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Additional Information

# **The effect of digitalization on business performance: An applied study of KIBS**

## **Abstract**

Although digitalization is a reality for companies and contributes to value creation, few studies have examined its impact on business performance in the service sector. The aim of this paper is to analyze how the digitalization of knowledge-intensive business services (KIBS) contributes to their performance. The analysis centers on their use of information systems, as well as the contingent factors of the manager's age and gender and company size. This study explores how these factors contribute to the performance of KIBS, with performance here measured in terms of future financial performance. The analysis was conducted using fuzzy-set qualitative comparative analysis (fsQCA). The study shows that updating social networks, using social networks for corporate purposes, having a high level of training in digital tools, and having older managers can enhance company performance.

**Keywords:** knowledge-intensive business services, KIBS, digitalization, information systems, financial performance

## **1. Introduction**

Today's digital era revolves around the use of new technologies that create value for companies and offer a host of benefits (Sommarberg & Mäkinen, 2019; Parida et al., 2019; Scott et al., 2019). Despite the advantages that this technological revolution offers the business community, there has been little discussion of its impact on the service sector, particularly regarding its effect on the performance of knowledge-intensive business services (KIBS; Görs, Hummert, Traum, & Nerdinger, 2019). Studies have shown the benefits of using highly innovative technologies such as blockchain (Liu et al., 2018), the Internet of Things (Bresciani et al., 2018), and big data (Loebbecke & Picot 2015), understood as a system of technologies. Some of these advantages relate to attracting and satisfying customers (Serravalle et al., 2019) through improvements in network cybersecurity, enhancing capabilities and organizational learning, and innovating. After reviewing previous contributions on the topic, two reflections emerge.

First, the Fourth Industrial Revolution, and therefore digitalization, are broad concepts that encompass the use of numerous tools. Although these systems of interrelated technologies should be studied and promoted, they are not yet fully implemented in service companies. Not all companies are at the same stage of development in this process (Sommarberg & Mäkinen, 2019). Therefore, to generalize the results of previous studies, a sufficient number of KIBS must first have implemented these novel tools. To shed light on this topic, we analyze the performance effects of relatively simple digital tools that are accessible to any company and that are considered part of digitalization. Second, no previous study has focused on financial performance as an outcome of the effect of digitalization on KIBS. Janger et al. (2017) argue that KIBS have superior levels of profitability and productivity. However, the factors (or combinations of factors) that lead to this superior performance remain unknown.

This study examines how the use of new technologies arising from the Fourth Industrial Revolution can influence the performance of KIBS. We study the use of simple tools that are accessible to any company. Specifically, we examine social network updates, the corporate use of digital tools and social networks, and training in new digital tools. We also study the influence of several contingent factors that may influence this relationship. The analysis of contingent factors centers on the manager's age and gender and the size of the digitalized company. Finally, regarding the method, fuzzy-set qualitative comparative analysis (fsQCA) is employed. Using fsQCA, combinations of conditions are studied to investigate how their interaction can lead to the outcome of strong financial performance. The aim of this study is to identify the combination of conditions and factors that lead to high performance. Ultimately, the hope is to provide simple yet effective recommendations for knowledge and service companies that are struggling to digitally transform their businesses.

The structure of this paper is as follows. Section 2 presents the theoretical framework for both information systems and the contingent factors considered in this study. Section 3 describes the method. Section 4 reports and discusses the results of the analysis. Section 5 presents the discussion. Finally, the conclusions are stated in Section 6.

## **2. Theoretical framework**

The service sector plays a key role in driving employment and increasing public well-being in the OECD countries (Miles, Belousova, & Chichkanov, 2017). Within the service (or tertiary) sector, there is evidence that KIBS have superior levels of profitability and productivity (Janger et al., 2017).

In recent years, numerous authors have studied knowledge markets and KIBS, which are the consequence of service innovation (Chung & Tseng, 2019). The concept of KIBS emerged in the early 1990s, when scholars began to discover similarities among certain types

of service companies (Doloreux, Freel, & Shearmur, 2010; J-Figueiredo, Vieira Neto, Gonçalves Quelhas, & de Matos Ferreira, 2017). This discovery coincided with a surge in globalization, which led to an intensification of the workforce, especially the qualified segment (Athota & Malik, 2019). The two key characteristics of KIBS are *knowledge* and *services*. Unlike in other service industries, where the core offerings are services, KIBS primarily produce knowledge, and services constitute secondary offerings (Chung & Tseng, 2019). According to Strambach (2008), KIBS also appear to play a central role as drivers of the dynamics of knowledge in a range of contexts, contributing to transforming knowledge and competency bases and developing employee skills within companies.

Digitalization can be defined simply as the use of digital technologies to create value for a company (Sommarberg & Mäkinen, 2019). Its benefits are numerous and include automating and optimizing processes to improve productivity, saving costs, streamlining production, substantially reducing human error, and fostering a culture of innovation (Parida et al., 2019; Scott et al., 2019). Digitalization today is primarily driven by some key technologies that have evolved in recent years. The Fourth Industrial Revolution offers the opportunity for those who took advantage of the previous waves to continue to develop and progress and generate wealth and economic development (Schwab & Davis, 2018). Industry 4.0 (reminiscent of the Fourth Industrial Revolution) has the potential to generate competitive advantages in organizations (Federico, 2018). However, it cannot be understood in isolation and must instead be interpreted as an interdependent system of technologies (Ustundag & Cervikcan, 2017). Digital traceability, cybersecurity, social networks and information systems, the Internet of Things, big data, blockchain technology, and virtual reality are examples of technologies that form the aforementioned systems and shape the society of the future (Ustundag & Cervikcan, 2017). In addition, with these emerging technologies, it must be ensured that the benefits of the Fourth Industrial Revolution are distributed fairly across society

and that we are living a revolution by the people, for the people. The Fourth Industrial Revolution is human centered, and digitalization is reshaping the way talent is managed by companies (Botella & Tudela, 2020). However, although digitalization and the Fourth Industrial Revolution reflect a major trend, the literature barely addresses the relationship with the service sector in general, particularly in terms of the effect on the performance of KIBS (Görs, Hummert, Traum, & Nerdinger, 2019).

KIBS are one of the growing segments of the European economy. Studies have shown moderate positive relationships between a firm's degree of technological innovation and the level of service innovation and digitalization, as well as between these three factors and market returns (Carvalho & Sarkar, 2018). As noted earlier, multiple technologies and systems are shaping this new era. Many of these technologies play a role in business performance. Therefore, it is important to study which Industry 4.0-related factors and which combinations of these factors lead to the superior performance of KIBS. This line of inquiry can provide practical advice to help KIBS in their digitalization processes.

Two groups of conditions are considered in this study: the use of information systems and the contingent factors of KIBS. These conditions may bear some relation to the outcome. The selected conditions are (1) social network updates, (2) the use of new digital tools and social networks, (3) training in new digital tools, (4) the age of the manager of the digitalized company, (5) the gender of the manager of the digitalized company, and (6) the size of the company, measured as the number of employees. The first three relate to the use of information systems; the others are contingent factors. The analysis of these conditions shows which of them positively influence the performance of KIBS as a result of digitalization. The theoretical framework presented in the next section includes a review of the main technologies used in the digitalization of KIBS. The six propositions tested in this study are then presented.

### ***2.1. Key technologies and innovation in knowledge-intensive business services***

Fundamental changes due to digitalization processes and big data analytics are believed to reshape knowledge-intensive industries and services (Loebbecke and Picot 2015) and increase customer attraction and satisfaction across service offerings (Serravalle et al., 2019). These changes and improvements are strongly related to an increase in firm performance and competitiveness (Mikalef et al., 2019). However, the use of blockchain technology in KIBS is slowly increasing, especially to enhance network cybersecurity and verify personal certificates (Liu et al., 2018). The Internet of Things (IoT) has enabled physical objects to share information and communicate with each other so that joint decisions can be made (Ghobakhloo, 2018). It has also affected the way that KIBS approach innovation and how they create and capture value for their employees and clients in everyday business activities (Bresciani et al., 2018).

These technologies also increase organizational learning and the capabilities of adaptability and agility in the workforce. These factors are closely related to increased performance (Rialti et al., 2019). Few KIBS still implement these cutting-edge technologies in digitalization. However, according to Horváth and Szerb (2018), the use of such novel technologies is not necessary to make significant advances in business models and economic performance. Therefore, although we analyze their importance in the current digital transformation processes and the Industry 4.0 paradigm, this study focuses on digital tools and processes that a large number of KIBS have already implemented and embraced.

## ***2.2. The use of information systems***

### *2.2.1. Social network updates by digitalized companies*

Today, many companies use social networks to interact with customers and build online communities (Ayodeji & Kumar, 2019). The use of social networks is one of the most widely adopted marketing strategies by companies to forge brand-customer relationships (Ayodeji &

Kumar, 2019). Big data is related to this concept, and its impact on business performance has been shown (Ferraris et al., 2019). An active corporate social network profile is capable of making consumers perceive the brand in a favorable light so as to become loyal customers (Park & Kim, 2014). Customers are a vital part of corporate marketing and communication processes, so social network updates contribute to achieving objectives and creating successful digital contact hubs (Buenaño et al., 2015). In addition, more generous budgets in content marketing and social network updates have been found to lead to an increase in conversions and sales (Forouzandeh et al., 2014; Kothari et al., 2016). Finally, customer participation is greater when social network updates are more frequent and customers feel less buying pressure and sensitivity to deals offered by the company (Rishika et al., 2013). The first proposition is derived from this argument.

Proposition 1: Performing social network updates influences the performance of digitalized companies.

### *2.2.2. Corporate use of digital tools and social networks*

The digitalization of production systems can increase the general availability of data and offers a way for companies to adapt to changing market demands (Stoldt et al., 2018). Digital management practices and the use of IT tools tend to enhance business performance, according to Horváth and Szerb (2018).

Notable examples of these digital tools are email, LinkedIn, Facebook, Messenger, blogs, newsletters, and customer relationship management (CRM) systems (Valdez-Juárez, 2012). In addition, the use of social networks at the corporate level goes a step further in terms of customer-centric strategies as a fundamental part of the business (Güler & Büyüközkan, 2019). According to Martínez-Sala et al. (2018), there is a close relationship between brands with active social network profiles and interest in brands from potential customers. This social

network activity leads to a privileged position with respect to competitors in the minds of customers (Kotler & Armstrong, 2008) in an increasingly saturated and competitive market. To be able to exploit the potential of online social networks, it is essential to be aware of the digital resources and social networks that a company uses, as well as stakeholders' expectations and interests. Only then can these two areas be aligned (Cortado & Chalmeta, 2016). These factors may lead to superior company performance. Therefore, a second proposition is stated.

Proposition 2: The use of new digital tools and social networks for corporate purposes influences company performance.

### *2.2.3. Training in new digital tools*

Employee training is important not only for the ongoing growth of companies' intangible assets but also for ensuring sustainable human resource management (Zhang et al., 2019). In the specific case of KIBS, a special mix of organizational, interpersonal, and technical skills is required (Miles et al., 1995). In addition, for a company to stay competitive, it must embrace digital tools such as the Internet of Things, big data, and human-machine interaction (Sorko et al., 2016). The *Future of Jobs 2016* report states that over a 10-year time horizon, more than half of all jobs will be transformed by digitalization and will require a combination of mathematical and interpersonal skills (World Economic Forum, 2016). In this context, new skills are needed to tackle the challenges posed by digitalization because employees will be the individuals responsible for overcoming these challenges.

It has also been shown that information and communication technology (ICT) training increases not only company performance but also employee motivation, team cohesion, and the pride of belonging to the company (Benson et al., 2004). Performance management and employee compensation are also improved with training in new digital tools (Soltis et al., 2018). Moreover, organizational learning capabilities are positively related to the overall

competitiveness of digital companies (Ferraris et al., 2019). To explore these ideas, a third proposition is stated.

Proposition 3: Training in new digital tools influences company performance.

### **2.3. Contingent factors**

#### *2.3.1. The manager's age*

In reference to strategic corporate change, Wiersema and Bantel (1992) report that having young management teams affects the level of receptiveness to change and the willingness to take more risks within the company. This idea could be extrapolated to the process of digitalization within the company, leading to the assumption that young management teams should positively influence the performance of digitalized companies. According to Akson et al. (2013), these young managers belong to Generation Y (born between 1981 and 1999). This generation is characterized by its extensive use of social networks in social and personal settings because members of this generation have grown up with technology and the Internet. Therefore, it may be expected that managers from this generation generate greater profit in the digitalized company. Macky et al. (2008) concluded that generational differences are not only psychological but also technological and that they must be understood by both managers and organizations to maximize profits for the company. Younger managers show greater ambition, but they might face higher constraints in terms of credibility and professional experience (Storey, 1994). Finally, Morris et al. (2005) affirmed that at young ages, managers are more likely to have positive relationships with technology, and the differences between genders become blurred. However, it is assumed that managers with experience in the private sector have a greater ability to use ideas, technologies, or finished products developed in earlier job positions. This idea implies a higher degree of integration of KIBS in their environment and an

associated increase in financial performance (Horgos & Koch, 2008). In light of the above, we posit the fourth proposition.

Proposition 4: The age of the manager of the digitalized company influences company performance.

### 2.3.2. *The manager's gender*

Numerous studies have considered the perspective of gender in business management as a key performance factor (Schein et al., 1996, Hermalin & Weisbach, 2003, Shafique et al., 2014, Laguía et al., 2019). However, the number of women managers is still low. In the European Union in 2016, only 33% of top and middle managers were women (European Union, 2017). There are two streams of literature on this topic. Although gender has been the subject of discussion on countless occasions, scholars such as Herring (2009) and Twenge and Campbell (2011) have concluded that women's participation in corporate decision making is necessary for companies to improve their performance and strengthen their customer base. Campbell and Vera (2008) also reported that having women in management positions leads companies to achieve better financial performance. According to Harb et al. (2013), women managers also find it easier to learn digital skills. Interpersonal skills such as empathy and leadership ability will be key factors in the labor market of tomorrow because it will be impossible to replace these skills with artificial intelligence in the foreseeable future (Bobade & Shelar, 2018). The use of ICT and the rise of social media in work and business contexts have also increased the development of women managers' access to equal opportunities with men in business development (Rajahonka & Villman, 2019).

In contrast, other studies suggest that having male managers leads to more successful performance by digitalized companies (Guiso & Rustichini, 2011) because women are generally more risk averse than men, which could lead to moderate financial performance

(Jewell, 2019). In the context of KIBS, this question has not yet been analyzed. Therefore, we state the fifth proposition.

Proposition 5: The gender of the manager of the digitalized company influences its performance.

### 2.3.3. *Company size*

The size of the digitalized company influences company performance, measured as the average number of employees (Lafuente & Rabetine, 2011). However, the literature tackles this question from two angles. Generally, larger firms have a greater capacity to innovate and have fewer resource constraints, while they are also able to diversify their activity (Becheikh, Landry, & Amara, 2006). Moreover, a lack of skills and capabilities is one of the main barriers to innovation, especially in small and medium-sized enterprises (Stoldt et al., 2018). However, small firms are better able to offer customer-oriented services and are therefore more capable of achieving superior performance. Hence, the size of the digitalized company influences its performance (Doloreux & Frigon, 2019), although each specific case should be analyzed to draw a valid conclusion. Windrum and Tomlinson (1999) reported that KIBS tend to be small but that knowledge exploitation and performance do not rely on company size. Horváth and Szerb (2018) noted that resource-constrained small firms are better able to improve their business models from a cost perspective and enhance their results. Therefore, we test whether this condition affects company performance. The sixth proposition is thus stated.

Proposition 6: The size of the digitalized company (number of employees) influences its performance.

### **3. Method**

#### **3.1. *Sample***

The fieldwork was carried out in the Region of Valencia, Spain. KIBS that were highly active on social networks (in terms of the frequency and quality of their publications) were selected. The population for this study was 82 KIBS. A sample of 69 KIBS was obtained. The age of the respondents was between 22 and 52 years. There was a high proportion of respondents in the age group of 24 to 33 years. Women represented 78% of the sample (22% were men). Regarding the job position held by the respondents, 32 were consultants. A total of 19 were technicians or office managers. The remaining respondents (18) were regional managers. Regarding company size, 67.1% of respondents worked for an international company, whereas 29.3% of respondents worked for a national company. Finally, 3.7% of respondents worked for a regional company.

#### **3.2. *Data collection***

Once the questionnaire had been designed, Limesurvey was used to distribute the questionnaire and collect the data. Limesurvey Version 2.05+ was used for various reasons. First, it enabled us to use different question formats within the questionnaire. Second, it allowed us to vary the order of the items, thus avoiding possible biases derived from this issue. Third, it is compatible with the data formats required by SPSS. Finally, it is free software with a large community of users.

The data collection took place in July 2019. Initial contact was made with companies through the social network LinkedIn. A private message was sent explaining the objectives of the research and inviting them to participate. Afterwards, the link with access to the questionnaire was sent. An open and anonymous survey was chosen to enhance access and increase sincerity and confidence among respondents because of the guarantee of anonymity.

### **3.3. Questionnaire**

The questionnaire had 31 items using a 5-point Likert scale. Items 1 to 10 corresponded to the measurement of the use of information systems. Items 11 to 20 were used to measure contingent factors. Finally, items 21 to 31 were used to measure company performance. Additional questions were included to identify certain sociodemographic characteristics of the respondents.

### **3.4. Definition of the outcome and causal conditions**

First, the outcome and conditions of the study must be specified. The outcome was company performance. In this study, performance was measured using human resource managers' perceptions of how effectively the company will achieve its long-term goals.

As per the literature review, six conditions were considered potential drivers of company performance. Two of these conditions (age and gender) are key demographic features of managers. An additional condition is the number of employees at the company. These three conditions are contingent factors. The other three conditions relate to the action plans implemented by the company to integrate information systems. Table 1 gives more detail on the outcome and conditions.

(Table 1 should be placed here)

### **3.5. Calibration**

FsQCA was used to study the combinations of conditions and observe how interactions between them can lead to the outcome of interest. The raw data from the survey of managers were calibrated into fuzzy values following the guidelines provided by Ragin (2009). The full membership and full non-membership of each case was represented by placing the values on a

scale of 0.0 to 1.0. The transformation of the raw data into fuzzy values is known as calibration. In this study, the following values were used to determine the membership levels:  $\geq 0.95$  for full membership,  $\leq 0.05$  for full non-membership, and 0.5 for the cross-over point. Table 2 presents the results of the calibration in this study. Table 2 shows the values employed for calibration, enabling analysis of the role of each condition in causing the outcome.

(Table 2 should be placed here)

Several studies have relied on percentiles for calibration (Khedhaouria & Thurik, 2017; Meuer & Rupietta, 2017; Woodside et al., 2016; Misangyi & Acharya, 2014; Kim et al., 2013). The commonly used percentiles are the 90th percentile for full-membership, the 50th percentile for the mid-point, and the 10th percentile for full non-membership (Kraus et al., 2018). However, the research team's knowledge and the theoretical background are also valuable to determine fuzzy values (Ragin, 2009). In this particular case, the fuzzy values for the outcome and conditions were determined using the percentiles employed by Kraus et al. (2018), namely the 90th, 50th, and 10th.

Table 2 shows that the values for the calibration of the outcome (company performance measured as the company's future financial situation) were 2 for the 90th percentile, 1.5 for the cross-over point, and 1 for the 10th percentile. For the condition of gender, a value of 1 was taken if the respondent was male and 0 if the manager was female. For the remaining conditions, the percentiles employed by Kraus et al. (2018) were used. The remaining contingent factors referred to the innate characteristics of managers or companies. They were continuous variables that were transformed into fuzzy values for this study. In this case, the contingent factors were age (AGE) and company size in terms of number of employees (EMP).

Next, the conditions related to the use of information systems were calibrated. All corresponded to fuzzy values. First, the number of updates (SN) reflects the importance that the company attaches to the relevance and up-to-datedness of its social networks. Second, the use of social networks and new technological tools for corporate purposes (TOO) reflects the company's focus on using new digital tools and social networks for corporate purposes. Finally, training in new digital tools (TRA) reflects the level of training on the use of new digital tools in the company.

#### **4. Results**

FsQCA was used to determine which combinations of the aforementioned conditions lead to the presence or absence of superior company performance. The grouping of different conditions can lead to the same result. Therefore, two models were considered:

MODEL A: Superior company performance =  $f(\text{GEN,AGE,EMP,SN,TOO,TRA})$

MODEL B:  $\sim$ Superior company performance (i.e., poor company performance) =  $f(\text{GEN,AGE,EMP,SN,TOO,TRA})$

The tilde symbol ( $\sim$ ) in Model B expresses the absence of the outcome. In this particular case, the outcome is superior company performance. Therefore, the absence of the outcome corresponds to poor company performance. The following section presents the results of the fsQCA. These results show the combinations of conditions that lead to the presence or absence of superior company performance.

##### ***4.1. Analysis of necessary conditions***

Before the conditions that lead to the outcome can be described, the conditions that are necessary for the presence or absence of superior company performance must first be identified.

Necessary conditions are those that must be present in all combinations that lead to the outcome. This study uses the threshold set by Schneider and Wagemann (2012), who define a condition as necessary when the consistency score is greater than 0.9. Table 3 shows the conditions that are necessary for both the presence and absence of the outcome. The conclusion is that no condition is necessary to explain the presence or absence of superior company performance because no consistency value is greater than 0.9.

(Table 3 should be placed here)

#### **4.2. Analysis of sufficient conditions**

The results of the study are determined by the consistency cut-off chosen for the analysis. In this study, the consistency cut-off was set at 0.83 for the presence of the outcome (high performance) and 0.75 for the absence of the outcome (low performance). The cut-off point should not be less than 0.75 (Berg-Schlusser et al., 2009). The coverage threshold adopted for this study was 1 for both presence and absence of the outcome. Therefore, there were 12 cases for the analysis of the combinations that result in superior company performance and nine cases for the analysis of poor company performance.

The fsQCA method was used to analyze the combinations of conditions that are causally related and lead to superior company performance or poor company performance. This technique yielded three separate solutions: complex, parsimonious, and intermediate. In this study, the parsimonious and intermediate solutions were considered to ensure a rigorous and comprehensive analysis of the combinations of conditions.

Table 4 shows the combinations for the intermediate and parsimonious solutions. Both solutions were considered because the intermediate solution includes the parsimonious solution (Crilly et al., 2012). The notation used in this study to present the results is based on the

indications provided by Fiss (2011). The solutions given by the fsQCA software are presented in such a way that each type of circle has a specific meaning. Black circles indicate the presence of a particular condition. White circles denote the absence of a condition. Large circles indicate that the condition appears in both the parsimonious and intermediate solutions. Small circles denote conditions that appear only in the intermediate solution (but not in the parsimonious solution). A blank space means that the condition is not relevant to the configuration.

(Table 4 should be placed here)

As shown in Table 4, the analysis performed using the fsQCA software results in two models. The first model represents the combinations of causal conditions that lead to high company performance. The second model represents the combinations of causal conditions that lead to poor company performance. Both models are acceptable because the solution consistency is greater than 0.75 in both cases (0.88 and 0.78, respectively; Schneider & Wagemann, 2012). The solution coverage measures to which extent the solution measures the four configurations for high company performance and the three configurations for poor company performance. For both cases, the solution coverage is acceptable (0.429 and 0.439, respectively).

The discussion now centers on each individual configuration. The consistency measures to which extent the configuration is represented by the overall outcome. In this study, configurations with consistency values greater than 0.75 were selected. Based on this threshold, all four configurations for high performance were selected, and two of the configurations for low performance were selected. The raw coverage represents the extent to which each configuration explains membership in the outcome. Therefore, a high raw coverage value means that a particular configuration explains a large proportion of high company performance.

The unique coverage measures the extent to which each configuration explains membership in the outcome.

Configurations 1, 2, 3, and 4 are the combinations that result in high company performance. According to Configuration 1, 31% of the cases in this study indicate that for high company performance, gender has no influence, the number of employees is small, the corporate use of social networks is intensive, social networks are updated regularly, and the company invests in employee training in areas related to social networks. The consistency score for this solution is 0.878.

According to Configuration 2, 4% of the cases suggest that company performance is high when there is a large number of employees and the managers are older. Gender plays a role in determining high company performance. Social networks are also used for corporate purposes and are updated regularly, and the company invests in training for employees in areas related to social networks. The consistency score for this solution is 0.900.

According to Configuration 3, in 8% of the cases that lead to high company performance, gender has no influence, and managers are older. In addition, there is a large number of employees. Social networks are regularly used for corporate purposes, and the level of training in areas related to social networks is strong, while the number of updates is low. The consistency score for this solution is 0.878.

According to Configuration 4, 15% of cases suggest that high company performance is achieved when managers are older, and the company has few employees. Social networks are updated regularly, but there is little employee training in areas related to social networks. Age has no effect on the outcome. The consistency score for this solution is 0.913.

Configurations 5, 6, and 7 are the combinations that result in poor company performance. This discussion centers on Configurations 5 and 6 because they are the only configurations with a consistency score of more than 0.75 (Fiss, 2011).

According to Configuration 5, 25% of the cases suggest that a company performs poorly when the managers are young and the company has few employees. In addition, the level of training in the use of social networks is weak, and few updates are made to the company's social networks. Gender does not have an influence on poor company performance. The consistency score for this configuration is 0.820.

According to Configuration 6, 13% of cases suggest that gender has an influence on poor company performance, there are few employees, there is little corporate use of social networks, and updates to social networks and training in this area are rare. The consistency score for this configuration is 0.838.

According to the criterion stated by Fiss (2011), Ragin (2009), and others, all of the configurations discussed here (four explaining high performance and two explaining poor performance) are of interest for analysis.

## **5. Discussion**

### ***5.1. Comparison of results with the previous literature***

Many of the studies cited in this paper indicate a clear positive relationship linking the use of corporate social networks and training in new digital tools to the performance of digitalized companies (Rishika et al., 2013, Martínez-Sala et al., 2018, Soltis et al., 2018, Ayodeji & Kumar, 2019). This study investigates the relationship between these conditions (as well as other conditions) for the specific case of KIBS, which are founded on the basis of service and knowledge innovation (Chung & Tseng, 2019).

According to Horváth and Szerb (2018), management practices linked to digitalization and the use of digital tools increase business performance. They report the incentive to shift business models through digital technologies by making minor changes and improvements. Our results show which combination of conditions influences the corporate performance of

KIBS to the greatest extent. The results reported in the previous section show that high company performance is achieved when the number of social network updates, the intensity of the corporate use of social networks, and the level of social network training are high. Therefore, we accept Propositions 1, 2, and 3 stated in the section on the theoretical framework. These conditions positively influence the performance of KIBS.

Although some scholars such as Macky et al. (2008) and Akson et al. (2013) have reported that having young managers leads to better performance by digitalized companies, our results show that having older managers is also linked to the superior performance of companies. This relationship may arise because their experience in the industry and cumulative learning in strategy, management, and decision making can allow them to achieve better performance. Therefore, we accept Proposition 4.

The absence of gender is linked to both strong and weak company performance. Therefore, in the context of KIBS, we reject the assertions of Guiso and Rustichini (2011), who claim that male managers lead firms to successful performance. The same occurs with the studies of Herring (2009) and Twenge and Campbell (2011), who suggest that women managers are associated with enhanced financial performance. Finally, company size is either present in or absent from the combinations. Therefore, the number of employees of a company does not seem to affect its financial performance in the context of KIBS. This finding is consistent with the study by Windrum and Tomlinson (1999).

## **5.2. *Theoretical implications***

The analysis of the results of the study and whether they support or contradict those presented in the subject-specific literature reveals several theoretical implications. First, this study shows that updating social networks and the intensity of the corporate use of social networks exert a positive impact on the performance of KIBS. It would of interest to study the effect of this condition on other areas of the organizational performance of KIBS and to

compare this impact with the effect in other sectors. Social media training has also been shown to contribute to company performance. Future studies could examine whether training in other digital skills has the same results. Finally, older managers—with more experience—achieve higher performance. Other personal characteristics of managers may also influence performance, so future studies should address this possibility.

## **6. Conclusions**

As discussed in the previous section, our study shows the combination of factors in digitalization that lead to the superior performance of KIBS. We go a step further than either Horváth and Szerb (2018) or Ayodeji and Kumar (2019) by showing that enhanced financial performance is achieved by KIBS that use social networks for corporate purposes, update them regularly on a modest budget, and train employees in digitalization and new digital tools. Moreover, managers should accumulate experience and have a strong background to lead their company to high performance. By contrast, the gender of the manager is not relevant, because leadership in embracing digital technologies can be developed through training. The size of the company does not affect the financial performance of KIBS either.

From a methodological perspective, this study enriches the literature by using fsQCA to examine how digitalization contributes to the financial performance of KIBS. The six analyzed conditions form two categories: contingent factors of the digitalized companies considered in the study (three conditions) and factors related to the use of new technologies in the company (three conditions). This approach also covers a gap in the literature given that this topic had not previously been studied using this method.

Future studies should continue to investigate contingent factors that improve the performance of KIBS in different cultural contexts. This is a limitation of our research because our sample only contains companies from the Region of Valencia, Spain. Therefore, we could

not test cultural differences. Future research could explore cross-cultural comparisons by focusing on several cultural differences. Studies should test whether the information systems included in our theoretical framework have the same or different effects on the performance of KIBS. Another limitation of our study was the choice of contingent factors, which focused solely on the company's CEO (manager's gender or age). Future lines of research might also include the study of other contingent variables such as the company's sector, degree of internationalization, and company age. It would also be of interest to study other conditions related to the degree of digitalization. For example, future studies could focus on the financial resources that the company allocates to new technologies. Finally, this study focuses only on KIBS. It would be of interest to conduct a similar study considering other sectors such as food, tourism, or commerce.

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## Tables

Table 1. Description and format of the outcome and conditions

Type	Name	Description	Format
Outcome	SIT	Company performance measured as the company's future financial situation	Fuzzy value
Condition	GEN	Manager's gender	Crisp value
Condition	AGE	Manager's age	Fuzzy value
Condition	EMP	Company size (number of employees)	Fuzzy value
Condition	SN	Number of social network updates by the company	Fuzzy value
Condition	TOO	Use of social networks and new technological tools for corporate purposes	Fuzzy value
Condition	TRA	Training in new digital tools	Fuzzy value

Table 2. Calibration of the outcome and conditions

	Cut-off points		
	Full membership	Cross-over point	Full non-membership
Company performance	2	1.5	1
Age	46.1	32.5	24.9
Gender	1 = male, 0 = female		
Size (number of employees)	2	0.5	0
Number of updates	3	2.7	1
Use of digital tools	4	3	1.9
Training	2	1.5	1

Table 3: Analysis of necessary conditions (presence and absence of the outcome)

	Presence of outcome		Absence of outcome	
	Consistency	Coverage	Consistency	Coverage
GEN	0.221945	0.494444	0.304348	0.505556

AGE	0.546883	0.684030	0.437458	0.407985
EMP	0.305237	0.648993	0.328428	0.520679
SN	0.747631	0.739516	0.458863	0.338431
TOO	0.687531	0.687702	0.525753	0.392118
TRA	0.667830	0.714705	0.454515	0.362690
~ GEN	0.778055	0.600000	0.695652	0.400000
~ AGE	0.526683	0.556668	0.661204	0.521086
~ EMP	0.774564	0.607352	0.778595	0.455221
~ SN	0.331172	0.45078	0.646823	0.656483
~ TOO	0.392269	0.525911	0.581271	0.581077
~ TRA	0.404489	0.498617	0.642475	0.590532

Table 4. Analysis of sufficient conditions

Configuration	Superior company performance				Poor company performance		
	1	2	3	4	5	6	7
GEN	∅	●	∅	∅	∅	•	∅
AGE		•	•	•	∅		•
EMP	∅	●	●	∅	∅	∅	●
SN	●	•	∅	•	∅	∅	●
TOO	•	•	●			∅	•
TRA	•	•	•	∅	∅	∅	•
Raw coverage	0.314	0.047	0.081	0.157	0.258	0.125	0.132
Unique coverage	0.202	0.047	0.019	0.049	0.183	0.125	0.057
Consistency	0.878	0.9	0.878	0.913	0.82	0.838	0.745
Solution coverage	0.429				0.439		
Solution consistency	0.884				0.786		

\*Large back circles indicate the presence of a core condition. Large white circles indicate the absence of a core condition. Small black circles indicate the presence of a particular condition. Small white circles indicate the absence of a particular condition. Blank spaces indicate that the condition is not relevant for the configuration.

