

## Digital new ventures: Assessing the benefits of digitalization in entrepreneurship

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### ABSTRACT

New ventures must rigorously manage their resources because they suffer from the liabilities of newness and smallness. Digitalization, traditionally associated with resource savings, higher operational efficiency and more flexibility, implies great benefits for new ventures; however, this effect has not been empirically proven. Implementing the resource-based view, this article uses a survey with 102 new ventures to investigate how new ventures benefit from digitalization. We clustered the new ventures in three groups according to their degree of digitalization (low, medium or high) and conducted an analysis of variance to compare the benefits of digitalization among these groups. Our results show that a higher degree of digitalization in new ventures does not result in direct resource savings such as decreased human capital or office space needed; rather, it results in indirect savings through increased operational efficiency. It also leads to considerably greater market flexibility. Our findings assist founder and founder support initiatives in evaluating the necessity of investing in digitalization given the benefits realized.

### Introduction

New ventures typically suffer from the liabilities of newness and smallness (Djupdal & Westhead, 2015; George, 2005; Stinchcombe, 1965; Symeonidou, 2013). A variety of challenges accompany these liabilities, such as limited resources, which restrict new ventures in the number of actions they can employ (Djupdal & Westhead, 2015; Ko & Liu, 2017). To survive despite limited resources, entrepreneurial organizations must rigorously manage resources and concentrate on actions that enhance efficiency (George, 2005). Digitalization might help to overcome those limitations.

Information technologies encompass digital solutions for all elements of the value chain. Researchers have assigned a variety of benefits to the application of digital technologies, such as resource savings, greater operational efficiency and more flexibility (Bleicher & Stanley, 2018; Henriette et al., 2015; Ladeira et al., 2019; Nambisan, 2017; Parviainen et al., 2017). Integrating digital technologies in new ventures early in their life cycle therefore seems to be

beneficial to overcome the limited amount of resources in entrepreneurial firms. In line with the resource-based view (RBV), new ventures might be able to generate competitive advantage by focusing on exploiting the benefits of applying digital technologies (Barney, 1991; Ladeira et al., 2019; Muhos et al., 2019).

Although previous research has identified a generally positive influence of digitalization, this effect has not been empirically tested in an entrepreneurial environment (Devos et al., 2012; Obwegeser et al., 2016; Riemenschneider et al., 2003). Current research has just begun to understand the causalities between digital technologies and entrepreneurship, a research stream known as digital entrepreneurship (Ladeira et al., 2019; Muhos et al., 2019; Nambisan, 2017; Ziyae et al., 2014). However, this research stream is still in its infancy and is limited in scope in explaining the benefits of applying digital technologies in the area of entrepreneurship (Ferreira et al., 2016; Ladeira et al., 2019; Nambisan, 2017; Zhao & Collier, 2016). As a result, researchers have called for future studies analyzing how digital technologies can shape the complex entrepreneurial environment (Berger & Kuckertz, 2016; Ladeira et al., 2019; Nambisan, 2017).

Our study fills existing research gaps in this context.

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In this article, we examine how new ventures benefit from digitalization along the value chain. Our investigation distinguishes between degrees of digitalization to determine whether a higher degree of digitalization leads to greater benefits such as resource savings, greater operational efficiency or more flexibility in new ventures. Building on the RBV, we develop and test hypotheses regarding the benefits of digitalization in new ventures. To do so, we collected data from 102 new ventures from various industries using a survey design. We used cluster analysis to group the new ventures according to degree of digitalization (low, medium or high) and conducted an analysis of variance (ANOVA) to test for the benefits of digitalization among these groups.

This study contributes to the literature by responding to current calls for more digital entrepreneurship research (Ferreira et al., 2016; Ladeira et al., 2019; Nambisan, 2017; Zhao & Collier, 2016). The article provides researchers with a solid basis for understanding digitalization as a resource through the lens of the RBV and also highlights its limitations in entrepreneurship. This contribution is important in terms of research development, as there are only a few empirical studies in digital entrepreneurship and current knowledge on the effects of a higher degree of digitalization in new ventures has not been driven efficiently. Understanding the causality between digitalization in new ventures and the benefits resulting thereof is also important from a practical perspective. With this article, we contribute to entrepreneurial practice by providing managerial insights that highlight the most important benefits of digitalization for new ventures. This is a key concern for new ventures, as the limited access to tangible resources results in the need to carefully evaluate costs and benefits of their investments (George, 2005; Symeonidou, 2013). Thus, without knowing the payoffs of digitalization, investments (whether by the new venture itself, its investors or other founder supporter) might not bring the expected returns (e.g., resource reduction) but instead result, in the worst case, in a waste of resources. Because new ventures are subject to the liabilities of newness and smallness, misallocating resources to digitalization could ultimately threaten not only new ventures' competitiveness but even their survival (George, 2005).

The remainder of this article is structured as follows. In the next section, we introduce the theoretical framework by providing insights into digitalization in the area of entrepreneurship and developing hypotheses to test the benefits resulting from the usage of digital technologies. Next, we describe the methodology and present and discuss the results of the empirical study. Finally, we highlight the implications as well as the study limitations and future research suggestions.

## Theoretical Framework

### Entrepreneurship and Digitalization

Entrepreneurship describes the discovery, founding and running of new businesses, allowing the realization of novel ideas or business models and the generation of new opportunities in business (Ferreira et al., 2016; Ladeira et al., 2019; Memon, 2016). Herein, we define the entrepreneurial firm as a new venture, being an organization not older than 10 years and having not more than 50 employees. Research highlights that new ventures are typically confronted with a variety of challenges caused by the liabilities of newness and smallness (Djupdal & Westhead, 2015; George, 2005; Stinchcombe, 1965; Symeonidou, 2013). New ventures need to put a great deal of effort into developing intangible resources (e.g., a broad skill set, the establishment of operational routines), which they typically do not have in the initial years due to the liability of newness (Barney, 1991; Fackler et al., 2013; Stinchcombe, 1965). Developing this knowledge and these actions takes time and financial resources. However, new ventures typically lack these tangible resources and have difficulty generating scaling effects, because of the liability of smallness (Fackler et al., 2013). According to the RBV, entrepreneurs therefore need to select a strategy that can exploit internal resources and capabilities in the best possible way relative to the opportunities arising externally (Barney, 1991).

The RBV lays the theoretical foundation in our article to examine how new ventures might be able to generate competitive advantage by focusing on exploiting the benefits of digitalization (Barney, 1991; Cai et al., 2014; Martin & Javalgi, 2016). Using the RBV to explain new venture performance issues is common in entrepreneurship research (Cai et al., 2014; Martin & Javalgi, 2016; Sirmon et al., 2007). Developing capabilities in the field of digital technologies might help new ventures efficiently and effectively perform value-adding tasks along the value chain (Martin & Javalgi, 2016). Creating own capabilities, such as digital technology capabilities, is necessary because the external environment is unlikely to provide all resources needed for a new venture to perform well (Cai et al., 2014; Sirmon et al., 2007). Building up a high degree of digitalization in new ventures seems to be a promising strategy for new ventures to overcome the liabilities of newness and smallness.

“Digitalization” describes the adaptation of digital technologies in business, economy and society and provides possibilities to connect objects, individuals and entire organizations (Autio, 2017; Legner et al., 2017). Applying digital technologies in the field of entrepreneurship is summarized as “digital entrepreneurship” (Davidson & Vaast,

2010; Nambisan, 2017), defined as new ventures that are linked with digital activities or goods and services and thus pursue opportunities with the help of any digital element (Davidson & Vaast, 2010; Dutot & Van Horne, 2015). According to Hull et al. (2007), digital entrepreneurship can be divided into three groups: light, moderate and extreme digital entrepreneurship. Light digital entrepreneurship describes a firm that uses digital technologies only as complement to more traditional processes. Moderate digital entrepreneurship, in contrast, encompasses new ventures that can exist only by concentrating on a digital product/service or other digital components, and extreme digital entrepreneurship describes firms having a digital product or service as well as digital processes. Berger et al. (2018) note that these digital processes can be of pure technical nature or can include the active involvement of humans (e.g., digital customer interaction, digital internal collaboration). In this article, we define the degree of digitalization similar to Hull et al.'s (2007) conceptualization, distinguishing between low, medium and high degrees of digitalization by means of digital products/services, digital processes, digital customer interaction and digital internal collaboration.

### **The Benefits of Digitalization**

The application of digital technologies in the context of entrepreneurship and small-and medium sized enterprises has revolutionized organizations around the globe (Celuch et al., 2014; Ziyae et al., 2014). New ventures that can successfully adopt digital technologies and develop the necessary capabilities to use those resources along the value chain are able to generate a variety of benefits (Ladeira et al., 2019; Voelker et al., 2017; Žebrytė et al., 2019) to overcome the liabilities of newness and smallness. Parviainen et al. (2017), for example, show that the potential effects resulting from digitalization are positive. Organizations that can, for example, digitalize information-intensive processes are able to replace manual steps, which helps streamline actions (Parviainen et al. 2017). Thus, an integrated digitalization enables new ventures to track processes in real time so that workflows become more transparent (Arkhipova & Bozzoli, 2018; Iivari et al., 2016), which allows for not only faster decision making but also the identification of processes with improvement potential, which might result in cost savings (Hui, 2014; Iivari et al., 2016; Mazhelis et al., 2013).

In addition, the transformation from manual to digital processes along the entire value chain enables firms to automatically collect and analyze data, which can help new ventures increase the quality and comprehensiveness of information that is transferred from one end to another (Ladeira

et al., 2019). It further helps organizations identify risk factors. The continuous access to real-time data provides managers with the opportunity to react before problems occur, resulting in potential cost savings (Parviainen et al., 2017). Thus, we believe that the more parts along the value chain are digitalized, the higher are the resource savings.

Replacing manual tasks with digital technologies can also render some tasks previously performed by employees obsolete (Parviainen et al., 2017), resulting in potential staff reductions. Having fewer team members might also affect the office space needed. Moreover, the more digital organizations are, it seems the greater opportunity for flexible work styles such as remote work, which can potentially further decrease the need for office space (Parviainen et al., 2017). When all the information and services are digitalized, the necessity of collocated work teams is minimized (Hull et al., 2007) because employees have access to all necessary tools and information digitally (Iivari et al., 2016). In addition, the greater the degree of digitalization in the new venture, the less infrastructure is needed to store documents or other physical products, which also appears to result in less need for office space, which in turn might lead ultimately to lower costs (Ladeira et al., 2019). Those potential resource savings through digitalization lead to the first hypothesis:

**H1.** A higher degree of digitalization in new ventures leads to greater resource savings.

Digitalization also facilitates the development of improved working routines in new ventures (Hair et al., 2013). Using digital technologies in entrepreneurial organizations allows, for example, for immediate replies to customer queries, either automatically for standard requests or with just-in-time replies through online applications, such as chat bots (Ladeira et al., 2019; Mazhelis et al., 2013). Such technologies appear to save time and thereby potentially influence new ventures' operational efficiency. Digitalizing further provides firms with the potential to have digital payment or customer relationship management systems (Mazhelis et al., 2013), which looks as if it leads to faster response times and less routine work. Moreover, the more digital an organization is, it seems, the greater the amount of new opportunities for communication and internal collaboration (Hair et al., 2013; Joshi et al., 2018). This is especially relevant when members of the new ventures are dispersed in terms of time or geography (Hair et al., 2013). Employees' digital capabilities can also include the ability to engage in active exchange of information and documents through digital platforms such as cloud services (Fischer & Reuber, 2011). These digital capabilities support decision making and ultimately influence digital collaboration. Moreover, digital



means of communication also provide new opportunities to share information with external stakeholders such as suppliers (Hull et al., 2007; Ladeira et al., 2019). By providing suppliers with direct access to diverse digital platforms, it appears that the operational efficiency in new ventures can be increased in the sense that information does not need to be manually shared with these stakeholders. A high degree of digitalization in new ventures therefore seems to result in more operational efficiency (Iivari et al., 2016). These aspects give rise to the second hypothesis:

**H2.** A higher degree of digitalization in new ventures results in more operational efficiency.

Digitalizing various parts of the value chain in new ventures means that team members have access to all digital information regardless of their location. The more digital a new venture is, the greater appears the work flexibility, as the number of actions team members must physically perform in the office decreases (Parviainen et al., 2017). Instead, they are able to work remotely from any place with internet connection, resulting in potentially increased working flexibility. Digitalization further influences the market flexibility for organizations (DeLone et al., 2018; Ladeira et al., 2019; Von Briel et al., 2018). The more digitalized a new venture is, the more opportunities the firm has to generate valuable information about stakeholders such as customers and the greater its access to other markets due to the internet (Ladeira et al., 2019). In addition, with digitalization comes the “ability to turn existing products or services into digital variants, and, thus, offer advantages over tangible products” (Parviainen et al., 2017, p. 64). This way, new products can be introduced to the market more easily. Furthermore, a high degree of digitalization enables firms to get digital customer feedback through digital platforms. This way, new ventures can integrate customers’ opinions as they develop digital innovations. As such, digital technologies seem to speed up the time to market and to affect the market flexibility (DeLone et al., 2018; Von Briel et al., 2018). This reasoning results in the third hypothesis:

**H3.** A higher degree of digitalization in new ventures results in greater flexibility.

## Method

### Data

We collected data of German digital new ventures from May 2018 until November 2018. We asked the founders to fill out our online survey. For the data collection, we initially dispersed our survey link within our university

network as well as shared the survey at two entrepreneurship conferences. We then used a snowballing sampling technique, meaning that we asked respondents to refer us to other potential participants. Using this technique for data collection is common in entrepreneurship research (Khelil, 2016; Kuhn & Galloway, 2015; Singh et al., 2015; Verver & Koning, 2017) because it provides an effective method to create a homogeneous sample in a population in which the total size is unknown. This holds true in the case of the German entrepreneurial landscape. Due to its continuous increase but also disappearance of new ventures the overall size of the market is unidentified (Khelil, 2016; Neergaard, 2007). This is especially the case as we aimed to have a high share of digital new ventures in our dataset.

To develop items to measure the degree of digitalization and evaluate its benefits, we referred to academic literature (Berghaus et al., 2017; Davidsson et al., 2017; Hull et al., 2007). We made adjustments to our items by considering the characteristics of new ventures. Two experts on our author team guided the process, a common academic practice (Davidsson et al., 2017): One author is a successful digital entrepreneur with 20 years of experience who has founded four digital new ventures and is an investor in more than 35 digital businesses. A second author serves as minister for digitalization on the state level. Furthermore, we also discussed our items with two other founders as well as four other researchers from our field. For these discussions, we put special focus on comprehensiveness and comprehensibility. We then conducted two pretests involving a total of 17 people, with the aim of gaining feedback on the survey questions. As a result of this feedback, we again adapted our items. In addition, we paid special attention to outliers in our constructs, which might have been caused by misunderstandings. Again, we adjusted the items accordingly. Following the first two pretests, we conducted a pilot study with 24 participants to determine the reliability of the constructs and significant items (Davidsson et al., 2017). We observed a high reliability in the constructs; therefore, we began the final data collection using the questionnaire items that remained. After 116 responses, we were not referred to any more new ventures, meaning that we already had included all new referrals in our data set. We removed 14 responses from our final calculations: 4 of the participating firms were older than 10 years and 10 were not headquartered in Germany.

Our final model therefore contains 102 cases. On average, the new ventures were 3.4 years old (median: 3). The majority of the participants (70.6%) were part of the founding team, 15.7% were members of the management team and the rest included other team members (13.7%). The industry distribution was diverse, with participating or-

ganizations active in information technology (IT)/consumer electronics (12 participants), consumer services (11 participants) and consumer commerce (9 participants), among others. Participants' ages were diverse as well: seven participants were between 18 - 24 years of age, 61 were between 25 - 34 years, 25 were between 35 - 44 years, eight were between 55 - 65 years, and one was over 65 years. The majority of participants (59%) had a business/economics background; the remainder of respondents had varied backgrounds: IT: 11, social science: 8, life science: 6, engineering 4, law: 1 and other: 11.

We measured the degree of digitalization with four dimensions: digital product and services, digital processes, digital customer interaction and digital collaboration. To measure the items for the construct of digitalization, we used a multi-indicator approach. Because the degree of digitalization cannot be measured directly, we used partial least squares (PLS) structural equation modeling to create a latent variable score for the construct. This type of variance-based structural equation modeling has recently gained popularity in entrepreneurship and management research and is the method of choice for explorative studies (Cannavale & Nadali, 2018; Kuckertz & Prochotta, 2018; Shinnar et al., 2012). We found that all four constructs exceeded a Cronbach's alpha of 0.7, a composite reliability of 0.8 and an average variance extracted of 0.5 (Hair Jr. et al., 2016; Kline, 2015), indicating high construct reliability. In addition, we tested for the discriminant validity using three approaches: the Fornell-Larcker criterion, the cross-loading approach and the heterotrait-monotrait ratio (Henseler et al., 2015). Our model passed all tests. We then extracted the latent variable score of the degree of digitalization constructs, which captures the value of all items per construct, thereby obtaining a single variable for each construct of the degree of digitalization.

We then used cluster analysis to group the new ventures according to the four dimensions of digitalization. The goal of cluster analysis is to classify the data into homogeneous groups (Hair et al., 2014): The elements within one group should have very similar characteristics, and the elements from two distinct groups should be different. We used hierarchical cluster analysis with Ward's method and Euclidian distances to group the new ventures in our sample accordingly.

## Measures

We distinguish between the constructs that measure the degree of digitalization and those that measure the benefits of digitalization. In the following subsections, we describe how we capture these variables.

**The degree of digitalization.** We created four constructs to measure the degree of digitalization: digital product and services, digital processes, digital customer interaction and digital collaboration. We initially based these constructs on items from Berghaus et al. (2017), but we adjusted them during the pretests to reflect the conditions of new ventures. We used five-point Likert scales for all items.

With regard to digital products or services, we asked respondents to rate whether their level of digitalization of their products and services is high compared with their competitors, whether they exploit all opportunities for digitalization in the market to develop their products and services, whether they successfully implemented new digital business ideas or business models within the last three years and whether they are able to quickly adopt their digital offerings. We also asked them to provide information on the integration of feedback in the technical development process of their products and services.

For the construct digital processes, we asked participants to rate how often the new venture used digital technology to support standard processes, whether they implement the most current digital channels (including mobile and social media) in their processes, whether their decision making was supported by data analytics, whether digital channels were used to integrate and improve core and standard processes and whether they collect control metrics for their digital channels.

For the variable digital customer interaction, we asked such questions as whether the new venture was able to handle customer requests digitally, how much of the customer journey occurred in a digital format, whether the customer interactions take place on multiple digital channels and whether marketing and communication were individualized using customer data.

Items for the construct digital collaboration covered whether the new venture regularly used digital tools for communication, collaboration and information sharing (e.g., SharePoint, Jive, Trello, Slack, Dropbox, Google Drive) and whether team members were able to work from any location because they had access to digital collaboration tools.

**The benefits of digitalization.** To assess the benefits of digitalization in new ventures, we asked respondents to rate the extent to which they experienced a variety of benefits. We derived these items from the literature (Bleicher & Stanley, 2018; Bogner et al., 2016; Katz & Koutroumpis, 2013; Kuester et al., 2018; Lenka et al., 2017; Nambisan, 2017; Unruh & Kiron, 2017) and measured them with five-point Likert scales (1: Very weak; 2: Weak; 3: Average; 4: Strong; 5: Very strong). To examine whether digitalization leads to

resource savings, we asked new ventures to rate the extent to which they experienced cost savings, fewer team members and less office space needed. To study whether digitalization leads to higher operational efficiency, we asked participants to rate the degree of time savings, decrease in routine work, decrease in response time and increase in collaboration through the use of digital technologies. To investigate whether digitalization leads to greater flexibility, we asked new ventures to rate the extent to which they experienced greater market and work flexibility.

### Results

Our cluster solution results in three clusters. The cluster solution assigned 21 participants to Group 1 (low degree

of digitalization), 50 to Group 2 (medium degree of digitalization) and 31 to Group 3 (high degree of digitalization). We chose this cluster solution for the following reasons. First, a solution with four or more clusters would lead to one cluster having only seven elements, less than 10% of the elements of our data set, which is not feasible (Hair et al., 2014). Second, a cluster solution with more than three clusters leads to a situation in which at least one of the outcome variables does not differ significantly within the clusters. Table 1 shows the means of the cluster variables (degree of digitalization). Note that the greatest differences between the means between Groups 1 (low degree of digitalization) and 3 (high degree of digitalization) are in terms of digital processes and digital products/services.

To assess the validity of our cluster approach, we

Table 1  
Means of the cluster variables

	Digital Products and Services	Digital Processes	Digital Customer Interaction	Digital Collaboration
Group 1	-1.481	-1.430	-1.207	-1.295
Group 2	0.017	-0.243	-0.169	-0.052
Group 3	0.611	0.751	0.612	0.576
Group 3 - Group 1	2.091	2.181	1.819	1.871

Note: the scores are standardized, with a mean of 0 and a standard deviation of 1

used two approaches (following Birley & Westhead, 1994; Khelil, 2016; Proksch et al., 2018). First, we conducted an ANOVA using the aforementioned four variables measuring the degree of digitalization. The values of the four variables should significantly differ between the three groups. Table 2 shows that, indeed, an ANOVA based on the three cluster solutions (low, medium and high degree of digitalization) shows all variables are significant at the 99.9% level; therefore, our cluster solution passes the first test.

Second, we applied discriminant analysis using the group variable as categorical variable and the four degrees of digitalization variables as independent variable. We did so to determine whether the data could be segmented into the three groups by using the values of the four degree of digitalization variables. As Table 3 shows, the first discriminant function is significant, the second is not. However, the first discriminant function already explains 98.8% of the variance. Furthermore, the discriminant function achieved a high degree of accuracy (see Table 4), with a high ratio of 96% (98 of 102 cases) correctly classified. The maximum chance criterion (49% + 25% = 74% < 96 %) and the proportional chance criterion (37.5% + 25% = 62.5% < 96%)

are fulfilled (Hair et al., 2014, p. 260). Our cluster solution therefore also passes the second test.

We conducted an ANOVA to test whether the consequences differ between the three groups. Our findings (Table 5) show that one of the three benefits assessing H1 is significant (cost savings), but the other two are not (fewer

Table 2  
Results of the ANOVA with the degree of digitalization variables

	F-Value	Significance
Digital products/services	86.194	0.000 ***
Digital processes	124.254	0.000 ***
Digital customer interaction	47.861	0.000 ***
Digital collaboration	51.269	0.000 ***

\* Sig. on 95% level, \*\* Sig. on 99% level, \*\*\* Sig. on 99.9% level

Table 3  
Summary of the three-group discriminant analysis

Discriminant Function	Eigenvalue	% of Variance	Canonical Correlation	Wilks' Lambda	Chi-Square	Significance
1	4.826	98.800	0.910	0.162	177.566	0.000
2	0.061	1.200	0.239	0.943	5.732	0.125

Table 4  
Accuracy of the prediction by the discriminant analysis

Cluster	Number of Cases	1	2	3	Percentage of Cases Correctly Classified
1	21	19 90.5%	0 0%	2 9.5%	21 90.5%
2	50	0 0%	49 98%	1 2%	50 98.0%
3	31	1 3.2%	0 0%	30 96.8%	30 96.8%

team members and less office space needed). Thus, we can only partially confirm H1. For H2, which hypothesized that a higher degree of digitalization in new ventures results in more operational efficiency, all four of our variables (time savings, less routine work, faster response time and better collaboration) are significant (with the exception of less routine work, all at the 99.9% level), confirming H2. Testing of H3 shows that only one variable, more market flexibility, is significant (99.9% level); the other variable is not. Therefore, we can only partially confirm H3.

Table 6 shows the mean values for the benefits variables for the three groups (low, medium and high degree of digitalization). For “cost savings” (H1), the data show that a higher degree of digitalization leads to higher cost savings. For time savings (H2), the data show that the greater the degree of digitalization in new ventures, the higher are the time savings. The same applies for faster response time. Here, the distances from Group 1 to Group 2 and from Group 2 to Group 3 are about equal. The data for less routine work indicates almost no difference between Groups 1 and 2; the value is even a bit lower for Group 2 than in Group 1. In contrast, between Groups 1 and 2 and Group 3 the difference is quite substantial. The data for better collaboration (H2) show that the distance between Groups 1 and 2 is large. Groups 2 and 3 have almost the same average value, showing that the benefits of digitalization in terms of better collaboration are not much higher after a medium degree of digitalization is achieved.

For more market flexibility (H3), the data indicate that a higher degree of digitalization leads to greater market flexibility: The distances between Groups 1 and 2 and Groups 2 and 3 are almost equal.

## Discussion

We statistically classify the digital new ventures of our data set into three distinct groups (low, medium and high degree of digitalization), confirming Hull et al.'s (2007) findings. Similar to their results, our data show that the less digitalized group has low values in all four dimensions and the high digitalized group has higher values in these dimensions. The biggest difference can be observed in the area of digital processes.

Our findings further show that digitalization only partially leads to young digital ventures needing less resources. We first looked at cost savings, which differ considerably between the less and more digitalized ventures, confirming findings from extant literature that applying digital technologies can result in significant cost savings (Hui, 2014; Iivari et al., 2016; Ladeira et al., 2019; Mazhelis et al., 2013; Parviainen et al., 2017). In this aspect, digitalization can help new ventures handle the liability of smallness. We observed multiple places where costs could be saved. For example, the digitalization of information-intensive processes helps streamline actions, so that unnecessary actions can be reduced, resulting in cost savings (Parviainen et al., 2017). Digital processes also enable new ventures to make workflows more transparent, leading to the potential to identify issues more easily (Hui, 2014; Iivari et al., 2016; Mazhelis et al., 2013; Parviainen et al., 2017).

However, our results show that digitalization does not lead to a reduction of staff or office space. Especially with small founding teams, each team member must fulfill multiple roles (e.g., product development, sales, human resources); thus, a high coordination effort for all endeavors



Table 5  
Results of the ANOVA with the 9 outcome variables

Consequences		F-Value	Significance
H1	Cost savings	8.141	0.001 ***
	Fewer team members needed	0.322	0.726
	Less office space needed	0.263	0.769
H2	Time savings	7.280	0.001 ***
	Less routine work	5.682	0.005 **
	Faster response time	13.392	0.000 ***
	Better collaboration	9.055	0.000 ***
H3	More work flexibility	1.199	0.306
	More market flexibility	19.046	0.000 ***

\* Sig. on 95% level, \*\* Sig. on 99% level, \*\*\* Sig. on 99.9% level

Table 6  
Means of benefits per group

Benefits		Group 1	Group 2	Group 3
H1	Cost savings	3.48	3.81	4.26
	Fewer team members needed	3.05	3.13	3.26
	Less office space needed	3.57	3.32	3.42
H2	Time savings	3.57	4.03	4.32
	Less routine work	3.48	3.35	3.98
	Faster response time	3.48	4.06	4.44
	Better collaboration	3.48	4.23	4.26
H3	More work flexibility	4.29	4.32	4.54
	More market flexibility	3.24	3.81	4.30

is more easily handled when all team members are working together physically in one office (e.g., handling application processes, meeting customers or investors). Moreover, new ventures typically increase rather than reduce number of team members in the first years after inception.

In our analysis, a high degree of digitalization results in more operational efficiency. First, digitalization leads to time savings. Standard processes can be supported by IT systems, which reduces the manual labor needed. This finding is also supported by the second variable, less routine work. However, only Group 3 was able to leverage this particular benefit. A possible explanation is that we must distinguish between digitalization and automation. Doing the same tasks digitally instead of using a paper-based method does not necessarily lead to an improvement of the process itself. Only a redesign of the process with, for example, some form of automation might result in significantly less routine work. Possibly, only the third group in our data

set had the necessary level of process digitalization to also enable automation. In addition, digitalization enables new ventures to respond more quickly to customer requests. Examples include chat bots, which allow an immediate reply to customer queries. New ventures can use this benefit to derive competitive advantage in line with the RBV, for example, having a better customer relationship management system than other ventures. Furthermore, a higher degree of digitalization supports better collaboration among team members. They can use digital tools to support communication and to engage in active exchange of information and documents through digital platforms such as cloud services (Hull et al., 2007; Ladeira et al., 2019). Effective collaboration ultimately also influences the working environment for team members, as it facilitates the flow of information (Sievert & Scholz, 2017). However, we did not see a difference between Groups 2 and 3, which means that digital new ventures only need a moderate level of digitalization to inte-



grate such tools. Nevertheless, we can see that digitalization can be helpful in supporting new ventures in managing the liability of newness.

Our results further show that a high degree of digitalization results in greater market flexibility, such that new ventures integrating digital technologies are able to react quickly to changing market conditions. We speculate two reasons for this finding; first, digital analysis of customer feedback can quickly reveal a change in customer needs and requirements, and second, a digital product can be adapted more quickly than a physical production (DeLone et al., 2018; Ladeira et al., 2019; Parviainen et al., 2017). Therefore, new ventures might be more robust to a volatile external environment. This finding is in line with the RBV, which posits that digital capabilities are a source of competitive advantage. In contrast, a high degree of digitalization does not lead to more work flexibility, possibly because the necessary IT infrastructure, including cloud storage and online accessible office tools, is a commodity and present in every new venture.

In summary, we show that a high degree of digitalization in new ventures leads to a reduction in costs, but not in terms of other resources such as number of team members or office space needed. However, a higher degree of digitalization also results in greater operational efficiency, which can be interpreted as an indirect resource reduction. In addition, a high degree of digitalization increases market flexibility, though not necessarily work flexibility, in our sample.

## Implications

### Theoretical Implications

Our findings contribute to the literature by responding to current calls for more digital entrepreneurship research (Ferreira et al., 2016; Ladeira et al., 2019; Nambisan, 2017; Zhao & Collier, 2016). Our results are important in terms of research development, as only a few empirical studies address this topic. In addition, researchers have not studied the effects of a higher degree of digitalization in new ventures. The results of our empirical study provide researchers with a solid basis for understanding digitalization as a resource according to RBV to derive benefits. We show that developing digital capabilities can help new ventures derive competitive advantages in terms of costs savings, operational efficiency and market flexibility. In addition, we also contribute to the literature by delivering empirical confirmation of the three distinct groups of new ventures, those with low, medium and high degrees of digitalization, as described by Hull et al. (2007).

### Practical Implications

Our article contributes to entrepreneurial practice by providing managerial insights that highlight the most important benefits of digitalization for new ventures. This is a key concern for new ventures especially, because they typically have limited access to tangible resources and must carefully evaluate the costs and benefits of their investments (George, 2005; Symeonidou, 2013). We demonstrate that a high degree of digitalization does not result in a direct reduction of resources such as human capital or office space needed. In this regard, founder and founder-support initiatives, such as accelerators, should not invest in the digitalization of new ventures with the goal of decreasing those resources. This result can help entrepreneurs and investors generate appropriate expectations from their investments in digitalization.

That said, we find that investing in digitalization does help increase operational efficiency. One important aspect is an improvement in collaboration in new ventures, which positively influences firms' creativity and innovativeness (McConnell, 2015; Nylén & Holmström, 2015). Thus, our study shows, on the one hand, that founders and founder initiatives keen to improve the internal collaboration between team members could invest in digital supporting tools. In that case, it might be useful to offer them digitalization-related training and to provide the necessary digital infrastructure. In addition, digitalization leads to a faster response time, which helps satisfy customer demands. New ventures that lack these skills can be supported by investing in digitalization. In addition, because digitalization decreases the reaction time to changed market conditions, founders and investors might especially consider investing in digitalization if the new ventures are active in a volatile environment.

### Limitations and Future Research

Our study is subject to some limitations. We clustered new ventures with respect to their digitalization degree and tested for the benefits of digitalization. To do so our study uses cross-sectional data. We relied on participants' perception of how they experienced the benefits of digitalization. A longitudinal research design would be of interest for future research to evaluate if scaling effects could be realized using digitalization over time by increasing the degree of digitalization in their new venture. In addition, because the founders in our data set provided a self-assessment of their degree of digitalization as well as the perceived benefits of digitalization, they may have been inclined to be more positive in answering the questions to generate a positive image of their company. To reduce this possible bias, we

clearly informed the founder that the data would be kept anonymous before distributing the survey. In addition, we did not reveal that we studied the influence of the degree of digitalization on the benefits of digitalization. Nevertheless, future studies should analyze the connection of a high degree of digitalization and company performance using more concrete data.

Furthermore, our results are solely based on ventures in Germany. We believe that studying the entrepreneurial landscape in Germany is important for several reasons. Not only is Berlin (the capital city of Germany) known as one of the top cities worldwide for new ventures, especially with regard to digital affords (Startup-Genome, 2019), but Germany's entrepreneurial ecosystem is also highly attractive for European investors. German new ventures receive 29% of Europe's venture-capital investments (KPMG, 2018). Even though we think that our results might be transferable to other European countries with similar economic characteristics, a similar entrepreneurial infrastructure and similar values in a country digitalization index (see, e.g., Chakravorti et al., 2017) like France, researchers should be cautious to generalize the results. They should first create empirical evidence for this proposition. Therefore, we call for further studies that analyze the degree of digitalization and its benefits in other countries and across countries.

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