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Online information on digitalisation processes and its impact on firm value

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ABSTRACT

In the past decade, digitalisation has gained the attention of both professionals and academics. Investors are increasingly taking into account information on firm digitalisation in their decision-making. However, this information is poorly captured through corporate disclosure. A scarcity of this information has further increased its value in investment choices. Dissemination of information about digitalisation can be a signal that companies send to investors with the hope of a positive effect on firm value. Despite its relevance, there are no studies on the relationship between information about digitalisation and firm value. This study aims to fill this gap by analysing the impact of the information about digitalisation provided directly or indirectly by companies through their website on firm value. The regression analysis, conducted on a sample of 114 international firms, shows the existence of a positive relationship, demonstrating how information about digitalisation is a means for companies to increase their value.

1. Introduction

This study aims to analyse the effect of information on the digitalisation level—provided directly or indirectly by companies through corporate websites—on firm value.

It has been widely demonstrated that intangibles significantly contribute to the creation of competitive advantage. Within the various categories of intangibles, innovation, technology, and digitalisation play a pivotal role (Bertani, Ponta, Raberto, Teglio, & Cincotti, 2020; De Pablos & Edvinsson, 2020). Empirical studies indicate a positive effect of R&D expenditures and information and communication technology on the firm's performance (Agrawal & Knoeber, 1996; Anderson, Narus, & Van Rossum, 2006; Belvedere, Grando, & Bielli, 2013; Connolly & Hirschey, 1984; Hirschey & Weygandt, 1985; Skinner, 1994). Digitalisation also appears to have a positive effect on firm performance, as pointed out by Martín-Peña, Sánchez-López, & Díaz-Garrido (2019). Moreover, it is rapidly becoming one of the key elements for ensuring the transition of production systems to a structurally higher standard of competitiveness and improved performance of firms. Professionals are also paying more attention to digitalisation and its positive influence on firm performance. For example, PwC (2016) has outlined that digitalisation may be used as a managerial tool to facilitate the development of an organisation by optimising the business model and reducing the level of risk. Their study further measures the extent to which the absence of digitalisation can lead to the loss of competitive advantage and market share.

The growing importance of digitalisation is elucidating the information related to digitalised processes, which is becoming increasingly relevant for investors in their investment choices. Indeed, this type of information is scarcely captured through financial disclosure, as its measurement in monetary terms is highly complex (Gamayuni, 2015). Non-financial disclosure also fails in fully capturing the information on the level of firm digitalisation. In this regard, even integrated reporting provides only limited information, despite its focus on intellectual capital (Raimo, Vitolla, Marrone, & Rubino, 2020a; Vitolla, Raimo, & Rubino, 2019). In fact, non-financial disclosure and integrated reporting often consider the facets of digitalisation as a mere sub-category of structural capital in the context of information on intangibles.

The limited presence of information regarding digitalisation in traditional financial and more innovative corporate documents increases the value and relevance of the online information about digitalisation in the investors' decision-making processes. In a signaling theory key (Ross, 1977; Spence, 1973), this information can be considered as a signal that companies can send to the financial market, hoping to benefit from an increase in their value derived from an adequate and thorough evaluation by investors (Lev & Penman, 1990). However,

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given its relevance in the academic sphere, the level of information on digitalisation disclosed by firms is a rarely explored topic. Furthermore, no study has examined the relationship between the level of information about digitalisation and firm value. This information could influence the value of the company by increasing the expected cash flows and reducing the cost of equity capital, which are the key elements for computing firm value (Plumlee, Brown, Hayes, & Marshall, 2015). Previous research investigating the impact of certain forms of information—such as voluntary, environmental, sustainability and intangibles-related—on firm value (e.g. Al-Akra & Ali, 2012; Bachoo, Tan, & Wilson, 2013; Chung, Judge, & Li, 2015; Li, Gong, Zhang, & Koh, 2018; Orens, Aerts, & Lybaert, 2009; Uyar & Kılıç, 2012) have demonstrated the circumstances mentioned above.

Therefore, this study aims to fill this significant gap in the literature by analysing the information on digitalisation—provided directly or indirectly by companies—and the firm value. The study particularly examines the information present on corporate websites. In this regard, an important issue for companies is identifying the appropriate means for transferring information about their knowledge and resources to capital markets (Ndofor & Levitas, 2004). From this perspective, corporate websites can be the perfect channels for sending signals related to the digitalisation level as they provide rapidly updated information to investors at a low cost (Gandía, 2008).

This study is part of that stream of literature that examines the relationship between information and firm value. The results obtained suggest that information about the firm digitalisation level has a positive impact on firm value. In this perspective, the results are consistent with previous studies that examined the effect of other forms of information on firm value.

The remainder of this article is organised as follows. Section 2 offers an overview of the relevant literature and theoretical background while Section 3 develops the hypothesis. Section 4 outlines the research methodology. Section 5 summarises the findings. Finally, Section 6 discusses them, examines the theoretical and managerial implications and draws some conclusions.

2. Literature review and theoretical background

In line with the objectives of this study, the literature review focuses, firstly, on the academic contributions about the financial effects of digitalisation and, secondly, by analogy, (considering the absence of studies concerning the relationship between information about digitalisation and firm value) on the academic contributions about the relationship between information (in general) and firm value.

2.1. The effects of digitalisation

The effects of digitalisation have been studied recently in the empirical literature. In line with the objectives of this study, the literature review focuses on the financial effects of digitalisation. Several studies have shown that it represents a key factor for firm performance (Bellakhal & Mouelhi, 2020). It actually leads to new revenue-generating and value-creating opportunities (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019). In this regard, Westerman, Tannou, Bonnet, Ferraris, & McAfee (2012) have shown that the most digitalised companies show better performance in terms of profitability, revenue generation and market value. Instead, Weill and Woerner (2015) have underscored how companies with a deep engagement in digital ecosystems have a significantly higher level of revenues and profitability than their competitors. Bughin, Catlin, Hall, & van Zeebroeck (2017), subdividing the sample into three groups based on the level of digitalisation, showed a positive relationship between the use of digital tools and the amount of revenues. Barua, Konana, Whinston, & Yin (2004) and Eller, Alford, Kallmünzer, & Peters (2020) found a positive effect of digitalisation on financial performance. Martín-Peña et al. (2019), in addition to confirm these results, found that digitalisation positively mediates the relationship between servitization and firm performance.

The academic literature has also analysed the mechanisms through which digitalisation improves financial performance. First, it improves the product and service offering and the operational process (Kryvinska, Kaczor, Strauss, & Greguš, 2014; Martín-Peña et al., 2019). Accordingly, digitalisation facilitates commercialization and provides new methods of commerce and marketing, diversifies communication channels (website and social media) and sales methods (e-commerce). These circumstances transform the business model, create new business opportunities, improve relations with stakeholders and optimize firm processes, with a consequent improvement in financial performance (Bellakhal & Mouelhi, 2020). A second mechanism is represented by the greater possibilities of internationalization. Clearly, digitalisation favours access to international markets (Cassetta, Monarca, Dileo, Di Berardino, & Pini, 2019; Olejnik & Swoboda 2012). It offers new opportunities on foreign markets and facilitates identification and contact with new customers, partners and suppliers around the world at reduced costs (Bellakhal & Mouelhi, 2020). These circumstances allow an increase in revenues and a reduction in costs, improving the firm financial performance. Another mechanism through which digitalisation improves performance is represented by the increase in the efficiency and productivity (Bellakhal & Mouelhi, 2020). It is a fact that the automation of certain activities, a better control of the different production units and an improvement in the management of human resources connected to the use of digital tools improves the efficiency of companies, reduces costs, thus improving financial performance. Finally, digitalisation allows to cut some communication, administrative and commercial costs and provides a wide access to finance, with consequent improvement of performance (Bellakhal & Mouelhi, 2020).

The literature review shows a great deal of attention to the financial benefits associated with digitalisation and the mechanisms underlying this relationship. However, the existing contributions have mainly examined the effects on profitability, leaving out the impact of digitalisation on firm value. Furthermore, although digitalisation provides financial benefits, it is unclear whether these benefits also apply to the information about the digital aspects.

2.2. Information and firm value

Information influences the day-to-day decision-making of individuals. They make decisions based on freely available public and private information, accessible only to certain subjects under certain conditions (Connelly, Certo, Ireland, & Reutzel, 2011). Besides, this applies to companies and investment decisions of private investors.

The disclosure policies are crucial for firms to improve their transparency towards investors and stakeholders in general (Giacosa, Ferraris, & Bresciani, 2017). The reasons behind the decisions of companies to disclose voluntary information are the subject of several studies and theories. Among them, the signaling theory (Ross, 1977; Spence, 1973) is particularly useful for explaining the preference of companies to move beyond mandatory information. This theory is based on the concept of signal, which can be defined as 'any action by a competitor that provides a direct or indirect indication of its intentions, motives, goals, or internal situation' (Porter, 1980, p. 75). According to this theory, information can be a signal sent by the company to the market and potential investors, and the best-performing companies are induced to provide more information to the investors directly or indirectly, aiming to signal their competitive strength, thereby, attracting capital. The thesis is based on the assumption that firm value is influenced by investors' perceptions of managers' ability to predict and react to changes in the external environment (McGuire, Schneeweis, & Branch, 1990). Therefore, the decision to disclose information about the bulk of the laws and regulations in force lies in the willingness of companies to report management skills to the market (Morris, 1987). Signaling theory can also explain the direct and indirect dissemination of digitalisation-related information, which can be considered a reaction to the information asymmetry: companies

have information about their best practices (in terms of digitalisation) that investors do not possess. Under such circumstances, the most digitalised companies have an incentive to disclose information about their level of digitalisation to send a signal to the market, hoping to increase company value owing to an adequate evaluation of the company by the investors (Lev & Penman, 1990).

Previous research has examined the effects of various forms of information on firm value. Al-Akra and Ali (2012), Chung et al. (2015), and Uyar and Kılıç (2012) found a positive effect of voluntary disclosure of information on firm value by analysing the contents of corporate reports. Garay, González, Guzmán, and Trujillo (2013) obtained the same results by examining the information disclosed through corporate websites. Further, this positive relationship was verified for the information in the integrated reports (Barth, Cahan, Chen, & Venter, 2017; Lee & Yeo, 2016). The disclosure of environmental information by firms also appears to have the same positive effect on firm value, as demonstrated by Blacconiere and Patten (1994), Clarkson, Fang, Li, & Richardson (2013), and Plumlee et al. (2015). An alternative area of research focused on information related to corporate social responsibility and reported a positive effect of such information on firm value (Bachoo et al., 2013; Bidhari, Salim, Aisjah, & Java, 2013; Li et al., 2018). An analysis of information closer to digitalisation was performed by Orens et al. (2009) and Salvi, Vitolla, Giakoumelou, Raimo, & Rubino (2020) who found a positive effect of information about intellectual capital on firm value.

The literature review shows the absence of contributions aimed at examining the effect of the information about digitalisation on firm value. In fact, while the effects of various forms of information on firm value have been analysed in detail, no contributions have focused on information related to the digitalisation processes.

3. Hypothesis development

Although there is no empirical evidence about the impact of information about digitalisation on firm value, it is still possible to hypothesize a positive effect. This circumstance could be connected to two peculiar characteristics of information about digitalisation.

First, digitalisation is an important driver capable of influencing firms' financial performance (Anderson et al., 2006; Belvedere et al., 2013; Martín-Peña et al., 2019). Highly digitalised companies have a competitive advantage compared to competitors guaranteeing improved past and expected performance (Martín-Peña et al., 2019). Therefore, an adequate representation of this information, representing a signal sent by the company to investors can trigger the virtuous loop leading to a better perception of the company by investors, consequently increasing the firm value.

Second, information about the level of digitalisation is particularly valuable as it is not captured by financial disclosure due to the difficulty in monetary quantification (Gamayuni, 2015). Besides, non-financial disclosure devotes limited attention to aspects of firm digitalisation, which are frequently regarded as a mere sub-category of structural capital in the context of information on intangible assets. Furthermore, the generally accepted standards in the field of non-financial disclosure do not specifically require the inclusion of digitalisation-related information. These circumstances make it difficult for investors to utilise this information by generating significant information asymmetries. In this regard, the dissemination of digitalisation-related information could have a major impact on the perception of investors, and contribute of increasing the firm value.

The channel for disseminating the digitalisation-related information is also particularly important, and it can help in improving the effectiveness of the signal sent. The volume of information provided online by companies has increased steadily, contributing to more effective dissemination of information to economic agents, reducing the associated costs (e. g., printing or staffing costs), and improving the frequency and speed of dissemination (Bushman & Smith, 2001). Gandía (2008) accordingly stressed the importance of corporate websites, viewed as an efficient communication channel between companies and potential investors. Andrikopoulos, Merika, Triantafyllou, & Merikas (2013) have emphasised the role of the worldwide web, having revolutionised the dissemination of corporate information, and defined corporate websites as a superior means of disseminating information from firms to investors. Moreover, they illustrated the role of information released through corporate websites in reducing information asymmetries and its positive impact on corporate performance. Finally, López-Arceiz, Torres, and Bellostas (2019) confirmed the importance of online information, defining it as a mechanism for facilitating companies in achieving their strategic and financial goals. In light of the above, we formulate the following research hypothesis:

H1: There is a positive relationship between the level of information about digitalisation shown on corporate website and firm value.

4. Research methodology

4.1. Sample

Our sample consists of 114 companies listed in international stock markets. We construct our sample by taking 188 companies, randomly selected from the list of companies applying integrated reporting in 2018, as listed on the website of the International Integrated Reporting Council (IIRC). Specifically, to identify the sample we started from the '<IR> Reporters' section of the IIRC website (Raimo, Vitolla, Marrone, & Rubino, 2020b). This section presents a list of organization that adopt integrated reporting. First of all, non-profit companies were excluded from the list and, subsequently, 188 firms were selected from the remaining ones. Our rationale for selecting the list of companies applying integrated reporting is linked to the assumption of investors that companies preparing such documents provide a complete set of information (García-Sánchez, Raimo, Marrone, & Vitolla, 2020; Vitolla, Salvi, Raimo, Petruzzella, & Rubino, 2020), given that financial measures may be insufficient for representing a firm's value creation process (Vitolla, Raimo, Rubino, & Garzoni, 2019). This gives rise to a diversified sample in terms of the level of digitalisation of its constituents.

Seventy-four companies with missing accounting and market data are excluded from the initial list, leading to a final sample of 114 companies. The sample is differentiated in terms of the composition of both sector and region. The selected companies operate in seven different sectors—basic materials, communications, consumer, energy, industrial, technology, and utilities. Moreover, they are based in 5 different geographical regions—Africa, America, Asia, Europe, and Oceania. America includes Argentina, Brazil, Mexico, and the United States. Europe includes Austria, Belgium, Denmark, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Poland, Slovenia, Spain, Sweden, Switzerland, Turkey, and the United Kingdom. Asia comprises of Japan, India, and Singapore. Africa includes South Africa and Kenya, and Oceania includes Australia and New Zealand.

Table 1 and Table 2 describe the sample composition by industry and

Table 1
Sample distribution by industry.

Industry	Frequencies	
	Absolute	Relative (%)
Basic Materials	19	16.67
Communications	7	6.14
Consumer	37	32.46
Energy	6	5.26
Industrial	23	20.17
Technology	8	7.02
Utilities	14	12.28
Total	**114**	**100.00**

Table 2
Sample distribution by region.

Region	Frequencies	
	Absolute	Relative (%)
Africa	31	27.19
America	9	7.89
Asia	6	5.26
Europe	65	57.02
Oceania	3	2.64
Total	**114**	**100.00**

region, respectively. Normality tests (Kolmogorov-Smirnov test, skewness, and kurtosis values) were conducted on the selected sample, confirming a normally data distribution.

4.2. Dependent variable

The dependent variable employed in this study is Tobin's Q (TQ), calculated as the ratio of a firm's market value and the replacement value of its assets. It is 'an indicator of firm-level incentives for investment in corporate capital' (Hall, 1993, p. 1). This measure, first introduced by Tobin (1969, 1978), can be useful for predicting a firm's future value creation. According to Harrigan, Di Guardo, and Marku (2018), Tobin's Q ratio indicates whether investors expect high or low growth opportunities. Tobin's Q considers expected future opportunities as well as returns from current activities.

Following Ghosh and Wu (2007), employing TQ as a proxy for firm performance neutralises the effects of accounting policies; and it is simultaneously capable of capturing the impact of intangible assets on firm value. Furthermore, this measure 'indicates future performance despite being calculated from historical data' (Hejazi, Ghanbari, & Alipour, 2016, p. 260), considering the past and expected performance of the company. Therefore, we use TQ—a market-oriented measure of firm value—as a measure of investors' expectations of the ability of a firm to create value.

Taking a cue from Bharadwaj, Bharadwaj, and Konsynski (1999), we use the TQ computation method of Chung and Pruitt (1994), according to which it is possible to approximate this metric using basic financial and accounting information. Their results are very similar to alternative approaches such as that of Lindenberg and Ross (1981). We calculate TQ based on equation (1):

$$\text{Tobin's Q} = \frac{(\text{MVE} + \text{PS} + \text{Debt})}{\text{TA}} \quad (1)$$

where MVE is equal to (the closing price of a share at the end of the financial year) * (number of common shares outstanding); PS represents the liquidating value of the firm's outstanding preferred stock; Debt is equal to: (current liabilities – current assets) + (book value of inventories) + (long term debt), and TA represents the book value of total assets.

It is important to highlight that the numerator of our ratio 'may increase due to the perception of better industrywide growth opportunities, or due to individual firm differences (such as salient innovations)' (Harrigan et al., 2018, p. 2), which are not generally reflected in the denominator. This implies that higher TQ values suggest a superior economic performance, and the market and investors perceive that firms with a higher level of TQ have better growth opportunities. The firms with 'a q-value greater than 1.0 reflect an unmeasured source of value attributed to intangible assets' (Rubera & Droge, 2013, p. 453).

4.3. Empirical strategy and independent variable construction

Our independent variable is the level of information about digitalisation (ID) provided directly or indirectly by companies through the website. Digitalisation is a widespread concept which cannot simply be described by a single item because it is an ongoing process through which firms use digital technologies to create revenue, improve business, replace/transform business processes, and create an environment having digital information as its core (Ferreira, Fernandes, & Ferreira, 2019).

In this study, ID is measured by applying a manual content analysis of corporate websites. Krippendorff (1980, p. 21) defines content analysis as a 'research technique for making replicable and valid inferences from data according to their context'. This technique is considered reliable, objective, and is widely adopted in the literature (Guthrie, Petty, Yongvanich, & Ricceri, 2004). Furthermore, according to McMillan (2000), content analysis is particularly useful for analysing corporate websites and the flow of information provided by the companies due to their characteristics. Several past studies applied this technique to analyse the level of information related to intangibles provided by universities (Manes-Rossi, Nicolò, & Polcini, 2018), corporate governance (Gandía, 2008), and e-business dimensions (Meroño-Cerdan & Soto-Acosta, 2005). Consequently, we apply a corporate website manual content analysis. We visited the websites of the 114 listed companies in September 2019 for this purpose. This content analysis was aimed at assessing the presence of certain items identified and classified on the basis of a two-stage methodology.

Identification of items based on past academic contributions, research conducted by reputed international institutions, and practitioner literature represented the objective of the first stage. Concerning academic contributions, we specifically referred to relevant and recent studies focused on the digitalisation level of firms (Al-Samawi, 2019; Canestrino, Ćwiklicki, Kafel, Wojnarowska, & Magliocca, 2020; Galindo-Martín, Castaño-Martínez, & Méndez-Picazo, 2019; Ibem, Akinola, Erebor, Tolani, & Nwa-uwa, 2018; Martín-Peña et al., 2019; Pessot et al., 2020; Stoldt et al., 2018; Vadana, Torkkeli, Kuivalainen, & Saarenketo, 2019). Further, we examined the research conducted by reputed international institutions, namely, Eurostat (2017) and OECD (2019), along with exploring the Digital Economy and Society Index (DESI) provided by the European Commission (2019), which is considered a valuable indicator of the relevant elements of firm digitalisation level (Rubino, Vitolla, Raimo, & Garcia-Sanchez, 2020; Rubino, Vitolla, Raimo, & Garzoni, 2019). Finally, regarding practitioner literature, we examined the content of the research conducted by McKinsey (2016). This first stage led to the identification of twenty-three items relating to various aspects of firm digitalisation.

Based on the accomplishments of past studies, the second stage aimed at classifying the items identified previously. Hence, the twenty-three items were analysed to assess any affinity for grouping them into macro-categories. This contributed to the identification of the following five macro-categories: 1) instruments of digital communication; 2) e-commerce; 3) data management; 4) information about digitalisation and relevant activities; and 5) investments in digitalisation and relevant activities. The different macro-categories and specific items are described in Table 3.

Each item is treated as a binary measure, assuming a value equal to 1 if it is present on the corporate website, and 0 otherwise. All items are assigned the same weight in the calculation of the final score. Based on the construction, the overall score can vary between zero and twenty-three.

4.4. Control variables

Based on the key literature in the field (Bardhan, Krishnan, & Lin, 2013; Ghosh & Wu, 2007; Harrigan et al., 2018; Hejazi et al., 2016; Lee & Yeo, 2016), a set of control variables complements our econometric model. The control variables employed here include: firm size (FS), return on assets (ROA), liquidity (LIQ), research and development intensity (R&D), earnings growth rate (EGR), unlevered beta (B_U), and financial leverage (LEV).

FS is calculated as the natural logarithm of the company's book value

Table 3
Level of information about digitalisation.

N.	CATEGORIES	ITEMS
1	Instruments of digital communication	1. E-mail address (direct link with customers and business partners) 2. Restricted access area 3. Web applications 4. Documents sharing and cloud applications 5. Positioning on search engines 6. Mobile version of website
2	E-commerce	7. On-line product catalogues 8. Shop on-line 9. On-line payments
3	Data management	10. Data protection policy 11. Privacy policy
4	Information about digitalisation and relevant activities	12. Inbound logistics 13. Operations 14. Outbound logistics 15. Administration 16. Marketing and sales 17. Post sales services
5	Investments in digitalisation and relevant activities	18. Inbound logistics 19. Operations 20. Outbound logistics 21. Administration 22. Marketing and sales 23. Post sales services

of total assets (Lee & Yeo, 2016; Orens et al., 2009). We anticipate a positive relationship between FS and TQ, based on the notion that large companies should demonstrate a higher ability for undertaking new investment projects because of their greater resources and capabilities (Hejazi et al., 2016; Majundar, 1997).

ROA measures the firm's operating profitability, calculated as the ratio of net income and total assets. ROA is a good indicator of the actual capacity of the firm to generate returns by using its entire base of productive assets. According to the available literature, TQ and ROA are positively related because firms with superior operating performance frequently present higher stock prices and TQ (Chen, Guo, & Mande, 2006; Lee & Yeo, 2016). Furthermore, according to Rao, Agarwal, and Dahlhoff (2004), higher margins signal higher investor expectations regarding future cash flows.

LIQ is computed by dividing current assets by current liabilities (current ratio). We expect a positive relationship between LIQ and TQ because 'firms with higher liquidity have higher profitability' (Hejazi et al., 2016, p. 260).

R&D is calculated as the research and development expense of the company divided by the net sales. We expect a positive relationship between R&D and TQ due to the positive perception of the markets and investors towards more innovation-oriented firms (Ghosh & Wu, 2007; Salvi, Petruzzella, & Giakoumelou, 2018). According to Bardhan et al. (2013), R&D is associated with the development of intellectual property and knowledge capital, both affecting the dependent variable positively.

EGR is used as a proxy for a firm's potential for growth. A positive relationship is anticipated between EGR and TQ for the same reasons applicable to ROA (Ghosh & Wu, 2007), that is, more profitable firms should be capable of generating higher future cash flows and have a higher TQ.

Beta is used as a proxy for the firm's risk profile. The levered beta is a metric that simultaneously reflects leverage and market risk. We employ the unlevered beta (B_U) to isolate leverage risk, and it is calculated as follows (Botosan & Plumlee, 2005):

$$B_U = \frac{B_L}{1 + \left(\frac{\text{debt}}{\text{equity}}\right)} \quad (2)$$

where debt is the long-term debt, and equity is the stockholders' equity.

In this case, the expected relationship is negative considering that beta measures a firm's risk, and therefore the market perceives companies with a higher beta as riskier, and this negatively weighs on the TQ (Ghosh & Wu, 2007).

LEV is obtained by dividing the firm's total assets by shareholders' equity. This relationship is expected to be negative because a higher LEV of a firm reflects a higher degree of risk (Harrigan et al., 2018; Orens et al., 2009).

The data related to the dependent and control variables were collected from the Bloomberg database.

4.5. Model specification

We apply a multiple linear regression model to test the relationship between the level of information about digitalisation and firm value. More specifically, we use a cross-sectional analysis due to the impossibility of carrying out a panel analysis. The content analysis of corporate websites does not allow for measuring information about digitalisation level over different periods. The empirical analysis was performed for the year 2019. The proposed model is as follows:

$$TQ = \beta_0 + \beta_1 ID + \beta_2 FS + \beta_3 ROA + \beta_4 LIQ + \beta_5 R\&D + \beta_6 EGR + \beta_7 B_U + \beta_8 LEV + \varepsilon$$

5. Findings

5.1. Descriptive and correlation analysis

The first part of Table 4 reports the descriptive statistics and matrix correlation of the variables employed. Correlation coefficients are rather low: a maximum value of 0.4424 (p greater than 0.000) is reported between TQ and R&D, which confirms that investments in R&D have a strong and positive impact on TQ. We performed a variance inflation factor (VIF) test to check for collinearity among variables, and the findings indicate the absence of multicollinearity because all VIF values are lower than the suggested threshold of 10, as stated by Myers (1990).

5.2. Multivariate analysis

A linear regression analysis was conducted to test our research hypothesis. The results of the model are reported in Table 5. The relationship between TQ and ID is positive (0.0406) and statistically significant ($p = 0.001$), confirming our hypothesis that more intense dissemination of information about firm digitalisation through corporate websites can contribute to the improvement of firm value.

In addition, with reference to the control variables, FS has a positive (0.0602) and statistically significant ($p = 0.022$) impact on TQ, which confirms our assumption that larger companies can achieve better results due to a stronger ability to exploit internal resources and a higher degree of operational efficiency (Hejazi et al., 2016; Lee & Yeo, 2016). ROA is positively related (0.0190, $p = 0.029$) to the dependent variable, which is consistent with the findings of previous studies. The firm value increases with profitability; higher margins imply superior expectations in terms of future cash flows (Ghosh and Wu, 2007; Lee & Yeo, 2016). LIQ also confirms the expected relationship with a positive impact on TQ (0.1600, $p = 0.018$), consistent with the idea that a higher level of LIQ positively affects a firm's performance (Hejazi et al., 2016). As underlined in previous studies (Ghosh & Wu, 2007; Harjoto & Jo, 2011; Rubera & Droge, 2013), R&D is positively related (0.0437, $p = 0.000$) to TQ. The higher level of commitment to R&D allows companies to encourage innovation, a factor positively affecting firm value. EGR and TQ are positively associated (Ghosh & Wu, 2007), but this relationship is not statistically significant. The relationship between B_U and TQ is negative (−0.1227) and statistically significant ($p = 0.006$) (Ghosh & Wu, 2007). Further, we observe an inverse relationship (−0.0141, $p = 0.070$) between LEV and TQ (Harrigan et al., 2018; Hejazi et al., 2016), confirming our initial expectations about the impact of the risk level of a firm on TQ.

Table 4
Descriptive statistics, VIF and matrix correlation. Note: ***Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level.

	Mean	St. Dev	VIF	TQ	ID	FS	ROA	LIQ	R&D	EGR	B_U	LEV
TQ	1.3242	0.6895	–	1.00								
ID	11.9561	4.6551	1.26	0.3908***	1.00							
FS	10.8416	2.1713	1.40	0.3775***	0.2804***	1.00						
ROA	3.8925	6.2141	1.25	0.2446***	−0.2218**	0.1024	1.00					
LIQ	1.4640	0.7733	1.17	0.3947***	0.1106	0.1563*	0.2135**	1.00				
R&D	2.5788	4.2535	1.16	0.4424***	0.2592***	0.2817***	0.0376	0.1948**	1.00			
EGR	17.5768	83.0623	1.08	−0.0023	0.0615	−0.1137	−0.0093	0.0231	−0.0204	1.00		
B_U	0.4564	1.1632	1.13	−0.3492***	−0.0888	−0.1814*	−0.1542	−0.2048**	−0.0713	0.1895**	1.00	
LEV	5.4670	6.9101	1.27	−0.1372	0.0721	0.2943***	−0.2482***	−0.1597*	0.0474	0.0767	0.0821	1.00

Table 5
Regression analysis.

	Expected sign	Coefficient	Robust S.E.	*p* value
Intercept		*0.1095*	*0.2740*	*0.000*
ID	(+)	0.0406***	0.0114	0.001
FS	(+)	0.0602**	0.0259	0.022
ROA	(+)	0.0190**	0.0086	0.029
LIQ	(+)	0.1600**	0.0663	0.018
R&D	(+)	0.0437***	0.0120	0.000
EGR	(+)	0.0005	0.0006	0.441
B_U	(−)	−0.1227***	0.0434	0.006
LEV	(−)	−0.0141*	0.0077	0.070
	Adjusted R^2	0.4643	N. of obs. 114	Prob > F 0.000

Note: ***Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level.

6. Discussion and conclusions

6.1. Discussion and theoretical implications

The results obtained suggest that information about the company digitalisation level has a positive effect on firm value. These results are consistent with previous studies that examined the impact of other forms of information on firm value. The past studies have particularly reported the firm value to be positively affected by voluntary information (Al-Akra & Ali, 2012; Barth et al., 2017; Chung et al., 2015; Garay et al., 2013; Lee & Yeo, 2016; Uyar & Kılıç, 2012), environmental information (Blacconiere & Patten, 1994; Clarkson et al., 2013; Plumlee et al., 2015), information relating to corporate social responsibility (Bachoo et al., 2013; Bidhari et al., 2013; Li et al., 2018), and information about intangible assets (Orens et al., 2009; Salvi et al., 2020). This study is part of that stream of literature and extends the positive effect on firm value to the information about the digitalisation, provided directly or indirectly by companies. From this perspective, the disclosure of information on the digitalisation level of a firm can be considered an important signal sent by companies to investors. On the one hand, this signal is capable of influencing investors' perception of the expected cash flows of the firm, and on the other hand, it can reduce the perceived risk, consequently fostering the cost of equity capital reduction. These factors are the basis for determining the firm value (Plumlee et al., 2015).

Regarding the first point, the information provided by the companies on the level of digitalisation has an impact on the expected cash flows because investors expect higher cash flows from highly digitalised companies. Their expectations are based on the ability of such companies to generate higher cash flows, linked to a greater volume of revenue and a lower volume of costs. This perception of investors is particularly linked to the ability of highly digitalised companies to better understand customer needs, enhance value proposition, and improve response times and client service. Similarly, it is further related to the ability of the most digitalised companies to increase revenues through the use of e-commerce and to reduce costs by optimising the resources, applying innovative business models, and eliminating manual steps.

Concerning the second point, the information provided by the companies on the degree of digitalisation reduces the cost of equity as a consequence of the lower level of risk perceived by investors. The digitalisation of companies is a useful tool for adapting to an increasingly turbulent and potentially volatile competitive environment. Consequently, the dissemination of information about the level of digitalisation, reducing the information asymmetries particularly relevant in economic contexts characterised by exasperated technological innovation, allows investors to have a greater knowledge of the digital strategies of the firms and reduce the investment risks. Ultimately, it can be said that investors expect higher future cash flows for companies that provide more information on their level of digitalisation, as well as lower cost of equity. This kind of information influences both the future cash flows generated by the firms as well as the cost of equity, which are the two key factors in determining firm value.

As regards the theoretical implications, this study extends the field of signaling theory, clearly showing how information related to the level of digitalisation can represent a signal that companies send to investors with the hope of benefiting from an increase in firm value.

6.2. Managerial implications

Our results generate a series of managerial implications. First, managers should use corporate websites to report on strategies, processes, and results related to digitalisation to increase firm value. The conveyed information should favour the understanding of the relationship between digitalisation and value creation processes on behalf of the investors. With such regard, managers are expected to provide clear and comprehensive information capable of representing all the digital aspects of the company. Consequently, a clear and simplified language is a useful tool for non-experts to understand the positive effects of digitalisation on corporate operations. Besides, managers should provide both monetary and non-monetary data because only the combined use of information enables a complete understanding of the undertaken digitalisation processes and its potential impact on value creation. Furthermore, managers should provide information with a high level of detail and insert summary indicators capable of circumscribing the results and allowing a better graphical representation. Finally, the appropriate usage of graphics and images could improve traditional textual information.

Moreover, considering the growing importance of information on digitalisation for investors worldwide, managers should increase the degree of digitalisation of their firms. In this regard, managers should implement digitalisation processes that favour increased revenues and a reduction in costs and risks. They should develop web applications, document sharing, and cloud-based applications that can optimise efficiency and reduce time. Besides, they should pay particular attention to data protection, privacy policies, and positioning on search engines and e-commerce, and develop a mobile version of the corporate website. Finally, managers should invest in the digitalisation of primary and support activities of the value chain. The impact on firm value is strictly related to the process of communicating these aspects to potential investors.

6.3. Limitations and future lines of research

We cannot ignore the limitations in our work. The first lies in the methodology applied, and it is linked to subjectivity first in the selection process of the items that comprise the independent variable, and second in the content analysis techniques. However, concerning the first element, the reference to the existing literature limited subjectivity. Furthermore, concerning the second element, the use of a binary measure to evaluate the presence of each item comprising the independent variable attenuated the subjectivity of the measurement process, which was also examined through joint pilot tests on the corporate websites of ten companies that showed reliable data.

The second limitation is linked to the source of data employed, which is limited to corporate websites that may not be the only available internet-based source for information on the degree of firm digitalisation. This limitation may be a starting point for future research on this topic. Future studies could examine the information provided by means of other channels, such as social networks. Moreover, it could further investigate other specific aspects of firm digitalisation, such as big data analysis (Ferraris, Mazzoleni, Devalle, & Couturier, 2019; Rialti, Zollo, Ferraris, & Alon, 2019) and the impact of the latter on firm performance due to the growing importance of big data management in the corporate world.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Agrawal, A., & Knoeber, C. R. (1996). Firm performance and mechanisms to control agency problems between managers and shareholders. *Journal of Financial and Quantitative Analysis, 31*(3), 377–397.

Al-Akra, M., & Ali, M. J. (2012). The value relevance of corporate voluntary disclosure in the Middle-East: The case of Jordan. *Journal of Accounting and Public Policy, 31*(5), 533–549.

Al-Samawi, Y. (2019). Digital firm: Requirements, recommendations, and evaluation the success in digitization. *International Journal of Information Technology and Computer Science, 1*, 39–49.

Anderson, J. C., Narus, J. A., & Van Rossum, W. (2006). Customer value propositions in business markets. *Harvard Business Review, 84*(3), 90.

Andrikopoulos, A., Merika, A. A., Triantafyllou, A., & Merikas, A. G. (2013). Internet disclosure and corporate performance: A case study of the international shipping industry. *Transportation Research Part A: Policy and Practice, 47*(C), 141–152.

Bachoo, K., Tan, R., & Wilson, M. (2013). Firm value and the quality of sustainability reporting in Australia. *Australian Accounting Review, 23*(1), 67–87.

Bardhan, I., Krishnan, V., & Lin, S. (2013). Research note—Business value of information technology: Testing the interaction effect of IT and R&D on Tobin's Q. *Information Systems Research, 24*(4), 1147–1161.

Barth, M. E., Cahan, S. F., Chen, L., & Venter, E. R. (2017). The economic consequences associated with integrated report quality: Capital market and real effects. *Accounting, Organizations and Society, 62*, 43–64.

Barua, A., Konana, P., Whinston, A. B., & Yin, F. (2004). An empirical investigation of net-enabled business value. *MIS Quarterly, 28*(4), 585–620.

Belvedere, V., Grando, A., & Bielli, P. (2013). A quantitative investigation of the role of information and communication technologies in the implementation of a product-service system. *International Journal of Production Research, 51*(2), 410–426.

Bertani, F., Ponta, L., Raberto, M., Teglio, A., & Cincotti, S. (2020). The complexity of the intangible digital economy: An agent-based model. *Journal of Business Research*.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information technology effects on firm performance as measured by Tobin's q. *Management Science, 45*(7), 1008–1024.

Bidhari, S. C., Salim, U., Aisjah, S., & Java, E. (2013). Effect of corporate social responsibility information disclosure on financial performance and firm value in banking industry listed at Indonesia stock exchange. *European Journal of Business and Management, 5*(18), 39–46.

Blacconiere, W. G., & Patten, D. M. (1994). Environmental disclosures, regulatory costs, and changes in firm value. *Journal of Accounting and Economics, 18*(3), 357–377.

Botosan, C. A., & Plumlee, M. A. (2005). Assessing alternative proxies for the expected risk premium. *The Accounting Review, 80*(1), 21–53.

Bughin, J., Catlin, T., Hall, B., & Van Zeebroeck, N. (2017). Improving your digital intelligence. *MIT Sloan Management Review*.

Bushman, R. M., & Smith, A. J. (2001). Financial accounting information and corporate governance. *Journal of Accounting and Economics, 32*(1–3), 237–333.

Canestrino, R., Ćwiklicki, M., Kafel, P., Wojnarowska, M., & Magliocca, P. (2020). The digitalization in EMAS-registered organizations: Evidences from Italy and Poland. *The TQM Journal*.

Cassetta, E., Monarca, U., Dileo, I., Di Berardino, C., & Pini, M. (2020). The relationship between digital technologies and internationalisation. Evidence from Italian SMEs. *Industry and Innovation, 27*(4), 311–339.

Chen, C. R., Guo, W., & Mande, V. (2006). Corporate value, managerial stockholdings and investments of Japanese firms. *Journal of International Financial Management & Accounting, 17*(1), 29–51.

Chung, H., Judge, W. Q., & Li, Y. H. (2015). Voluntary disclosure, excess executive compensation, and firm value. *Journal of Corporate Finance, 32*(C), 64–90.

Chung, K. H., & Pruitt, S. W. (1994). A simple approximation of Tobin's q. *Financial Management, 23*(3), 70–74.

Clarkson, P. M., Fang, X., Li, Y., & Richardson, G. (2013). The relevance of environmental disclosures: Are such disclosures incrementally informative? *Journal of Accounting and Public Policy, 32*(5), 410–431.

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: A review and assessment. *Journal of Management, 37*(1), 39–67.

Connolly, R. A., & Hirschey, M. (1984). R & D, Market Structure and Profits: A Value-Based Approach. *The Review of Economics and Statistics, 66*(4), 682–686.

De Pablos, P. O., & Edvinsson, L. (2020). *Intellectual Capital in the Digital Economy* (1st ed.). Routledge. Published: The Publisher.

Eller, R., Alford, P., Kallmünzer, A., & Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. *Journal of Business Research, 112*, 119–127.

Bellakhal, R., & Mouelhi, R. B. A. (2020). Digitalisation and Firm Performance: Evidence from Tunisian SMEs. Working paper.

European Commission (2019). The Digital Economy and Society Index (DESI), European Commission, available at: https://ec.europa.eu/digital-single-market/en/desi.

Eurostat (2017). Digital economy and society. ICT usage in enterprises, Eurostat, available at: https://ec.europa.eu/eurostat/web/digital-economy-and-society.

Ferraris, A., Mazzoleni, A., Devalle, A., & Couturier, J. (2019). Big data analytics capabilities and knowledge management: Impact on firm performance. *Management Decision, 57*(8), 1923–1936.

Ferreira, J. J., Fernandes, C. I., & Ferreira, F. A. (2019). To be or not to be digital, that is the question: Firm innovation and performance. *Journal of Business Research, 101*(C), 583–590.

Galindo-Martín, M.Á., Castaño-Martínez, M. S., & Méndez-Picazo, M. T. (2019). Digital transformation, digital dividends and entrepreneurship: A quantitative analysis. *Journal of Business Research, 101*, 522–527.

Gamayuni, R. R. (2015). The effect of intangible asset, financial performance and financial policies on the firm value. *International Journal of Scientific and Technology Research, 4*(1), 202–212.

Gandía, J. L. (2008). Determinants of internet-based corporate governance disclosure by Spanish listed companies. *Online Information Review, 32*(6), 791–817.

Garay, U., González, M., Guzmán, A., & Trujillo, M. A. (2013). Internet-based corporate disclosure and market value: Evidence from Latin America. *Emerging Markets Review, 17*(C), 150–168.

García-Sánchez, I. M., Raimo, N., Marrone, A., & Vitolla, F. (2020). How Does Integrated Reporting Change in Light of COVID-19? A Revisiting of the Content of the Integrated Reports. *Sustainability, 12*(18), 7605.

Ghosh, D., & Wu, A. (2007). Intellectual capital and capital markets: Additional evidence. *Journal of Intellectual Capital, 8*(2), 216–235.

Giacosa, E., Ferraris, A., & Bresciani, S. (2017). Exploring voluntary external disclosure of intellectual capital in listed companies: An integrated intellectual capital disclosure conceptual model. *Journal of Intellectual Capital, 18*(1), 149–169.

Guthrie, J., Petty, R., Yongvanich, K., & Ricceri, F. (2004). Using content analysis as a research method to inquire into intellectual capital reporting. *Journal of intellectual capital, 5*(2), 282–293.

Hall, B. H. (1993). The Value of Intangible Corporate Assets: An Empirical Study of the Components of Tobin's Q. Department of Economics, Working Paper Series qt44x548gq, Department of Economics, Institute for Business and Economic Research, UC Berkeley.

Harjoto, M. A., & Jo, H. (2011). Corporate governance and CSR nexus. *Journal of Business Ethics, 100*(1), 45–67.

Harrigan, K. R., Di Guardo, M. C., & Marku, E. (2018). Patent value and the Tobin's q ratio in media services. *The Journal of Technology Transfer, 43*(1), 1–19.

Hejazi, R., Ghanbari, M., & Alipour, M. (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management, 23*(4), 259–273.

Hirschey, M., & Weygandt, J. J. (1985). Amortization policy for advertising and research and development expenditures. *Journal of Accounting Research, 23*(1), 326–335.

Ibem, E. O., Akinola, A. O., Erebor, E. M., Tolani, M. O., & Nwa-uwa, A. E. (2018). Survey data on digitalization of building procurement process by architectural firms in Abuja, Nigeria. *Data in Brief, 20*, 1062–1067.

Krippendorff, K. (1980). Validity in content analysis. Retrieved from. In E. Mochmann (Ed.), *Computerstrategien für die kommunikationsanalyse* (pp. 69–112). Frankfurt, Germany: Campus.

Kryvinska, N., Kaczor, S., Strauss, C., & Greguš, M. (2014). Servitization-its raise through information and communication technologies. In *International conference on exploring services science* (pp. 72–81). Cham: Springer.

Lee, K. W., & Yeo, G. H. H. (2016). The association between integrated reporting and firm valuation. *Review of Quantitative Finance and Accounting, 47*(4), 1221–1250.

Lev, B., & Penman, S. H. (1990). Voluntary forecast disclosure, nondisclosure, and stock prices. *Journal of Accounting Research, 28*(1), 49–76.

Li, Y., Gong, M., Zhang, X. Y., & Koh, L. (2018). The impact of environmental, social, and governance disclosure on firm value: The role of CEO power. *The British Accounting Review, 50*(1), 60–75.
Lindenberg, E. B., & Ross, S. A. (1981). Tobin's q ratio and industrial organization. *Journal of Business, 54*(1), 1–32.
López-Arceiz, F. J., Torres, L., & Bellostas, A. J. (2019). Is online disclosure the key to corporate governance? *Online Information Review, 43*(5), 893–921.
Majundar, S. K. (1997). The impact of size and age on firm-level performance: Some Evidence from Indian Industry. *Review of Industrial Organization, 12*(2), 231–241.
Manes-Rossi, F., Nicolò, G., & Tartaglia-Polcini, P. (2018). New trends in intellectual capital reporting: Exploring online intellectual capital disclosure in Italian universities. *Journal of Intellectual Capital, 19*(4), 1469–1930.
Martín-Peña, M. L., Sánchez-López, J. M., & Díaz-Garrido, E. (2019). Servitization and digitalization in manufacturing: The influence on firm performance. *Journal of Business & Industrial Marketing, 35*(3), 564–574.
McGuire, J. B., Schneeweis, T., & Branch, B. (1990). Perceptions of firm quality: A cause or result of firm performance. *Journal of Management, 16*(1), 167–180.
Mckinsey (2016). Digital Europe: Pushing The Frontier, Capturing The Benefits, McKinsey Global Institute, available at: https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Digital%20Europe%20Pushing%20the%20frontier%20capturing%20the%20benefits/Digital-Europe-Full-report-June-2016.ashx.
McMillan, S. J. (2000). The microscope and the moving target: The challenge of applying content analysis to the World Wide Web. *Journalism & Mass Communication Quarterly, 77*(1), 80–98.
Meroño-Cerdan, A. L., & Soto-Acosta, P. (2005). Examining e-business impact on firm performance through website analysis. *International Journal of Electronic Business, 3*(6), 583–598.
Morris, R. D. (1987). Signalling, agency theory and accounting policy choice. *Accounting and Business Research, 18*(69), 47–56.
Myers, R. H. (1990). *Classical and modern regression with applications*. Belmont, CA: Duxbury.
Ndofor, H. A., & Levitas, E. (2004). Signaling the strategic value of knowledge. *Journal of Management, 30*(5), 685–702.
OECD (2019), Measuring the Digital Transformation: A Roadmap for the Future. Paris: OECD Publishing. available at: www.oecd.org/going-digital/measurement-roadmap.pdf.
Olejnik, E., & Swoboda, B. (2012). SMEs' internationalisation patterns: Descriptives, dynamics and determinants. *International Marketing Review, 29*(5), 466–495.
Orens, R., Aerts, W., & Lybaert, N. (2009). Intellectual capital disclosure, cost of finance and firm value. *Management Decision, 47*(10), 1536–1554.
Pessot, E., Zangiacomi, A., Battistella, C., Rocchi, V., Sala, A., & Sacco, M. (2020). What matters in implementing the factory of the future. *Journal of Manufacturing Technology Management*.
Plumlee, M., Brown, D., Hayes, R. M., & Marshall, R. S. (2015). Voluntary environmental disclosure quality and firm value: Further evidence. *Journal of Accounting and Public Policy, 34*(4), 336–361.
Porter, M. (1980). *Competitive strategy*. New York: Free Press.
PwC (2016). Private Equity & Digital Transformation. Retrieved from https://www.pwc.nl/nl/assets/documents/pwc-private-equity-and-digitisation.pdf.
Raimo, N., Vitolla, F., Marrone, A., & Rubino, M. (2020a). The role of ownership structure in integrated reporting policies. *Business Strategy and the Environment, 29*(6), 2238–2250.
Raimo, N., Vitolla, F., Marrone, A., & Rubino, M. (2020b). Do audit committee attributes influence integrated reporting quality? An agency theory viewpoint. *Business Strategy and the Environment, 29*(6), 2238–2250.
Rao, V. R., Agarwal, M. K., & Dahlhoff, D. (2004). How is manifest branding strategy related to the intangible value of a corporation? *Journal of Marketing, 68*(6), 126–141.
Rialti, R., Zollo, L., Ferraris, A., & Alon, I. (2019). Big data analytics capabilities and performance: Evidence from a moderated multi-mediation model. *Technological Forecasting and Social Change, 149*, Article 119781.
Ross, S. A. (1977). The Determination of Financial Structure: The Incentive-Signalling Approach. *The Bell Journal of Economics, 8*(1), 23–40.
Rubera, G., & Droge, C. (2013). Technology versus design innovation's effects on sales and Tobin's Q: The moderating role of branding strategy. *Journal of Product Innovation Management, 30*(3), 448–464.
Rubino, M., Vitolla, F., Raimo, N., & Garcia-Sanchez, I. M. (2020). Cross-country differences in European firms' digitalisation: The role of national culture. *Management Decision*.
Rubino, M., Vitolla, F., Raimo, N., & Garzoni, A. (2019). Cultura nazionale e livello di digitalizzazione delle imprese europee: Evidenze empiriche. In *XXXIX Convegno nazionale AIDEA, Torino* (pp. 581–593).
Salvi, A., Petruzzella, F., & Giakoumelou, A. (2018). CSR and firm performance: Trick or treat? A longitudinal study on holistic CSR practices. *International Journal of Business and Management, 13*(6), 42–71.
Salvi, A., Vitolla, F., Giakoumelou, A., Raimo, N., & Rubino, M. (2020). Intellectual capital disclosure in integrated reports: The effect on firm value. *Technological Forecasting and Social Change, 160*, Article 120228.
Skinner, D. J. (1994). Why firms voluntarily disclose bad news. *Journal of Accounting Research, 32*(1), 38–60.
Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019). Organizing for digital servitization: A service ecosystem perspective. *Journal of Business Research, 104*(450), 460.
Spence, M. (1973). Job Market Signaling. *Quarterly Journal of Economics, 87*(3), 355–374.
Stoldt, J., Trapp, T. U., Toussaint, S., Süße, M., Schlegel, A., & Putz, M. (2018). Planning for Digitalisation in SMEs using Tools of the Digital Factory. *Procedia CIRP, 72*, 179–184.
Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking, 1*(1), 15–29.
Tobin, J. (1978). Monetary policies and the economy: The transmission mechanism. *Southern Economic Journal, 44*(3), 421–431.
Uyar, A., & Kılıç, M. (2012). Value relevance of voluntary disclosure: Evidence from Turkish firms. *Journal of Intellectual Capital, 13*(3), 363–376.
Vadana, I. I., Torkkeli, L., Kuivalainen, O., & Saarenketo, S. (2019). Digitalization of companies in international entrepreneurship and marketing. *International Marketing Review, 37*(3), 471–492.
Vitolla, F., Raimo, N., & Rubino, M. (2019). Appreciations, criticisms, determinants, and effects of integrated reporting: A systematic literature review. *Corporate Social Responsibility and Environmental Management, 26*(1), 518–528.
Vitolla, F., Raimo, N., Rubino, M., & Garzoni, A. (2019). The impact of national culture on integrated reporting quality. A stakeholder theory approach. *Business Strategy and the Environment, 28*(8), 1558–1571.
Vitolla, F., Salvi, A., Raimo, N., Petruzzella, F., & Rubino, M. (2020). The impact on the cost of equity capital in the effects of integrated reporting quality. *Business Strategy and the Environment, 29*(2), 519–529.
Weill, P., & Woerner, S. L. (2015). Thriving in an increasingly digital ecosystem. *MIT Sloan Management Review, 56*(4), 27–34.
Westerman, G., Tannou, M., Bonnet, D., Ferraris, P., & McAfee, A. (2012). The Digital Advantage: How digital leaders outperform their peers in every industry. *MITSloan Management and Capgemini Consulting, MA, 2*, 2–23.

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