International Journal of Innovation Management
(2020) 2150002 (26 pages)

DOI: 10.1142/S136391962150002X

PERCEPTION OR CAPABILITIES? AN EMPIRICAL INVESTIGATION OF THE FACTORS INFLUENCING THE ADOPTION OF SOCIAL MEDIA AND PUBLIC CLOUD IN GERMAN SMEs

SOHAIB S. HASSAN*

KONTIKAT, Faculty III, University of Siegen, Germany
Kohlbettstr. 15, 57072 Siegen, Germany

SME Graduate School, Faculty III, University of Siegen
Unteres Schloss 3, 57072 Siegen, Germany
sohaib.hassan@uni-siegen.de

CHRISTIAN REUTER

Science and Technology for Peace and Security (PEASEC)
Technical University of Darmstadt, Pankratiusstraße 2
64289 Darmstadt, Germany

LEVAN BZHALAVA

Finland Futures Research Centre, Turku School of Economics
University of Turku, Rehtorinpellonkatu 3
Turku, 20500, Finland

Caucasus School of Business, Caucasus University
Paata Saakadze 1, Tbilisi, 0102, Georgia

Published 20 March 2020

Social media and public cloud computing (SM&PC) have emerged as important resources of small and medium enterprises (SMEs), but not all SMEs use SM&PC. The existing research predominantly focuses on the role of either the features of social media and cloud computing in relation to the perceptions of decision makers or the internal capabilities of organization concerning new innovation adoption. By integrating multidisciplinary literature, we, instead, argues that both the perception- and capability-related factors could play an important role in the adoption of new ICT technology, such as SM&PC. Therefore, we empirically investigated the decision maker's perception-related and SME's

*Corresponding author.

capability-related factors that may influence the adoption of SM&PC in SMEs in Germany. We used quantitative research methods to examine the proposed hypotheses on a sample of 2,404 SMEs from 17 industrial sectors. The results demonstrate that the decisions of German SMEs to engage in social media and cloud computing are not only influenced by the perceptions of SME owners about the usefulness, security aspects, and the implementation costs of SM&PC, but also by the internal capabilities of an SME, namely the innovativeness of an SME. The results and potential contributions of our research are discussed.

Keywords: Social media; cloud computing; SMEs; digital transformation; technology adoption.

Introduction

Digital technologies have altered the business practice and organisational culture across the globe. The convergence of modern digital technologies is widely believed to be the next source of innovation and productivity in organisations (Jung *et al.*, 2013). A plethora of emerging digital technologies and concepts, such as social media, big data, internet of things, cloud computing and mobile technology, are widely employed in the organisations to scale the business processes. No other technology, however, is as mainstream as social media network and cloud computing. Both technologies have gained considerable popularity due to their versatility and adaptability (Motta *et al.*, 2012; Correia *et al.*, 2014).

Although social media and cloud computing are two different digital technologies with their distinct usage and applications, the existing overlap between the two technologies (e.g., social cloud, scaling advantages), cost benefits, and their preponderance have made these technologies somewhat essential to the organisational settings. The contemporary literature has demonstrated that organisations are increasingly adopting and relying on social media and cloud computing to enhance their existing features, information exchange, and knowledge sharing as well as creating new values for their businesses. A large body of existing literature explores the opportunities and challenges of social media and cloud computing in large organisations (Krasnova *et al.*, 2009; Risius and Beck, 2015), whereas similar research on small and medium enterprises (SMEs) has only started growing recently (Ainin *et al.*, 2015; McCann and Barlow, 2015; Ross and Blumenstein, 2015; Mikkonen and Khan, 2016; Brink, 2017; Keegan and Rowley, 2017; Delerue and Cronje, 2015).

Scholars argue that social media and cloud computing, particularly the public cloud computing (hereafter collectively referred to as SM&PC) could be of particular relevance to the unique features of SMEs (Aljabre, 2012; Gupta *et al.*, 2013; He *et al.*, 2015). For instance, by adopting social media applications, SMEs

can enhance their consumer base through efficient and cost-effective marketing as well as by providing brand awareness and product improvements through prompt customer feedback (Colliander and Dahlén, 2011; Michaelidou and Siamagka, 2011). Similarly, while large organisations can afford to have their own cloud platforms, public cloud computing platforms become more relevant to SMEs, and enable them to use their internal resources through efficient collaboration, data management and skill identification in a cost effective manner (Richter *et al.*, 2013; Klier *et al.*, 2015). Subsequently, it increases their competitive positioning in the market (Lau, 2011). More recently, scholars have pointed to the relevance of SM&PC applications for the business continuity management in terms of communication, disaster recovery and information security (Carcary *et al.*, 2014; Reuter *et al.*, 2017).

Evidentially, the pace of SM&PC adoption among SMEs is slower than that of the large organisation (Saldanha and Krishnan, 2012) because SMEs, due to their limited resources and skeptical nature, tend to overlook the advantages of emerging information and communication technologies (ICT) and are less inclined to employ new digital technologies in this regard, such as SM&PC (Damanpour, 1992; Harland *et al.*, 2007). The puzzle, however, is if SM&PC are so beneficial to SMEs, why do substantial disparities in the SM&PC adoption among SMEs across countries exist? For instance, a relatively larger number of SMEs in the United States of America (USA) are using social media networks and public cloud computing compared to their counterparts in Europe (Clutch, 2018; Statista, 2018). An imbalance of SM&PC adoption exists even among the European SMEs (Beier and Wagner, 2016). For instance, in Germany, according to the Centre of European Economic Research's 2015 German ICT report (ZEW, 2015), only 20% of German organisation used any type of publicly available cloud computing, whereas around 44% used social media platforms (Statista, 2018).

At the aggregate level, scholars sometime attribute these disparities to the relative difference in the pace of the knowledge economy development in the USA and EU. For instance, the emergence of the knowledge economy in the USA has been faster, when compared to the EU, mainly due to their burgeoning ICT industry and a higher level of investments in the sector (van Ark *et al.*, 2008). At the firm level, literature in different fields underscore different factors that explain the slower pace of SM&PC adoption in SMEs, and there exists an obvious lack of scholarly consensus. On one hand, the literature in the information systems overwhelmingly focuses on the features (e.g., usefulness, interface, cost, security risks, etc.) of a new technology and the behavioural aspects of the decision makers to elicit its adoption in an organisation (Davis, 1986). The literature in the strategic management, on the other hand, underscores the critical importance of firm-specific capabilities and their relationship to the new technology adoption in SMEs e.g., Rogers (2003).

Against this background, converging on different strands of literature, we argue that the ICT adoption is a strategic decision within an organisation, and such decisions are contingent upon a combination of factors that emerge from the existing entrepreneurial and capability-related aspects of an SME, and their potential compatibility with the new ICT technologies, in this case, SM&PC. Along these lines, we empirically examine our key research question: to what extent behavioural and capability-related aspects of strategic decision making in SMEs influence the SM&PC adoption.

In order to address our research questions, unlike the previous research, we use quantitative methods to empirically explore the factors that affect the SM&PC adoption among a large sample of German SMEs. The remainder of this study proceeds as follows: First, we provide a literature review and develop our hypotheses. Then we describe our data and explain our methodology. In the ensuing section, we present and discuss our results. Finally, we conclude.

Literature Review and Hypothesis Development

Social media and cloud computing

Social media network is defined as a set of internet-based digital applications that are built upon web 2.0 and allow the interactive communication, creation and exchange of user generated content among users, and customers (in case of organisations) across a multitude of devices (Murugesan, 2007; Kaplan and Haenlein, 2010). User generated content ranges from text posts to pictures and videos. Although several social media applications (e.g., Facebook, YouTube, Twitter, and Xing) have gained popularity among the users, Facebook is, by far the largest social media network. The active user base of Facebook was approximately 2.27 billion in 2018 (Statista, 2018).

Cloud computing is the delivery of on-demand services through the internet (IBM, 2015). These services include, but not limited to, the hosting, backup and collaboration among the users with an access to the cloud network. The storage in cloud-based system, instead of on local computers, is on a remote server. This feature alone enables cloud computing a sought after and cheap alternatives to more costly backup solutions. Cloud computing is offered both through a public medium and a private medium. The current market of cloud computing stands at 130 billion U.S. dollars worldwide (Gartner, 2017). The public cloud computing services (e.g., Google drive, Dropbox) are more widespread due to their cost benefits (Columbus, 2017). Public cloud services are either offered free of cost to the users or with a premium much lower than private or local cloud storage options. In addition to data storage, cloud platforms, particularly the public cloud

platforms, offer a range of scalability services to the SMEs (Gupta *et al.*, 2013; Assante *et al.*, 2016), including but not limited to, data backup, internal collaboration and business continuity management.

Social media and public cloud computing adoption in SMEs

Role of decision maker's perceptions

Previous empirical evidence suggests that SMEs adopt new ICT technologies merely due to either the peer pressure or customer demand rather than realizing the real competitive advantage of the strategic implementation of ICT technology in their organisations (Egan *et al.*, 2003). SMEs, compared to the large organisations, are considered strategically flexible (Damanpour, 1992; Utterback, 1994; Stock *et al.*, 2002). However, SMEs, due to their limited capabilities and resources, pursue a cautious approach toward adopting and implementing new technologies and processes, especially the ICTs.

The literature in organisational behaviour and psychology suggests that the individual decisions in organisations are conscious and determined by the perceptions and beliefs of decision makers (Ajzen, 2002). Since the SMEs are largely owner-manager oriented and the strategic decision-making is mostly in the hands of a few individuals, the role of entrepreneurs in the strategic decision making becomes more profound (Thong and Yap, 1995). Similarly, the entrepreneurship literature underscores that the psychology of entrepreneurs in SMEs plays a key role in the strategic decision-making process, particularly in relation to the openness to new ideas and innovation adoption (Zhao and Seibert, 2006).

In addition to the entrepreneurial aspects, the innovation and innovation diffusion literature indicate that organisational decisions can also be drawn from the characteristics of an innovation and perceptions about it (Moore and Benbasat, 1991; Rogers, 2003). That is to say, the decision makers are inclined to adopt innovations that are perceived by them as useful and compatible with their organisational settings (Tornatzky *et al.*, 1990; Damanpour and Schneider, 2009; Hameed and Counsell, 2014). In line with the definition of innovation in the extant literature e.g., (Damanpour, 1992; Rogers, 2003), online social networks (e.g., Facebook) and public cloud computing services (e.g., Google Drive) are essentially new innovations and offer tremendous opportunities and challenges to the businesses.

The literature, further, demonstrates that the compatibility of innovation depends on the potential benefits it offers to the organisation, such as relative advantage in performance boost and when the level of complexity (e.g., implementation, maintenance) aligns with their existing skillset (Tornatzky and

Klein, 1982; Rogers, 2003). Similarly, in the context of new technology or innovation adoption in an organisation, the literature in information systems accentuates the importance of the perception of the adopter (decision maker). For instance, the Technology Acceptance Model (TAM) by Davis (1989) is considered as an influential model to elicit the behavioural aspects of new ICT adoption and acceptance in organisations (Venkatesh and Davis, 2000; Rauniar *et al.*, 2014). TAM underscores the critical importance of the perception of decision makers in relation to the adoption of a new information technology in an organisation (Davis, 1989). Specifically, the key contributors constitute the extent to which a decision maker perceives a new technology as advantageous to the business, and suitable to their extant skill-set, as well as being useful and easy to implement (Venkatesh and Davis, 2000; Rogers, 2003; Lybaert, 1998; Sawang and Unsworth, 2011). The perceived advantages can be in terms of performance gains and convenience concerning the adaptability with the existing technological settings in their organisations (Davis, 1989; Venkatesh and Davis, 2000).

Taken together, a new technology or innovation adoption in an organisation is, indeed, a strategic decision and the perception about a new ICT technology would influence its adoption decision in SMEs. A decision maker in an SME would only implement a new ICT technology (a new innovation) when it is perceived to be relatively more advantageous than existing technologies in their organisation, thus:

H1: *The perception of SME decision maker about social media network and cloud computing influences the SM&PC adoption decisions in an SME*

Determinants of perception in SMEs

A review of the existing literature in the domain of SMEs and new technology/innovation adoption research enable us to identify two main determinants of perception about new ICT innovation in SMEs: (1) security and privacy concerns and (2) perception about the associated costs.

***Security and Privacy Concerns*:** SMEs generally internalise on their specialised skills and lack necessary, and diversified, capabilities related to the implementation of technologies beyond the scope of their operations. This subsequently leads the decision makers in SMEs to be averse against impending uncertainties associated with the adoption of new technologies or to simply overlook the potential of new technologies, such as ICT, for their businesses (Dixon *et al.*, 2002; Hashim, 2007). New innovations, such as social media applications and cloud computing, may present a number of undesirable aspects which can be detrimental to their adoption in an organisation, such as lack of control, higher degree of

uncertainty, and critical information leakage over the internet (Meyer and Goes, 1988; Ahmad *et al.*, 2014; Laursen and Salter, 2014). Although the security parameters of social media applications have been greatly enhanced overtime, the existing empirical evidence demonstrate that SME owners are still found to be concerned about the data security risks associated with the SM&PC adoption in their organisations (Taylor and Murphy, 2004; Ahmad *et al.*, 2014; Khan *et al.*, 2014; Beier and Wagner, 2016). Along these lines, we posit that:

H1a: *Concerns about privacy and security influence the SM&PC adoption decisions in an SME*

Perception about the Associated Costs: Although social media tools and cloud computing are arguably more advantageous for SMEs due to their cost-effectiveness (Aljabre, 2012; He *et al.*, 2015), SMEs, owing to their limited resources, are still generally wary of unnecessary financial burden in the shape of impending costs and hidden expenses, especially in the absence or shortage of relevant labour (Aldrich and Auster, 1986; Drew, 2003; Nieto and Fernández, 2005; Ghobakhloo *et al.*, 2010). Furthermore, since SMEs usually do not have the knowledge and human capital beyond their fields of expertise, the decision maker perceive additional cost allocation to hire skilled or relevant labour an unnecessary financial burden, and this often leads to an inability to identify the true potential of emerging technologies or unwillingness to adopt new ICT technologies (Levenburg *et al.*, 2015). In such circumstances, owners believe that the investment might not be cost effective and might not bring any value added to their existing business model (Taylor and Murphy, 2004). Against this background, we posit that

H1b: *Perception about implementation costs influences the SM&PC adoption decisions in an SME*

Role of organisational capabilities

The behavioural aspects of decision maker's perceptions about an emerging technology are not considered the only factors that might determine the actual adoption of new technologies in an organisation, particularly when it comes to the adoption of ICT applications (Rauniar *et al.*, 2014). Scholars in the strategic management literature have underscored the role of endogenous organisational attributes of firms in facilitating their technological trajectories and capabilities (Pavitt, 1984). Scholars have argued that firms internal capabilities, such as innovativeness, skilled labour and productivity, are essential to firms to gain and maintain their competitive positions in the markets, locally and beyond (Porter, 1980). Similarly, the resource-based view of a firm suggests that firms employ their distinct strategic resources to

gain a competitive advantage in the market through constant learning and experience over time (Wernerfelt, 1984; Caldeira and Ward, 2003).

The future strategic decisions of firms are also determined by their previously acquired strategic resources and capacities (Cohen and Levinthal, 1990; Penrose, 1995). Such resources and capacities of a firm are accumulated overtime through previous related experience, human capital and knowledge, and leads it to develop abilities, such as innovation capabilities, to recognise knowledge value, appropriation, and assimilation (Cohen and Levinthal, 1990; Zahra and George, 2002; Lawson and Samson, 2001; Unsworth *et al.*, 2012). Such abilities thus enable firms to identify the potential of an emerging technology and to predict its relative success in their organisation (Cohen and Levinthal, 1990).

Furthermore, the innovation diffusion literature suggests that the entrepreneurial orientation drawn from their previous successful experience might establish a tendency among entrepreneurs to adopt new technologies (Rogers, 2003). The entrepreneurship literature also asserts that, due to the closely knitted communication and controlling mechanisms in SMEs, an entrepreneur's innovation orientation is decisive in implementing new ideas and adopting new innovations, thus shaping the capabilities of their organisations over time (Zhao and Seibert, 2006). Similarly, the literature in evolutionary economics also underscores that the implementation of new technologies in a firm is history-dependent, that is, firms with a positive prior experience with new technologies, their successful assimilation among the labour force, and the motivation of the workforce to learn new technologies, are more open to the acceptance of new innovations (Nelson and Winter, 1982). Moreover, increased collaboration in this regards with other SMEs, coupled with accumulated experience, leads to an increased knowledge sharing across organisation (Ferreira and du Plessis, 2009) and hence openness to new technologies and innovations (Flaig and Stadler, 1994).

In the strategic management literature, scholars have argued that the existing organisational culture and the organisational capabilities facilitate the strategic application of new technology in an organisation. It is because the strategic implementation of emerging technologies in organisational settings in the past might have led to an increase in firm productivity (Black and Lynch, 2001). Furthermore, firm managers remember from their previous experience with the skilled labour in hand and the successful usage of ICT in the past (Nelson and Winter, 1982; Hempell *et al.*, 2004). Furthermore, based on internal capabilities, it is widely acknowledged that more innovative firms are relatively more open to adopting new technologies compared to less innovative organisations (Flaig and Stadler, 1994). In terms of new ICT adoption, such internal resources and experience might provide them with the capacities of increased collaboration and a low-cost maintenance compared to costlier content management systems.

Consequently, through strategic implementation of their resources based on their internal capabilities (Nelson and Winter, 1982), more capable firms are able to tap the market through an efficient mix of innovation, related labour and production inputs to meet their customers' demands and expand business operations (Wilson, 2009; Tornatzky *et al.*, 1990; Damanpour and Schneider, 2009).

Therefore, against the presented background, we argue that the strategic implementation of new ICT technologies is associated with the internal capabilities (innovativeness, skilled labour and firm productivity) of the organisations, that is to say, the existing organisational culture and the organisational capabilities, in addition to the behavioural aspects of technology adoption, facilitate the strategic application of new technology in an organisation. Therefore, we posit that:

H2: *Internal capabilities of an SME influence its decision to adopt SM&PC*

Data and Methodology

Data

The dataset used in this study comes from the Centre of European Economic Research (ZEW)'s 2015 ICT survey. The survey was part of the project — ZEW ICT Survey: Diffusion and Use of ICT. The survey aimed to get a representative overview of the usage and the diffusion of ICT among German firms.

The ICT survey consists of four waves (2003, 2005, 2007, 2010, and 2015). The population of the ICT survey encompasses all firms based in Germany with a minimum of five employees. The final sample of the survey of about 4134 firm (out of the total population of 359,367 German firms at the start of the survey) is then drawn using a stratified sampling design, with stratifications in terms of size and 17 industrial sectors (ZEW, 2015; Bertschek *et al.*, 2018). We, however, use only the data from the latest wave (2015), as the questions pertaining to our research were available only in this survey.

Our dataset contains information about firm characteristics, location, innovation, and ICT-related behaviours. Since we based our analysis only on SMEs, we removed all firms with more than 250 employees (large organisations) from our sample. We have used the European Commission's definition of an SME to structure our data (European Commission, 2003).

Our final sample consists of 2,404 German SMEs. Most of the sample firms are from the service sector (58%), whereas around 42% of the sample consists of manufacturing SMEs. A further breakdown of the sample according to the industrial sectors is presented in Table 1. An industrial distribution of our sample shows that the highest proportion of the sample consists of the manufacturer of

Table 1. Industrial distribution: sector.

Industry	Frequency	Percentage
Consumer goods	342	14.23
Chemistry and Pharmaceutics	85	3.54
Raw materials	198	8.24
Metal industry	157	6.53
Electronics industry	145	6.03
Engineering	123	5.12
Automobile industry	65	2.7
Medical engineering	269	11.19
Retail trade	128	5.32
Wholesale trade	109	4.53
Transportation service	123	5.12
Media service	89	3.7
Telecommunication services	112	4.66
Financial service	94	3.91
Management consulting	136	5.66
Technological services	100	4.16
Corporate services	129	5.37
Total	2,404	100

consumer goods (14.23%) and medical engineering industry (11.19%), whereas the lowest proportion of the sample consists of automobile industry (2.7%).

Table 2 presents the geographical distribution of the sample. A significantly large number of the sample SMEs are in the largest federal states of Germany, i.e., North Rhine-Westphalia (17.76%), Bavaria (16.47%) and Baden-Württemberg (12.27%). Our sample also demonstrates a clear disparity between the former East Germany and former West Germany, as most of the SMEs (72%) are from the former West Germany.

Variables

Our dependent variables are binary variables of decision to use public cloud computing and social media network, and they measure whether an SME has implemented cloud computing and social media network in the year preceding the survey, or not. Table 3 presents the list of all the variables that we have used in this study.

Perception-specific variables: We use three explanatory variables to test our first set of hypotheses pertaining to the behavioural aspects of decision maker's

Table 2. Geographical distribution: German Federal States.

Federal states	Frequency	Percentage
Schleswig-Holstein	52	2.16
Hamburg	39	1.62
Lower Saxony	199	8.28
Bremen	19	0.79
North Rhine-Westphalia	427	17.76
Hessen	172	7.15
Rhineland-Palatinate	97	4.03
Baden-Württemberg	295	12.27
Bavaria	396	16.47
Saarland	25	1.04
Berlin	88	3.66
Brandenburg	88	3.66
Mecklenburg-Western Pomerania	48	2.00
Saxony	219	9.11
Saxony-Anhalt	97	4.03
Thuringia	143	5.95
Total	2,404	100

perception. Namely, we use perceived usefulness, security & privacy concerns and implementation costs. Our variables are measured through the binary responses of SMEs about the possible influence of said aspects on the implementation of social media and cloud computing in their organisations. Our variables are binary variables (1,0) where, where "1" indicates the presence of attribute and "0" indicates usually the absence of attribute. That is to say, with a variable taking value of "1" for each observation, it exerts an influence on the SM&PC adoption decision.

Capability-specific Variables: We test our second hypothesis pertaining to the capabilities of SMEs by using three variables. Our variable "innovativeness" is a categorical variables and measures how innovative an SME is, and it corresponds to the question in the survey whether an SME has innovated (product innovation, process innovation or both) in years prior to the survey. Our variable, "skilled labour" measures the number of ICT specialists in an SME as an indicator of an SME's ICT skill-base. Our variable "productivity" measures the labour productivity of an SME (as sales per employ) in the previous year.

Control variables: We also control for the factors that could otherwise affect our results. We control for the size (small, medium or micro), industrial sector (Manufacturing or service industry), sales market (exporter and non-exporter) and the end-customer base (B2b or B2C) of the SMEs in our sample.

Table 3. Variables.

Variable	Description	Measurement
Dependent variables		
Cloud Computing	Use of public cloud computing for collaboration (e.g., OneDrive, Google Drive)	Binary [0 (no) - 1 (yes)]
Social Media Network	Use of social media network (public profile on a social media website such as Facebook)	Binary [0 (no) - 1 (yes)]
Independent variables		
Perceived Usefulness	Management concerns and perception about the usefulness or need in the organisation	Binary [0 (no) - 1 (yes)]
Security & Privacy Concerns	Content control and privacy aspects of social media and public cloud networks	Binary [0 (no) - 1 (yes)]
Implementation Cost	Potential and unforeseen costs	Binary [0 (no) - 1 (yes)]
Innovativeness	Product or process innovations in the previous years	Categorical Variable (0: no innovation, 1: product or process innovation, 2: both product and process innovation)
Skilled Labour (ICT)	Share of ICT specialists in an SME	Log (number of full-time employees with ICT-related qualification)
Productivity	Labour productivity	Log (sales/employee)
Control variables		
Size	Size in terms of number of employees	Categorical Variable (1. Micro, 2. Small, 3. Medium)
Sector (d)	Main industrial sector of an SME	Dummy, (1. Service, 0. Manufacturing)
Exporter (d)	Sales market of an SME	Dummy (1. Exporter, 0. Non-exporter)
End customer (d)	Target customers of an SME	Dummy (1. Consumer, 0. Business)

Research Methodology

We consider a simplified decision-making process for an SME. We assume that an SME's decision to adopt social media and public cloud computing is contingent upon perception-based and capability-based factors. Since our dependent variables are binary in nature, a discrete choice model is the most suitable one. In our dataset, the implementation of social media network and that of cloud computing are potentially interdependent. Given this scenario, if we estimate two separate equations for our dependent variables, a pairwise correlation can possibly emerge from the error terms of two independent equations. This, in return, can make our estimates biased and inconsistent. We address this issue by using the bivariate probit estimation technique. In contrast to other logistic model, bivariate probit techniques enables us to model our two binary dependent variables as functions of the same set of explanatory variables. Furthermore, keeping in view our sample size, this way, we expect to get more reasonable estimates with a reduced level of endogeneity (Chiburis *et al.*, 2012). Finally, by using bivariate probit,1 we can estimate a simultaneous system of two equations and allow the error terms to correlate across equations freely and obtain unbiased estimates (Freedman and Sekhon, 2010).

Results

Descriptive statistics

Table 4 presents the descriptive statistics of the sample. The Variance Inflation Factor (VIF) values of all the explanatory variables and the mean VIF (1.21) are

Table 4. Descriptive statistics.

Variable	VIF	Mean	Std. dev.	Min.	Max.
Perceived Usefulness	1.39	0.616889	0.486246	0	1
Security & Privacy Concerns	1.22	0.583611	0.493062	0	1
Implementation Cost	1.36	0.537438	0.4987	0	1
Innovativeness	1.14	0.759151	0.427688	0	2
Skilled Labour (ICT)	1.09	2.14	8.337114	0	150
Productivity	1.09	−2.203	0.792316	−5.07517	1.791759
Size	1.11	2.105241	0.730517	1	3
Sector	1.2	0.424293	0.494338	0	1
Exporter	1.39	0.453827	0.497967	0	1
End Customer	1.08	0.197171	0.397946	0	1
Mean VIF	1.21				

far below the acceptable threshold of 10 (Neter *et al.*, 1985), indicating that the multicollinearity is not a serious concern in the estimations.

Estimation results

Table 5 reports the results of our bivariate probit estimation models for public cloud computing (Model 1) and social media network (Model 2). The models predict the likelihood of cloud computing and social media network adoption among the decision makers of the sample.

In terms of the perceptions of the decision maker, the results reveal that 'perceived usefulness' positively and significantly influences both the decisions to use public cloud computing and social media network among the sample SMEs

Table 5. Bivariate probit regression results.

	Public cloud computing (1)	Social media network (2)
Role of Perception		
Perceived Usefulness	0.249***	0.679***
	(3.64)	(10.28)
Security & Privacy Concerns	−0.144*	−0.255***
	(−2.25)	(−4.02)
Implementation Cost Concerns	−0.305***	−0.611***
	(−4.55)	(−9.31)
Role of Capabilities		
Innovativeness	0.594***	0.483***
	(7.03)	(5.81)
Skilled Labour (IT)	0.00457	0.0503
	(0.16)	(1.63)
Firm Productivity	0.0324	−0.0585
	(0.84)	(−1.52)
Controls		
Size	−0.267**	0.141
	(−3.14)	(1.66)
Sector (d)	0.284***	0.321***
	(4.33)	(4.94)
Exporter (d)	0.301***	0.0733
	(4.38)	(1.06)
End Customer (d)	−0.0860	−0.0228
	(−1.08)	(−0.29)
N	2404	
Log likelihood	−2390.6905	
Rho	0.2429664***	

Notes: *t*-statistics in parentheses, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

($\beta = 0.249$, $p < 0.01$ and $\beta = 0.679$, $p < 0.001$, respectively), i.e., higher the perceived usefulness, more likely a decision maker to adopt public cloud computing and social media network.

The coefficients of 'privacy & security concerns' are negative and significant for public cloud computing ($\beta = -0.144$, $p < 0.05$) and social media network ($\beta = -0.255$, $p < 0.001$). The results reveal that the prospects of 'implementation cost' has a significant and negative influence on the likelihood of public cloud computing adoption ($\beta = -0.305$, $p < 0.001$) and social media networks adoption ($\beta = -0.611$, $p < 0.001$) in the sample.

In terms of the firm's capabilities, 'innovativeness' shows a significant positive effect on the likelihood of public cloud computing adoption ($\beta = 0.594$, $p < 0.001$) and social media network adoption ($\beta = 0.483$, $p < 0.001$). These results show that more innovative SMEs are more likely to adopt SM&PC. Moreover, the coefficients of 'skilled labour' and 'productivity' are not significant for the decisions pertaining to SM&PC adoption in the sample.

The coefficients of the control variables in the analysis demonstrate that 'firm size' has a significant negative influence on the likelihood of public cloud computing usage and no influence on the adoption of social media network. These results suggest that larger an SME gets, less likely it is to adopt cloud computing, as larger organisations resort to in-house private cloud setups. 'Sector' dummy displays positive and significant effects on our dependent variables, which shows that, in regard to SM&PC adoption, there exist a significant variation between the SMEs from the manufacturing sectors and service sector. The propensity to engage in SM&PC is higher in the service sector SMEs relative to the base-group: SMEs in the manufacturing sector. Moreover, the coefficient of 'exporter; is positive and significant for the adoption of cloud computing among our sample, implying that exporter SMEs are more prone to adopt public cloud computing, whereas the coefficients of 'end customer' dummy are insignificant.

Discussion

Main findings

The results of this study exhibit that, instead of considering only the features of an innovation (perception aspects) or the capabilities of organisations (internal capabilities), both the perception of the decision makers in SMEs (Davis, 1989; Rogers, 2003) and the capabilities of the SMEs (Nelson and Winter, 1982; Cohen and Levinthal, 1990; Caldeira and Ward, 2003; Wilson, 2009) are significant in delineating the decisions to adopt social media network and cloud computing applications in the organisational settings. These results also empirically support

the theoretical developments presented in the literature review section of this study.

However, behavioural aspects in terms of perception of new ICT are still more important than the capability-related aspects of SMEs. Specifically, our study indicates that the perceived usefulness about SM&PC as new technologies (H1), perceptions about the potential risks associated with the SM&PC adoption (H1a) and the perceptions about the impending costs to implement SM&PC (H1b), all have a profound impact on the adoption of social media among German SMEs. This aspect is in line with the existing theory. The literature has underscored that due to the limited resources of SMEs, decision makers in SMEs are wary of unforeseen outcomes with regard to the implementation of new innovations in their respective organisations (Damanpour, 1992; Thong and Yap, 1995; Harland *et al.*, 2007). If the decision makers in SMEs perceive that SM&PC applications are not going to bring any added benefit to their organisation, or they do not find SM&PC useful or needed for their organisations, they are less likely to implement these in their organisations (Davis, 1989; Rauniar *et al.*, 2014). Furthermore, existing literature underscores that SMEs are generally risk-averse, particularly with regard to ICT adoption (Taylor and Murphy, 2004; Ahmad *et al.*, 2014; Beier and Wagner, 2016). We also find this aspect in our results, where potential costs and security threats discourage SMEs to adopt SM&PC.

In addition, among the capability factors, our results demonstrate that only SMEs' innovativeness appears to prominently influence the extent of SM&PC engagement, and lend some support to our second hypothesis (H2). literature has demonstrated that innovative organisations are more open to new ideas and implementation of new technologies (Rogers, 2003; Zhao and Seibert, 2006). Our results indicate that the decision makers in more innovative SMEs are more likely to adopt SM&PC. Other scholars have also reported the similar findings e.g., Wamba and Carter (2014).

Two of our capability-related variables did not show any influence on SM&PC adoption decisions. We expected that SMEs with higher labour productivities and larger ICT skill base should be more likely to adopt SM&PC. Our results show that this is not the case, and the innovativeness of an SMEs is the most important capability factor that influence its SM&PC adoption decision.

Our study also provides some additional inputs. The literature has demonstrated that the firm size could influence the motivations of organisations to implement new ICT (Lee and Xia, 2006; Zhu *et al.*, 2006; Wamba and Carter, 2014). This seems to be a case when it comes to the adoption of cloud computing in SMEs. Our results indicate that a larger SME is less likely to adopt cloud computing. This is apparently because the larger a firm gets, the more resourceful it becomes, and it is more probable to rely on private cloud computing solutions than the publicly

available ones. Furthermore, our results indicate that SMEs in the service sector are relatively more likely to adopt SM&PC compared to the ones in the manufacturing sector. This result confirms the ongoing trend that service sectors SMEs are more engaged on social media and public cloud computing services.

Conclusions

Social media and cloud computing have transformed into ubiquitous elements of societies across the globe. Individuals and organisations alike have increasingly engaged in SM&PC applications due to the array of their benefits. However, despite the potential advantages of social media and public cloud computing for SMEs, their adoption among SMEs is gradual, and little quantitative empirical research has been done as to which factors influence the adoption of SM&PC in SMEs. Our study's aim was to fill this gap by empirically identifying the factors that affect the decisions pertaining to the SM&PC adoption in SMEs. Our study has addressed the research question from a consolidated perspective. Previous research has explored the process of new technology adoption from different dimensions. For instance, literature in organisational behaviour, informatics, and entrepreneurship focus on the characteristics and psychology of individuals (e.g., owners, managers), whereas literature in strategic management and innovation studies underscore the importance of firm capabilities and resources (e.g., innovation, related labour) for the strategic decision-making process (e.g., SM&CP adoption). On the contrary, the premise of our research is that both the individual perceptions and the organisational capabilities can potentially influence the social media adoption among SMEs. One benefit of such research settings is to explore the relative influences of perception-based and capability-based attributes in the adoption of new ICT technologies in SMEs. Our results have revealed that although both the factors influence the decisions of technology adoption in SMEs, the perception-based factors play a more important role.

The perceptions about new innovation or technologies in SMEs are believed to be driven from the entrepreneurial orientation, experience and skills of the owner-managers (Powell and Dent-Micallef, 1997; Zenebe *et al.*, 2018), which subsequently influence the organisational structures and performance of SMEs (Penrose, 1995; Mahoney, 1995; Bassellier *et al.*, 2003; Jones *et al.*, 2007). Furthermore, perceptions of decision makers are evolved over time as a result of their social (e.g., social networking, working environment, professional interactions) and structural (e.g., previous education, training) experiences (Carson and Gilmore, 2000; Keh *et al.*, 2002; Jones *et al.*, 2007). In the case of ICT technologies, the roles of owner-manager's perceptions (Carson and Gilmore, 2000; Grant *et al.*,

2014; Nguyen, 2009) and digital orientation are believed to be very important in identifying and implementing the opportunities offered by the new technologies (Grant *et al.*, 2014; Quinton *et al.*, 2018; Khin and Ho, 2019; Annosi *et al.*, 2019; Moeuf *et al.*, 2019).

Since the decision making in SMEs is limited to one or few individuals (Thong and Yap, 1995), and it relies mostly on the individual and behavioural attributes of the decision makers (Rogers, 2003; Carson and Gilmore, 2000; Damanpour and Schneider, 2006; Fuller-Love, 2006), the perception about emerging technologies might play even a stronger role. The research in innovation diffusion and information technology has also shown that in the presence of entrepreneurial skills and digital orientation, decision makers in SMEs are better-off in assessing and identifying the value and relevance of new innovation for their organisation (Rogers, 2003; Premkumar *et al.*, 1994; Khin and Ho, 2019). In such scenarios, informed decision makers in SMEs also facilitate technology adoption in their respective organisations, provide active support to their employee and adjust the skill level of their workforce to emerging ICT technologies as well as empowering their workforce in the decision-making process (Teo and Pian, 2003; Soliman and Janz, 2004; Ramsey *et al.*, 2008; Crowley and Bourke, 2017; Moeuf *et al.*, 2019; Keh *et al.*, 2002). As a lack of such entrepreneurial effort and digital orientation might yield negative perception in decision-makers about the emerging digital technologies which explains the higher influence of perception-related aspects in our empirical analysis. Similarly, such behaviour might also lead to a certain undermining of the employees' entrepreneurial abilities, where employees are discouraged against using new ICT technologies at their jobs, and are not allowed a full freedom in terms of their entrepreneurial abilities in identifying and implementing emerging changes (Damanpour and Schneider, 2006; Jones *et al.*, 2005).

Future Research

There are a few limitations of our study. First, due to the nature and security parameters of the data, we could not identify the type of public cloud computing service or social media network used by the sample firms. Furthermore, we have used the ICT survey 2015 of ZEW as our data source. The data collection year is relatively older in relation to the rapidly changing technological environment. However, the social media and cloud computing had well evolved by the time of the ICT 2015 survey, and evolving ever since. Furthermore, in our study, we intended to examine the underlying research question from a quantitative point of view, with a larger set of observations and at an aggregate level to identify the

pattern of SM&PC adoption in German SMEs. Therefore, while latest data could have been more meaningful, with the collection year of our data source, we are still able to draw some valuable insights. Another data limitation is with regard to the types of variables. Most of the variables we have used in this study are binary in nature. Although, with categorical variables, one can expect to obtain detailed responses, the usage of binary variables does not limit the scope of our study, especially in regard to adaption decisions. Future research should employ modern and detailed datasets to examine the relevance of the research issue over time. Furthermore, we have only looked into the firm-specific internal factors that may impede or facilitate the SM&PC adoption in SMEs. An important avenue for the future research is to also focus on the external factors (e.g., market factors, government support). Finally, we have structured our data using survey responses to quantitatively examine the SM&PC adoption in SMEs. We have only carried out a one year-cross sectional analysis due to the data limitations. Survey responses are always prone to endogeneity issues. Although we have addressed this issue to some extent by employing relevant empirical techniques, future research should benefit from a time-series analysis and a use of more detailed variables. This would enable us to identify the gradual impact of factors that facilitate the adoption of SM&PC in SMEs.

Acknowledgment

This work was supported by the German Federal Ministry for Education and Research (BMBF) in the project KONTIKAT (13N14351).

References

Ahmad, A, R Bosua and R Scheepers (2014). Protecting organizational competitive advantage: A knowledge leakage perspective. *Computers and Security*, 42 (May), 27–39. doi: 10.1016/j.cose.2014.01.001.

Ainin, S, F Parveen, S Moghavvemi, NI Jaafar and NLM Shuib (2015). Factors influencing the use of social media by SMEs and its performance outcomes. *Industrial Management and Data Systems*. doi: 10.1108/IMDS-07-2014-0205.

Ajzen, I (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior 1. *Journal of Applied Social Psychology*, 32(4), 665–683. doi: 10.1111/j.1559-1816.2002.tb00236.x M4 - Citavi.

Aldrich, HE and E Auster (1986). Even dwarfs started small: Liabilities of age and size and their strategic implications. *Research in Organizational Behavior*, 8, 165–198. doi: 10.2139/ssrn.1497769.

Aljabre, A (2012). Cloud computing for increased business value. *Journal of Business and Social Science*, 3(1), 234–240. doi: 10.1109/ICPPW.2010.45.

Annosi, MC, F Brunetta, A Monti and F Nat (2019). Is the trend your friend? An analysis of technology 4.0 investment decisions in agricultural SMEs. *Computers in Industry*, (109), 59–71. doi: 10.1016/j.compind.2019.04.003.

Ark, B van, M O'Mahony and MP Timmer (2008). The productivity gap between Europe and the United States. *Journal of Economic Perspectives*, 22(1), 25–44. doi: 10.1257/jep.22.1.25 T4 - Trends and Causes M4 - Citavi.

Assante, D, M Castro, I Hamburg and S Martin (2016). The use of cloud computing in SMEs. *Procedia Computer Science*, (83), 1207–1212. doi: 10.1016/j.procs.2016.04.250.

Bassellier, G, I Benbasat and BH Reich (2003). The influence of business managers' IT competence on championing IT. *Information Systems Research*, 14(4), 317–336. doi: 10.1287/isre.14.4.317.24899.

Beier, M and K Wagner (2016). Social media adoption: Barriers to the strategic use of social media in SMEs. In *Proc. 24th Eur. Conf. Inf. Syst. (ECIS)*, pp. 1–18. Istanbul, Turkey.

Bertschek, I, J Ohnemus and S Viete (2018). The ZEW ICT Survey 2002 to 2015: Measuring the digital transformation in German firms. *Jahrbucher fur Nationalokonomie und Statistik*, 238(1), 1–13. doi: 10.1515/jbnst-2016-1005.

Black, SE and LM Lynch (2001). How to compete: The impact of workplace practices and information technology on productivity. *Review of Economics and Statistics*, 83(3), 434–445. doi: 10.1162/00346530152480081.

Brink, T (2017). B2B SME management of antecedents to the application of social media. *Industrial Marketing Management*, (64), 57–65. doi: 10.1016/j.indmarman.2017.02.007.

Caldeira, MM and JM Ward (2003). Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. *European Journal of Information Systems*, 12(2), 127–141. doi: 10.1057/palgrave.ejis.3000454.

Carcary, M, E Doherty, G Conway and S McLaughlin (2014). Cloud computing adoption readiness and benefit realization in Irish SMEs—An exploratory study. *Information Systems Management*, 31(4): 313–27. doi: 10.1080/10580530.2014.958028.

Carson, D and A Gilmore (2000). SME marketing management competencies. *International Business Review*, 9(3), 363–382. doi: 10.1016/s0969-5931(00)00006-8.

Chiburis, RC, J Das and M Lokshin (2012). A practical comparison of the bivariate probit and linear IV estimators. *Economics Letters*, 117(3), 762–766. doi: 10.1016/j.econlet.2012.08.037.

Clutch (2018). How small businesses use social media in 2018. https://clutch.co/agencies/social-media-marketing/resources/small-business-social-media-survey-2018.

Cohen, WM and DA Levinthal (1990). Absorptive capacity. *Administrative Science Quarterly*, 35(1), 128. doi: 10.2307/2393553 T4 - A New Perspective on Learning and Innovation M4 - Citavi.

Colliander, J and M Dahlén (2011). Following the fashionable friend: The power of social media weighing the publicity effectiveness of Blogsversus Online Magazines. *Journal of Advertising Research*, 51(1), 313–320. doi: 10.2501/JAR-51-1-313-320.

Columbus, L (2017). Roundup of Cloud Computing Forecasts, 2017. *Forbes*.

Correia, PAP, IG Medina, ZFG Romo and RS Contreras-Espinosa (2014). The importance of facebook as an online social networking tool for companies. *International Journal of Accounting and Information Management*, 22(4), 295–320. doi: 10.1108/IJAIM-08-2013-0050.

Crowley, F and J Bourke (2017). The influence of human resource management systems on innovation: Evidence from Irish Manufacturing and service firms. *International Journal of Innovation Management*, 21(1), 1–28. doi: 10.1142/S1363919617500037.

Damanpour, F (1992). Organizational size and innovation. *Organization Studies*, 13(3), 375–402. doi: 10.1177/017084069201300304.

Damanpour, F and M Schneider (2006). Phases of the adoption of innovation in organizations: Effects of environment, organization and top managers. *British Journal of Management*, 17(3), 215–236. doi: 10.1111/j.1467-8551.2006.00498.x.

Damanpour, F and M Schneider (2009). Characteristics of innovation and innovation adoption in public organizations: Assessing the role of managers. *Journal of Public Administration Research and Theory*, 19(3), 495–522. doi: 10.1093/jopart/mun021.

Davis, FD (1986). A technology acceptance model for empirically testing new end-user information systems. PhD Thesis, Cambridge, MA: Massachusetts Institute of Technology Sloan School of Management.

Davis, FD (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319. doi: 10.2307/249008.

Delerue, H and T Cronje (2015). Network technology adoption by US Biotechnology Firms: A contextual approach of social media applications. *International Journal of Innovation Management*, 19(5), 1–20. doi: 10.1142/S1363919615500474.

Dixon, AT, B Thompson and P Mcallister (2002). Report for small business service research programme the value of ICT for SMEs in the UK: A critical literature review, September. http://centaur.reading.ac.uk/24204/.

Drew, S (2003). Strategic uses of e-commerce by SMEs in the East of England. *European Management Journal*, 21(1), 79–88.

Egan, T, S Clancy and T O'Toole (2003). The integration of E-Commerce tools in the business processes of SMEs. *Irish Journal of Management*, 24(1), 139–153.

European Commission (2003). What is an SME? http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en.

Ferreira, A and T du Plessis (2009). Effect of online social networking on employee productivity. *South African Journal of Information Managament*, 11(1), 1–11.

Flaig, G and M Stadler (1994). Success breeds success — The dynamics of the innovation process. *Empirical Economics*, 19, 55–68.

Freedman, DA and JS Sekhon (2010). Endogeneity in probit response models. *Political Analysis*, 18(2), 138–150. doi: 10.1093/pan/mpp037.

Fuller-Love, N (2006). Management development in small firms. *International Journal of Management Reviews*, 8(3), 175–190. doi: 10.1111/j.1468-2370.2006.00125.x.

Gartner (2017). Size of the Public Cloud Computing Services Market from 2009 to 2020 (in Billion U.S. Dollars). Statista - The Statistics Portal. 2017.

Ghobakhloo, M, NB Zulkifli and FA Aziz (2010). The interactive model of user information technology acceptance and satisfaction in small and medium-sized enterprises. *European Journal of Economics, Finance and Administrative Sciences*, 19(1), 7–27.

Grant, K, D Edgar, A Sukumar and M Meyer (2014). Risky business: Perceptions of e-business risk by UK small and medium sized enterprises (SMEs). *International Journal of Information Management*, (34), 99–122. doi: 10.1016/j.ijinfomgt.2013.11.001.

Gupta, P, A Seetharaman and JR Raj (2013). The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*, 33(5), 861–874. doi: 10.1016/j.ijinfomgt.2013.07.001.

Hameed, MA and S Counsell (2014). Establishing relationships between innovation characteristics and it innovation adoption in organisations: A meta-analysis approach. *International Journal of Innovation Management*, 18(1), 1–41. doi: 10.1142/S1363919614500078.

Harland, CM, ND Caldwell, P Powell and J Zheng (2007). Barriers to supply chain information integration: SMEs Adrift of ELands. *Journal of Operations Management*, 25(6), 1234–1254. doi: 10.1016/j.jom.2007.01.004.

Hashim, J (2007). Information communication technology (ICT) adoption among SME owners in Malaysia. *International Journal of Business and Information*, 2(2), 221–240.

He, W, F-K Wang, Y Chen and S Zha (2015). An exploratory investigation of social media adoption by small businesses. *Information Technology and Management*, 18(2), 149–160. doi: 10.1007/s10799-015-0243-3 M4 - Citavi.

Hempell, T, H van der Wiel and G van Leeuwen (2004). ICT, innovation and business performance in services: Evidence for Germany and the Netherlands. In *The Economic Impact of ICT, Measurement, Evidence, and Implications*, OECD (Ed.), pp. 131–152. Paris: OECD.

IBM (2015). What is Cloud Computing? IBM Cloud. doi:10.1080/21505594.2018.1451284.

Jones, O, A Macpherson, R Thorpe and A Ghecham (2007). The evolution of business knowledge in SMEs: Conceptualizing strategic space. *Strategic Change*, 16(6), 281–294. doi: 10.1002/jsc.803.

Jones, R, N Jimmieson and A Griffiths (2005). The impact of organizational culture and reshaping capabilities on change implementation success: The mediating role of readiness for change. *Journal of Management Studies*, 42(2), 361–386. doi: 10.1111/j.1467-6486.2005.00500.x.

Jung, HJ, KY Na and CH Yoon (2013). The role of ICT in Korea's Economic Growth: Productivity changes across industries since the 1990s. *Telecommunications Policy*, (37), 292–310. doi: 10.1016/j.telpol.2012.06.006.

Kaplan, AM and M Haenlein (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, 53(1), 59–68. doi: 10.1016/j.bushor.2009.09.003.

Keegan, BJ and J Rowley (2017). Evaluation and decision making in social media marketing. *Management Decision*, 55(1), 15–31. doi: 10.1108/MD-10-2015-0450.

Keh, HT, M Der Foo and BC Lim (2002). Opportunity evaluation under risky conditions: The cognitive processes of entrepreneurs. *Entrepreneurship Theory and Practice*, 27(2), 125–148. doi: 10.1111/1540-8520.00003.

Khan, GF, B Swar and SK Lee (2014). Social media risks and benefits: A public sector perspective. *Social Science Computer Review*, 32(5), 606–627. doi: 10.1177/0894439314524701.

Khin, S and TCF Ho (2019). Digital technology, digital capability and organizational performance: A mediating role of digital innovation. *International Journal of Innovation Science*, 11(2), 177–195. doi: 10.1108/IJIS-08-2018-0083.

Klier, J, M Klier, V Rebhan and L Thiel (2015). Can social media help to alleviate skilled worker shortage? First insights from the German Federal Employment Agency. *Osnabrück: Wirtschaftsinformatik Proceedings 2015*, March, pp. 797–810. https://aisel.aisnet.org/wi2015/54.

Krasnova, H, O Günther, S Spiekermann and K Koroleva (2009). Privacy concerns and identity in online social networks. *Identity in the Information Society*, 2(1), 39–63. doi: 10.1007/s12394-009-0019-1.

Lau, CM (2011). Team and organizational resources, strategic orientations, and firm performance in a transitional economy. *Journal of Business Research*, 64(12), 1344–1351.

Laursen, K and AJ Salter (2014) The paradox of openness: Appropriability, external search and collaboration. *Research Policy*, 43(5), 867–878. doi: 10.1016/j.respol.2013.10.004.

Lawson, B and D Samson (2001). Developing innovation capability in organisations: A dynamic capabilities approach. *International Journal of Innovation Management*, 5(3), 377–400. doi: 10.1142/s1363919601000427.

Lee, G and W Xia (2006). Organizational size and IT innovation adoption: A meta-analysis. *Information and Management*, 43(8), 975–985. doi: 10.1016/j.im.2006.09.003.

Levenburg, NM, TV Schwarz and J Motwani (2015). Understanding adoption of internet technologies among SMEs. *Journal of Small Business Strategy*, 16(1), 51–70.

Lybaert, N (1998). The information use in a SME: Its importance and some elemenents of influence. *Small Business Economics*, 10(2), 171–191. doi: 10.2307/40228545.

Mahoney, JT (1995). The management of resources and the resource of management. *Journal of Business Research*, 33(2), 91–101. doi: 10.1016/0148-2963(94)00060-R.

McCann, M and A Barlow (2015). Use and measurement of social media for SMEs. *Journal of Small Business and Enterprise Development*, 22(2), 273–287. doi: 10.1108/JSBED-08-2012-0096.

Meyer, AD and JB Goes (1988). Organisational assimilation of innovations: A multi-level contextual analysis. *Academy of Management Review*, 31, 897–923.

Michaelidou, N and N Siamagka (2011). Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands. *Industrial Marketing Management*, 40(7), 1153–1159. doi: 10.1016/J.INDMARMAN.2011.09.009.

Mikkonen, I and I Khan (2016). Cloud Computing — SME company point of view. *International Research Conference Management Challenges*, 59–79. doi: 10.1016/j.joep.2012.09.001.

Moeuf, A, S Lamouri, R Pellerin, S Tamayo-Giraldo, E Tobon-Valencia and R Eburdy (2019). Identification of critical success factors, risks and opportunities of industry 4.0 in SMEs. *International Journal of Production Research*, 58(5), 1384–1400. doi: 10.1080/00207543.2019.1636323.

Moore, GC and I Benbasat (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3), 192–222. doi: 10.1287/isre.2.3.192.

Motta, G, N Sfondrini and D Sacco (2012). Cloud computing: An architectural and technological overview." In *Proceedings - 2012 International Joint Conference on Service Sciences, Service Innovation in Emerging Economy: Cross-Disciplinary and Cross-Cultural Perspective, IJCSS 2012*. doi: 10.1109/IJCSS.2012.37.

Murugesan, S (2007). Understanding web 2.0. *IT Professional*, (9), 34–41. doi:10.1109/MITP.2007.78.

Nelson, RR and SG Winter (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Belknap Press of Harvard University Press.

Neter, J, W Wasserman and M Kutner (1985). *Applied Linear Statistical Models*. Irwin: Homewood.

Nguyen, TUH (2009). Information technology adoption in SMEs: An integrated framework. *International Journal of Entrepreneurial Behaviour and Research*, 15(2), 162–186. doi: 10.1108/13552550910944566.

Nieto, MJ, and Z Fernández (2005). The role of information technology in corporate strategy of small and medium enterprises. *Journal of International Entrepreneurship*, 3(4), 251–262.

Pavitt, K (1984). Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory. *Research Policy*, 13(6), 343–373. doi: 10.1016/0048-7333(84)90018-0.

Penrose, E (1995). *The Theory of the Growth of the Firm*. New York: Oxford University Press. doi: 10.1093/0198289774.001.0001.

Porter, ME (1980). *Competitive Strategy*. New York: The Free Press. doi: 10.1002/smj.4250020110.

Powell, TC and A Dent-Micallef (1997). Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, (18), 373–405. doi: 10.1002/(SICI)1097-0266(199705)18:5<375::AID-SMJ876>3.0.CO;2-7.

Premkumar, G, K Ramamurthy and S Nilakanta (1994). Implementation of electronic data interchange: An innovation diffusion perspective. *Journal of Management Information Systems*. doi: 10.1080/07421222.1994.11518044.

Quinton, S, A Canhoto, S Molinillo, R Pera and T Budhathoki (2018). Conceptualising a digital orientation: Antecedents of supporting SME performance in the digital economy. *Journal of Strategic Marketing*, 26(5), 427–439. doi: 10.1080/0965254X.2016.1258004.

Ramsey, E, P Ibbotson and P McCole (2008). Factors that impact technology innovation adoption among Irish Professional Service Sector SMEs. *International Journal of Innovation Management*, 12(4), 629–654. doi: 10.1142/S1363919608002114.

Rauniar, R, G Rawski, J Yang and B Johnson (2014). Technology Acceptance Model (TAM) and social media usage: An empirical study on Facebook. *Journal of Enterprise Information Management*, 27(1), 6–30. doi: 10.1108/JEIM-04-2012-0011.

Reuter, C, M-A Kaufhold, M Schorch, J Gerwinski, C Soost, SS Hassan, G Rusch, P Moog, V Pipek and V Wulf (2017). Digitalisierung Und Zivile Sicherheit: Zivilgesellschaftliche Und Betriebliche Kontinuität in Katastrophenlagen (KontiKat). In *Sicherheit (DIAGONAL Jahrgang 38)*, G Hoch, H S von Brandt, V Stein and A Schwarz (Eds.), pp. 207–224. Göttingen: Vandenhoeck & Ruprecht.

Richter, A, J Heidemann, M Klier and S Behrendt (2013). Success Measurement of Enterprise Social Networks. *Wirtschaftsinformatik Proceedings 2013*. doi: 10.5167/uzh-89260.

Risius, M and R Beck (2015). Effectiveness of corporate social media activities in increasing relational outcomes. *Information and Management*, 52(7), 824–839. doi: 10.1016/j.im.2015.06.004.

Rogers, EM (2003). *Diffusion of Innovation*. New York: The Free Press.

Ross, PK and M Blumenstein (2015). Cloud computing as a facilitator of SME entrepreneurship. *Technology Analysis and Strategic Management*, 27(1), 87–101. doi: 10.1080/09537325.2014.951621.

Saldanha, TJV and MS Krishnan (2012). Organizational adoption of web 2.0 technologies: An empirical analysis. *Journal of Organizational Computing and Electronic Commerce*, 22(4), 301–333. doi: 10.1080/10919392.2012.723585.

Sawang, S and KL Unsworth (2011). A model of organizational innovation implementation effectiveness in small to medium firms. *International Journal of Innovation Management*. doi: 10.1142/S1363919611003398.

Soliman, KS and BD Janz (2004). An exploratory study to identify the critical factors affecting the decision to establish internet-based interorganizational information systems. *Information and Management*, (41), 697–706. doi: 10.1016/j.im.2003.06.001.

Statista (2018). Anteil Der Unternehmen, Die Folgende Social Media Plattformen Nutzen Weltweit Im Januar 2018. Statista. https://de.statista.com/statistik/daten/studie/71251/umfrage/einsatz-von-social-media-durch-unternehmen/.

Stock, GN, NP Greis and WA Fischer (2002). Firm size and dynamic technological innovation. *Technovation*, 22(9), 537–549.

Taylor, M and A Murphy (2004). SMEs and E-business SMEs and E-business. *Journal of Small Business and Enterprise Development*, 11(3), 280–289.

Teo, TSH and Y Pian (2003). A contingency perspective on internet adoption and competitive advantage. *European Journal of Information Systems*, (12), 78–92. doi: 10.1057/palgrave.ejis.3000448.

Thong, JYL and CS Yap (1995). CEO characteristics, organizational characteristics and information technology adoption in small businesses. *Omega*, 23(4), 429–442. doi: 10.1016/0305-0483(95)00017-I.

Tornatzky, LG, M Fleischer and AK Chakrabarti (1990). *The Processes of Technological Innovation*. Lexington, MA: Lexington Books. http://www.worldcat.org/title/processes-of-technological-innovation/oclc/20669819.

Tornatzky, LG and KJ Klein (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, EM-29(1), 28–45. doi: 10.1109/TEM.1982.6447463.

Unsworth, K, S Sawang, J Murray, P Norman and T Sorbello (2012). Understanding innovation adoption: Effects of orientation, pressure and control on adoption intentions. *International Journal of Innovation Management*, 16(1), 1–35. doi: 10.1142/S1363919611003593.

Utterback, JM (1994). *Mastering the Dynamics of Innovation: How Companies Can Seize Opportunities in the Face of Technological Change*. Harvard Business School Press.

Venkatesh, V and FD Davis (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. doi: 10.1287/mnsc.46.2.186.11926.

Wamba, SF and L Carter (2014). Social media tools adoption and use by SMES. *Journal of Organizational and End User Computing*, 26(2), 1–17. doi: 10.4018/joeuc.2014040101.

Wernerfelt, B (1984). A resource-based view of the firm. *Strategic Management Journal*, 5, 171–180.

Wilson, J (2009). Social networking: The business case. *Engeneering & Technology*, 10(4), 54–56.

Zahra, SA and G George (2002). Absorptive capacity: A review, reconceptualization, and extension. *The Academy of Management Review*, 27(2), 185. doi: 10.2307/4134351.

Zenebe, A, FM Alsaaty and D Anyiwo (2018). Relationship between individual's entrepreneurship intention, and adoption and knowledge of information technology and its applications: An empirical study. *Journal of Small Business and Entrepreneurship*, 30(3), 215–232. doi: 10.1080/08276331.2017.1397441.

ZEW (2015). ZEW ICT Survey. ZEW ICT-Report. https://www.zew.de/en/publikationen/zew-gutachten-und-forschungsberichte/forschungsberichte/informationswirtschaft/ikt-report/.

Zhao, H and SE Seibert (2006). The big five personality dimensions and entrepreneurial status: A meta-analytical review. *Journal of Applied Psychology*, 91, 259–271. doi: 10.1037/0021-9010.91.2.259.

Zhu, K, S Dong, SX Xu and KL Kraemer (2006). Innovation diffusion in global contexts: Determinants of post-adoption digital transformation of European companies. *European Journal of Information Systems*, 15(6), 601–616. doi: 10.1057/palgrave.ejis.3000650.