	*XVI*	*XVII*	*XVIII*	*XIX*	*XX*	*XXI*
	Dependent variable																					
1)	Digital innovation	1																				
	Mediator variable																					
2)	Absorptive capacity	0.42	1																			
	Independent variables																					
3)	Employee-related CSR	0.28	0.54	1																		
4)	Customer-related CSR	0.25	0.46	0.50	1																	
5)	Community-related CSR	0.25	0.30	0.41	0.34	1																
	Controls																					
6)	Manufacturing	–0.05	0.03	0.08	0.12	0.05	1															
7)	Construction	–0.11	–0.03	–0.01	–0.01	0.03	–0.17	1														
8)	Trade	0.02	0.06	–0.00	0.02	–0.02	–0.19	–0.12	1													
9)	Services	0.20	0.02	0.01	–0.02	0.02	–0.39	–0.26	–0.29	1												
10)	Crafts	–0.09	–0.06	–0.01	0.06	–0.01	–0.15	–0.10	–0.12	–0.24	1											
11)	Other sectors	–0.08	–0.04	–0.09	–0.20	–0.10	–0.17	–0.12	–0.13	–0.27	–0.11	1										
12)	Firm's age	–0.05	0.07	0.03	0.08	0.09	0.21	0.15	0.03	–0.26	0.02	–0.05	1									
13)	Firm's size	0.06	0.08	0.16	0.10	0.12	0.10	0.09	–0.12	0.00	–0.11	0.01	0.23	1								
14)	Innovation	0.35	0.27	0.26	0.28	0.28	0.18	–0.12	0.01	–0.06	0.00	–0.03	0.12	0.11	1							
15)	Business situation	0.16	0.31	0.20	0.07	0.14	–0.03	0.14	–0.12	–0.01	–0.01	0.06	0.08	0.08	0.07	1						
16)	Competitiveness	0.21	0.40	0.29	0.23	0.25	–0.04	0.02	–0.00	0.05	–0.00	–0.03	–0.00	0.07	0.21	0.43	1					
17)	Degree of digitisation	0.47	0.29	0.19	0.15	0.17	–0.09	–0.04	–0.00	0.16	0.01	–0.08	–0.05	0.03	0.20	0.17	0.43	1				
18)	Managing director	–0.05	–0.01	0.01	0.10	0.11	–0.04	0.05	0.02	–0.03	0.17	–0.12	–0.02	–0.18	0.03	–0.04	0.14	0.04	1			
19)	Board member	0.04	0.08	0.05	–0.01	–0.02	–0.01	–0.10	–0.00	0.12	–0.12	0.04	–0.04	0.04	–0.00	–0.03	–0.08	0.05	–0.70	1		
20)	Staff	0.01	–0.09	–0.07	–0.11	–0.11	0.06	0.08	–0.02	–0.12	–0.04	0.10	0.08	0.17	–0.03	0.09	–0.06	–0.11	–0.29	–0.47	1	
21)	University cooperation	0.18	0.16	0.10	0.11	0.13	0.16	–0.00	–0.09	–0.03	–0.02	–0.04	0.11	0.24	0.20	0.07	0.15	0.16	0.01	–0.03	0.02	1

Number of obs. = 520.

Table 4 Ordinary least squares regression estimation results

	Model 1 (DV: Absorptive capacity)			*Model 2 (DV: Digital innovation)*			*Model 3 (DV: Absorptive capacity)*			*Model 4 (DV: Digital innovation)*			*Model 5 (Digital innovation)*		
	Coef.	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*
Independent variable															
Employee-related CSR							0.23926	(0.03506)	***	0.11376	(0.06301)	*	0.00684	(0.06536)	
Customer-related CSR							0.20918	(0.04860)	***	0.17696	(0.07981)	**	0.08348	(0.07505)	
Community-related CSR							0.00653	(0.02043)		0.08750	(0.03913)	**	0.08458	(0.03824)	**
Mediator variable															
Absorptive capacity													0.44686	(0.08554)	***
Controls															
Manufacturing[1]	0.05649	(0.07656)		0.03425	(0.12820)		–0.07807	(0.06766)		–0.07552	(0.12527)		–0.04063	(0.12057)	
Construction[1]	–0.01138	(0.08784)		–0.03261	(0.15537)		–0.10885	(0.07909)		–0.12464	(0.15419)		–0.07600	(0.14874)	
Trade[1]	0.16080	(0.07708)	**	0.28506	(0.13763)	**	0.04879	(0.06806)		0.19474	(0.13300)		0.17294	(0.12638)	
Services[1]	0.04291	(0.06897)		0.34203	(0.11479)	***	–0.04504	(0.06125)		0.26183	(0.11189)	**	0.28196	(0.10549)	***
Crafts[1]	–0.03116	(0.09446)		–0.09146	(0.15593)		–0.14854	(0.08159)	*	–0.18610	(0.14962)		–0.11973	(0.14697)	
Firm's age	–0.00028	(0.00148)		–0.00516	(0.00260)	**	–0.00052	(0.00130)		–0.00579	(0.00257)	**	–0.00556	(0.00246)	**
Firm's age * firm's age	0.00000	(0.00001)		0.00003	(0.00001)	*	0.00001	(0.00001)		0.00003	(0.00001)	**	0.00003	(0.00001)	**
Firm's size	0.00006	(0.00020)		–0.00001	(0.00042)		–0.00030	(0.00020)		–0.00030	(0.00042)		–0.00017	(0.00041)	

Table 4 Ordinary least squares regression estimation (continued)

	Model 1 (DV: Absorptive capacity)			*Model 2 (DV: Digital innovation)*			*Model 3 (DV: Absorptive capacity)*			*Model 4 (DV: Digital innovation)*			*Model 5 (Digital innovation)*		
	Coef.	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*	*Coef.*	*St. Err.*	*Sig.*
Innovation	0.17241	(0.04287)	***	0.52744	(0.07681)	***	0.05756	(0.03846)		0.41764	(0.07924)	***	0.39192	(0.07739)	***
Business situation	0.12918	(0.02981)	***	0.13940	(0.05095)	***	0.10544	(0.02774)	***	0.12234	(0.04982)	**	0.07522	(0.04814)	
Competitiveness	0.2105	(0.04546)	***	–0.14484	(0.07453)	*	0.12231	(0.04167)	***	–0.21931	(0.07443)	***	–0.27397	(0.07428)	***
Degree of digitalisation	0.05720	(0.02614)	**	0.42465	(0.04540)	***	0.04585	(0.02294)	**	0.41424	(0.04405)	***	0.39375	(0.04254)	***
Managing director[2]	0.06482	(0.06749)		–0.20431	(0.10975)	*	–0.00213	(0.05755)		–0.28076	(0.11169)	**	–0.27981	(0.10789)	***
Board member[2]	0.14381	(0.06205)	**	–0.13427	(0.09417)		0.07882	(0.05057)		–0.19253	(0.09338)	**	–0.22776	(0.09099)	**
University cooperation	0.13020	(0.09477)		0.32958	(0.12512)	***	0.13327	(0.07334)	*	0.31856	(0.12375)	**	0.25901	(0.12331)	**
Constant	2.06474	(0.15952)	***	1.61126	(0.29319)	***	0.82421	(0.22096)	***	0.73649	(0.37520)	*	0.36818	(0.34356)	
R–squared	0.261			0.349			0.449			0.384			0.416		
F–test	11.89		***	19.67		***	19.07		***	18.79		***	22.71		***
Number of obs	520			520			520			520			520		

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, robust standard errors in parentheses; [1]Reference: Other sectors; [2]Reference: Staff.

Following the four-step procedure to assess the potential mediation by ACAP (Baron and Kenny, 1986; MacKinnon et al., 2007), the results from Model 5 show that ACAP fully mediates the relationship between employee- and customer-related CSR and digital innovation. As shown in Model 4, employee- and customer-related CSR positively effects an SME's digital innovation. Then, as shown in Model 3, a significant positive relationship was found between employee- or customer-related CSR and SME's ACAP. Next, Model 5 shows that a significant relationship exists between ACAP and digital innovation ($\beta = 0.44686$; p-value = 0.000) when controlling for employee-, customer- and community-related CSR. Finally, in Model 5 the coefficients of employee-related CSR ($\beta = 0.00684$; p-value = 0.917) and customer-related CSR ($\beta = 0.08348$; p-value = 0.267) are no longer significant, which indicates a full mediation. In conclusion, we observed two mediation effects for employee- and customer-related CSR: the relationship between these two CSR activities and digital innovation is mediated by ACAP. Consequently, we found supporting evidence for hypotheses 3a and 3b. Moreover, although a positive relationship between employee- and customer-related CSR and digital innovation initially appears in Model 3, in-depth mediation analysis shows that ACAP is the crucial link between employee- and customer-related CSR to digital innovation. The direct effects of both employee- and customer-related CSR on digital innovation are not significant, and therefore, their effect on digital innovation is fully mediated by ACAP. Thus, ultimately, hypotheses 1a and 1b are not supported by the data.

Moreover, the results from the bootstrap test (MacKinnon et al., 2007) show that the mediation effects are significantly different from zero. The statistical significance was tested with 5,000 bootstrap samples on a 95% bias-corrected confidence interval level. A mediation effect is classified as significant in the bootstrap test if zero is not within the respective range of the bootstrapping confidence intervals. The estimation results show that ACAP mediates the relationship between employee-related CSR and digital innovation, as zero is not within the respective range of the bootstrapping confidence interval (lower limit = 0.064; upper limit = 0.168). This finding strengthens the empirical support for hypothesis 3a.

Furthermore, the bootstrap test shows similar results for the mediating role of ACAP in terms of customer-related CSR. Again, zero is not within the bootstrapping confidence interval (lower limit = 0.049; upper limit = 0.160), further supporting hypothesis 3b. However, we found no empirical support that ACAP mediates the relationship between community-related CSR and digital innovation. The results of the bootstrap test show that zero lies within the respective range of the bootstrapping confidence interval (lower limit = –0.015; upper limit = 0.022). As a result, the mediation effect is insignificant. Therefore, we must reject hypothesis 3c. The results can be found in Table 5.

Finally, to check the robustness of our results, we ran the regression models using the path analysis part of the structural equation model known as the structural component, and we obtained the necessary coefficients using a seemingly unrelated regression model. Our main results remained robust. Table 6 provides an overview of the hypotheses and their empirical support.

Table 5 Bootstrap estimation for mediation effects

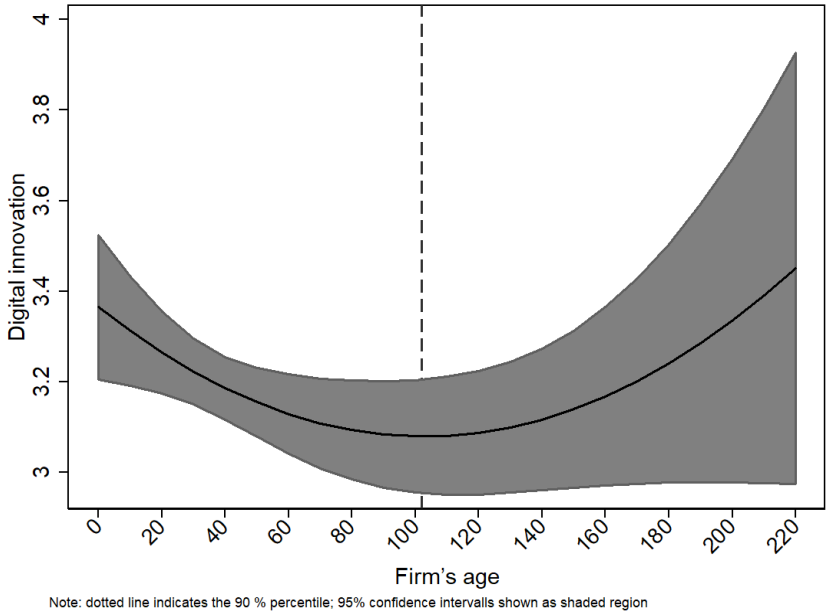
	Bootstrap Coef.	*Bootstrap SE*	*Lower-level Bootstrap CI*	*Upper-level Bootstrap CI*
Employee-related CSR (indirect effect)	0.107	0.026	0.064	0.168
Customer-related CSR (indirect effect)	0.095	0.027	0.049	0.160
Community-related CSR (indirect effect)	0.003	0.009	–0.015	0.022
TOTAL indirect effect	0.203	0.044	0.130	0.305

Table 6 Results of the hypotheses testing

H1a:	*An increase in employee-related CSR activities is positively associated with SME's digital innovation.*	×
H1b:	*An increase in customer-related CSR activities is positively associated with SME's digital innovation.*	×
H1c	*An increase in community-related CSR activities is positively associated with SME's digital innovation.*	✓
H2a:	*An increase in employee-related CSR activities is positively associated with SME's ACAP.*	✓
H2b:	*An increase in customer-related CSR activities is positively associated with SME's ACAP.*	✓
H2c:	*An increase in community-related CSR activities is positively associated with SME's ACAP.*	×
H3a:	*ACAP mediates the relationship between SME's employee-related CSR activities and digital innovation.*	✓
H3b:	*ACAP mediates the relationship between SME's customer-related CSR activities and digital innovation.*	✓
H3c:	*ACAP mediates the relationship between SME's community-related CSR activities and digital innovation.*	×

Regarding the effects of our control variables, it is worth drawing attention to the age effect on digital innovation. Analytically, we checked for the non-linearity of the relationship by adding quadratic (squared) power terms as a non-linear model (Mitchell, 2012). As shown in Model 5, we found empirical evidence for a significant non-linear relationship ($\beta_{age} = –0.00556$; $p = 0.024$; $\beta_{age*age} = 0.00003$; $p = 0.042$). In Figure 2, we illustrate the curved nature of the relationships based on the predicted values of Model 5. We found a U-shaped (convex) relationship between the firm's age and digital innovation. We also found that digital innovation decreases with firm's age for most SMEs (i.e., left of the dashed line that indicates the 90% percentile).

Figure 2 Ordinary least squares quadratic regression results (visualisation of the age effect)



Note: dotted line indicates the 90 % percentile; 95% confidence intervalls shown as shaded region

5 Discussion

Established SMEs with a scarce resource base often lack the skilled personnel necessary for digital innovation (Arendt, 2008; Soluk and Kammerlander, 2021). Based on a survey of 520 German SMEs, we explored how established SMEs can succeed in a digital economy by examining CSR and ACAP and using these as drivers of digital innovation. We found that employee-, customer- and community-related CSR activities increase the digital innovation possibilities in SMEs. Specifically, the relationships between employee- or customer-related CSR activities and digital innovation are fully mediated by ACAP.

ACAP seems to act as a bridge between both employee- and customer-related CSR activities and digital innovation, which contradicts our assumption that through CSR, increased information flows between a firm and its stakeholders will directly increase the firm's digital innovation. CSR helps a firm build the capabilities to process this new information and apply it to commercial ends. An explanation for this finding may be that through CSR, increased trust between a firm and its employees or customers (Du et al., 2011; Spence et al., 2003; Vlachos et al., 2009; Voegtlin and Greenwood, 2016) results in a higher interaction, thereby improving mutual understanding (Cheng et al., 2014). Increased understanding of employees and customers may allow the firm to better transform stakeholders' loosely expressed thoughts into specific products and processes (Liao et al., 2007). Especially in an open innovation context, CSR can increase trust among stakeholders to facilitate the digital innovation process. Hence, boundary-spanning CSR activities act as strategic tools for SMEs aiming at outperforming competitors.

However, we found no mediating effect for the relationship between community-related CSR and digital innovation, which shows that although community-related CSR activities can positively affect an SME's digital innovation, it is not due to an increase in its ability to acquire, assimilate, transform, and exploit new knowledge. This could be because the community generally does not have enough network ties within the studied SMEs and cannot affect a firm's ACAP. Following Surroca et al. (2010), we believe that other intangible assets mediate the relationship between community-related CSR and digital innovation. Although we have not definitively ascertained the extent of the effect of community-related CSR on digital innovation, we can assume that it is not ACAP.

Our analyses reveal a U-shaped (convex) relationship between firm age and digital innovation. While young SMEs show relatively high levels of digital innovation, these decrease when a firm is aging which is in line with empirical research concerning non-digital innovation, proving that older firms tend to decrease in innovativeness since they tend to engage in lower-risk and, consequently, more incremental innovation (Balasubramanian and Lee, 2008; Coad et al., 2016). We found a similar pattern for digital innovation, proving that new ventures, which tend to be previously founded in a digital ecosystem (Elia et al., 2020; Le and Tarafdar, 2009; Sussan and Acs, 2017), achieve higher levels of digital innovation than older SMEs (Arendt, 2008; Quinton et al., 2018; Soluk and Kammerlander, 2021). Hence, established SMEs need to counteract their decreasing ability to innovate digitally by conducting CSR activities. However, in our data sample, we found a few particularly old SMEs that managed to avoid such a decrease and have exceptionally high levels of digital innovation, thus leading to the U-shaped (convex) relationship between firm age and digital innovation. We encourage future research to explore the key drivers making those firms more successful than others in digital innovation.

Our research enabled us to make essential theoretical contributions. We contributed to the debate on whether CSR generates positive economic business outcomes (Barnett, 2007; Bocquet et al., 2019; Matten and Moon, 2008). By building trust and reciprocity toward different stakeholders, CSR activities positively affect economic outcomes. As previous research has indicated, this effect is not necessarily direct (Surroca et al., 2010; Tang et al., 2012) but is mediated by intangible assets, such as ACAP, in terms of stakeholders with network ties. Our results show that the pathway of achieving economic outcomes through CSR strongly depends on which stakeholder benefits from the respective CSR activity, highlighting the relevance of CSR as a strategic instrument in fostering economic outcomes.

In addition, we provided evidence for the relevance of the boundary-spanning theory, particularly regarding innovation in SMEs. Often, established SMEs do not have the necessary resources to enter new markets successfully when seeking further exploration of market opportunities (Baumbach et al., 2020; Dias et al., 2020). This resource lack also applies to the adoption of new technologies. Using Tushman's (1977) boundary-spanning theory, we provided a new explanation of how SMEs with insufficient resources can manage to acquire, assimilate, transform, and exploit external knowledge sources (i.e., ACAP). The compatibility of the boundary-spanning theory with the concept of open innovation allows a more comprehensive understanding of the economic aspects of CSR and the innovation process of resource-lacking SMEs in general.

Furthermore, we contributed to the ongoing debate on how companies, especially SMEs, can improve their competitive position in a digitally transformed economy (Soluk and Kammerlander, 2021). Specifically, SMEs can overcome their lack of knowledge by

opening up their innovation process. We explained how SMEs could accelerate their digital innovation output by fostering proper relationships with their stakeholders (i.e., conducting CSR). Our empirical analyses showed that SMEs could support digital innovations by increasing their ACAP through CSR activities while targeting different stakeholders. Therefore, we increased the theoretical understanding of how SMEs can use their network relations optimally to adapt and be competitively viable within a digital economy.

From a practical standpoint, many SMEs may be unaware that CSR activities can help them efficiently solve future problems related to their resource scarcity, whether digital or non-digital. SMEs should learn to advertise their use of CSR activities and take advantage of them for economic improvement. For example, through sustainability reporting (Hsueh, 2018), CSR activities can signal to stakeholders, thereby encouraging meaningful cooperation (Su et al., 2016; Zerbini, 2017). Moreover, especially since a company's ability to innovate seems to decrease with age (Balasubramanian and Lee, 2008; Coad et al., 2016), resource-scarce SMEs could explicitly evaluate the potential benefits of investing in CSR activities.

Nevertheless, as in any empirical study, some factors limited the results of our analyses. The examined SMEs were ultimately too small to provide accessible, comprehensive, and publicly available information, and due to their size, they were not required to provide detailed reports. Since the determinants of interest are socially desirable, there is also a risk that the reported data may be biased (El Akremi et al., 2018). Furthermore, we are aware that misleading practices (e.g., greenwashing) can cause external parties to doubt the sustainability information promulgated by organisations (Lock and Seele, 2016). However, this enables future research to take a deeper look into how CSR-related greenwashing impacts the processes described in our study.

The implementation of CSR strategies within a company necessitates a significant time lapse before the effects can be assessed. A panel dataset should be used to explore the causal relationship between CSR and its outcomes. However, our study is based on cross-sectional data collected in Germany at a single point in time. That is, even though we are confident that a mediation analysis is the appropriate model to test our research question, we are aware that, from an empirical viewpoint, we have to refer to this model as a causal model in a highly restricted sense. Thus, many alternative explanations could probably be offered with the empirical model we propose – including reverse causality. However, we believe that this is a problem with almost any statistical analysis. Consequently, this means that the causal arguments must be strongly grounded in a set of strong theoretical predictions, which we believe is the case in this study.

Moreover, our study did not consider every feasible predictor from previous studies, thus, omitted variable bias might be an issue. For instance, previous studies indicate that available financial resources, employee commitment, or the amount of time invested is critical for an SME's digital innovation process (Soluk and Kammerlander, 2021). Although our context-related research approach affects the general applicability of our results, it offers the possibility of testing our results using datasets from different cultural and economically developed regions, which can help to understand CSR-related outcomes through comparative studies.

6 Conclusion

We identified a growing interest in digital innovation, where current research provides little insight into how established SMEs should position themselves competitively in a digitised economy and remain competitive when hampered by resource constraints. Our study successfully shows that CSR, as a boundary-spanning instrument, can be used to drive digital innovation by increasing ACAP. Especially in an open innovation context, CSR increases the effectiveness of developing digital innovation. Furthermore, the theoretical concept of our study provides a solid basis for future SME-specific CSR and digital innovation research.

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Appendix 1: Digital innovation scale

Question: Please now answer the following four blocks of questions. These relate to the degree of digitisation of your company (1 = strongly disagree; 5 = strongly agree). Our company...

Digital products and services

1 ... offers digital services or products.

2 ... leverages digital technologies to complement its existing offerings.

3 ... enriches its current products or services with digital technologies.

4 ... adapts its business model according to digital, commercial opportunities.

Digital operations

5 ... has digitised processes along the value chain.

6 ... continuously optimises and streamlines operation processes based on automated analytics.

7 ... provides tools for digital collaboration.

8 ... optimises its operation processes within the ecosystem by securing data compatibility.

Source: Groberg et al. (2016)

Appendix 2: Absorptive capacity scale

Question: Please indicate to what extent you agree with the following statements (1 = strongly disagree; 5 = strongly agree):

Potential absorptive capacity

1 We have frequent interactions with other in the industry to acquire new knowledge related to product development.

2 Employees are engaged in cross-functional work.

3 We collect information through informal means (e.g., lunch or social gatherings with customers and suppliers, trade partners and other stakeholders).

4 We are hardly in touch with other firms and stakeholders in the industry. (reverse-coded)

5 We organise special meetings with customers, suppliers, or third parties to acquire new knowledge on process, product, logistics and distribution related innovation.

6 We operations regularly approach third parties outside the industry (such as professional organisations) to gather information.

7 We are slow to recognise shifts in the environment (e.g., competition, regulation and demography). (reverse-coded)

8 We are able to quickly identify new opportunities to meet our customer needs.

9 We quickly analyse and interpret changing market demands.

Realised absorptive capacity

10 We regularly consider the consequences of changing market demands in terms of new products.

11 Employees record and store newly acquired knowledge for future reference.

12 We quickly recognise the usefulness of new external knowledge to existing knowledge.

13 Our employees hardly share practical experiences with each other. (reverse coded)

14 We laboriously grasp the opportunities from new external knowledge. (reverse-coded)

15 Departments periodically meet to discuss consequences of new product development and other process or organisation innovation.

16 It is clearly known how activities within and between departments should be performed.

17 We are less responsive to customer complaints. (reverse coded)

18 We have a clear division of roles and responsibilities.

19 We constantly consider how to better exploit knowledge.

20 We have difficulty implementing new products and new processes. (reverse-coded)

21 Our employees speak a common language regarding our innovation practices.

Source: Fernhaber and Patel (2012)

Appendix 3: Corporate social responsibility scale

Question: Please indicate to what extent you agree with the following statements (1 = strongly disagree; 5 = strongly agree):

Employee-related CSR

1 Our company implements policies that improve the well-being of its employees at work.

2 Our company promotes the safety and health of its employees.

3 Our company avoids all forms of discrimination (age, sex, handicap, ethnic or religious origin) in its recruitment and promotion policies.

4 Our company supports equal opportunities at work (e.g., gender equality policies).

5 Our company encourages employees' diversity in the workplace.

6 Our company helps its employees in case of hardship (e.g., medical care, social assistance).

7 Our company supports its employees' work and life balance (e.g., flextime, part-time work).

Customer-related CSR

8 Our company checks the quality of goods and/or services provided to customers.

9 Our company is helpful to customers and advises them about its products and/or services.

10 Our company respects its commitments to customers.

11 Our company invests in innovations which are to the advantage of customers.

12 Our company ensures that its products and/or services are accessible for all its customers.

Community-related CSR

13 Our company invests in humanitarian projects in poor countries.

14 Our company provides financial support for humanitarian causes and charities.

15 Our company contributes to improving the well-being of populations in the areas where it operates by providing help for schools, sporting events, etc.

16 Our company invests in the health of populations of developing countries (e.g., vaccination, fight against AIDS).

17 Our company helps NGOs and similar associations such as UNICEF, the Red Cross, and emergency medical services for the poor.

18 Our company gives financial assistance to the poor and deprived in the areas where it operates.

19 Our company assists populations and local residents in case of natural disasters and/or accidents.

Source: El Akremi et al. (2018)