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IMPACT OF DIGITALISATION AND INVESTMENTS IN INTANGIBLE CAPITAL ON THE NON-FINANCIAL PERFORMANCE OF FIRMS IN SLOVENIA**

Abstract. Article examines the impact of digitalisation and intangible capital investment on the non-financial performance of firms in Slovenia. Article examines the relationship between: (1) digitalisation and firms' non-financial performance; (2) digitalisation and firms' attitude to digitalisation; (3) investments in intangible capital and firms' non-financial performance; where we (4) also expect differences by industry and between firms operating in global value chains. Considering survey data, the SEM approach shows that, digitalisation and intangible investment both have positive effects on non-financial performance. Level of digitalisation depends on the importance attributed to digitalisation, whereas the importance of digitalisation depends on the expected long-term benefits of digitalisation for the firm. Level of digitalisation is dependent on the anticipated long-term benefits of digitalisation. These have a positive, yet non-significant impact on a firm's level of digitalisation. Despite business agility having an impact on the importance of digitalisation for businesses that is less than the expected benefits, it is still highly significant. Other results were not statistically significant.

Keywords: *intangible capital, digitalisation, firm performance*

Introduction

In the last decade, competition and the growing digitalisation of the economy have led companies to focus on investments in intangibles such as intellectual property, human capital, digitalisation and others because these

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investments provide companies with competitive advantages. Empirical research confirms the many benefits of new technologies (Corrado and Hulten, 2010; Gómez and Vargas, 2012; Lane, 1991) that are expected to bring significant positive effects, notably increased productivity (Andrews et al., 2018; Fitzgerald et al., 2013).

The impact of adopting new technologies is often closely linked to the motivation for adopting them. Short-term impacts focus on efficiency gains occurring by way of increased speed, adaptability/flexibility in production, traceability and product quality, standardisation of processes, reduced associated costs and delivery times, more efficient management of business processes, a smaller administrative burden, and others (Škare and Soriano, 2021; Vázquez-Bustelo et al., 2007). More detailed data on the structure of intangible investment reveal that intangible investment is also partly related to the adoption of new technologies (OECD, 2022).

Moreover, the new economy is ever more knowledge-based and relies on intangible capital. Following the well-established definition of intangible capital by Corrado (2006), we distinguish three categories of it, namely: (1) computerised information; (2) innovative property; and (3) economic competencies. Early estimates showed that intangible capital accounts for up to one-quarter of total productivity growth (Corrado et al., 2009; Fukao et al., 2009; Piekkola, 2011; Roth, 2020; Roth and Thum, 2013).

The objective of this article is to investigate the impact of digitalisation and intangible capital investment on firms' non-financial performance. To that end, the article examines the relationships between digitalisation and firms' non-financial performance, and between intangible capital investments and firms' non-financial performance.

The analysis is based on survey data from Slovenian companies. Structural equation modelling (SEM) with the Stata package SEM was used to evaluate the conceptual model. The results primarily show that, as anticipated, the influence of the level of digitalisation (H1) and intangible investments on non-financial performance (H2) are both positive and statistically significant. As expected (H3), digitisation depends on the importance attributed to digitalisation by the firm (proxied by perceived strategic importance) and the importance of digitalisation depends on its expected long-term benefits for the firm (H4). Business agility has a positive impact on the importance of digitalisation for firms (H6). Although the impact is lower than the impact of the expected benefits, it remains highly significant. The results also show that the impact of trade participation on the importance of digitalisation is positive, yet relatively weak and also not significant (H5). Similarly, the results show that the influence of trade participation on the importance of digitalisation is positive, albeit quite weak, and also not significant (H5).

The article makes several original contributions to the literature. First, it is one of the earliest empirical analyses to examine the combined effect of intangible investment and digitalisation on firms' non-financial performance (Erjavec and Redek, 2022). Second, it is the first work for Slovenia establishing a link between attitudes to digitalisation and the level of digitalisation implemented. Third, the study also examines the relationship between the degree of the firm's globalisation and the level of its digitisation.

The article is structured as follows. A review of existing literature and theory on digitalisation, intangible capital, and firm performance is initially presented. The second section describes the empirical analysis (methodology, data description, descriptive statistics, hypothesis testing). A discussion and a conclusion then follow.

Literature review and development of hypotheses

The framework for this study is the impact of digitalisation and investment in intangible capital on the non-financial performance of firms. Productivity is influenced by many factors, with some stemming from the economic environment and others from companies themselves. Productivity determinants can be broadly divided into internal (resource allocation, amount and structure of capital, human capital, competencies, trainings etc.) and external factors (business, institutional, macroeconomic and technological environment, international exchange, exchange rates etc.) (Redek et al., 2019).

Digitalisation and the adoption of new technologies are some of the key factors for accelerating growth in productivity (Ahmad and Murray, 2019; Parviainen et al., 2017; Škare and Soriano, 2021). Digitalisation is part of the new, fourth industrial revolution. The fourth industrial revolution may be defined as progress in: (1) physical capital; (2) digital technologies; and (3) developments in the field of biology, with numerous technologies encompassing the aforementioned elements (Bettiol et al., 2019; B. Čater et al., 2019b; T. Čater et al., 2021; Deloitte, 2015, 2018).

Digitalisation and the non-financial performance of companies

Firm performance can be measured with regard to both financial and non-financial aspects. Financial performance is understood as stock-market-based measures of financial returns (e.g., ROI, profitability, cash flow etc.) (Wagner, 2010). In addition, non-financial performance¹, which this article

¹ Kaplan and Norton (1992) first defined non-financial indicators as customer perspective measures, internal business perspective measures and innovation and learning perspective measures, alongside the financial perspective measures.

focuses on, can be observed via increased competitiveness, market share or market growth (Banker et al., 2000), consumer satisfaction (Anderson et al., 1994), product quality, increased innovation performance (Abdel-Maksoud et al., 2005), environmental performance and social performance (Abdel-Maksoud et al., 2010) and others (Maletič et al., 2021). The literature confirms that new technologies positively impact the performance of firms by improving both their short-term efficiency and long-term growth and competitiveness (Gao et al., 2012; Müller et al., 2018). Digital transformation generates additional revenue streams through new digital technologies (Chawla and Goyal, 2021), enables better customer service, more efficient operations, increases accuracy, quality, and speed, indirectly lowers costs and stimulates employment growth due to superior business operations and higher demand, in turn affecting both financial and non-financial performance (Andrews et al., 2018; Fitzgerald et al., 2013). Innovative combinations of technologies involved in the digital transformation process also improve non-financial performance (Bharadwaj et al., 2013), alongside those mentioned above, by improving old or customising new products and processes (Chawla and Goyal, 2021). New technologies are also mentioned as a solution to labour shortages caused by the ageing of labour markets in Europe (Prašnikar, Redek and Koman, 2017). Productivity gains are greater for firms that are already more productive (Berlingieri, 2018), although the gains from technology also rely on the type of technology (e.g., cloud computing is more beneficial for small firms as it means they do not need to invest in a large IT infrastructure) (Bloom and Pierri, 2018). Further, a study by Bettiol et al. (2019) of 1,149 Italian companies that examined seven key technologies (robotics, additive manufacturing, laser cutting, big data and cloud, 3D scanning, augmented reality, and IoT and intelligent products) relative to a firms' performance showed that new technologies like 3D printing, block chain and others have a positive impact on product innovation and hence on firms' performance (Menguc and Ozanne, 2005).

H1: Digitalisation (implementation of new technologies) has a positive impact on the non-financial performance of the firm.

Investments in intangible capital and company performance

Following Corrado's (2006) well-established definition of intangible capital, we distinguish three categories of intangibles: 1) computerised information, which comprises computer software and computerised databases; 2) innovative capital, which among others includes R&D, but also other innovative expenditure; and 3) economic competencies, which encompass

brand equity, firm-specific human capital, and organisational structure². As defined by Lev (2000), intangible capital has a positive impact on firm performance without being financially or physically embodied. Therefore, investments in intangibles bring companies certain competitive advantages in relatively (Khan et al., 2018). Intangible capital is becoming an ever more important source of productivity growth in the knowledge society. Early estimates revealed that intangible capital accounts for up to one-third of total productivity growth (Corrado et al., 2009a; Fukao et al., 2009; Roth, 2020; Roth and Thum, 2013; van Ark et al., 2009). The Corrado et al. (2009) study showed that the inclusion of intangible investment in the real output of the non-farm business sector increased the estimated growth rate of output per hour by 10%–20% relative to the baseline case which completely ignores such investment. Studies suggest that intangible investments have a positive effect on a firm's performance (Mansion and Bausch, 2020; Seo and Kim, 2020; Yadiati et al., 2019), despite significant differences in the intensity (Kaus et al., 2020) and contribution of intangible assets to company performance depending on the firm's size (Kostevc and Redek, 2021).

Intangible capital enhances firm performance (Corrado et al., 2017; Maggi, 2019; Piekkola and Rahko, 2020; Roth, 2020). Moreover, a firm's possession of intangible capital has been found to bring competitive advantages (Bianchi, 2017; Khan et al., 2018), with resources that are "intangible" named knowledge, invisible assets, absorptive capability (Levin et al., 1985), core competencies, strategic assets, core capabilities, intangible resources, organisational memory or any other denomination with a similar meaning and result in the non-financial performance of a firm such as: (1) value creation for customers; (2) rarity, in comparison to competence; (3) imitability; and (4) substitutability (Barney, 1991).

In Slovenia, intangible investment is still relatively weak. About 75% of microenterprises in 2020 had no intangible capital, compared to about 5% of large enterprises (Erjavec and Redek, 2022). Slovenian companies make almost 60% of all their investments on machinery and other equipment, significantly more than the European average (49%). Yet, Slovenian companies allocate only about 20% of all their investments to investments in intangible capital, which is considerably below the EU average of 36% (European Investment Bank, 2021). The lag behind the EU is also evident from data on

² While digitalisation, focusing on new technology implementation, is often understood as a synonym for new technology implementation and the use of ICT, the delineation between digitalisation and intangible investments is quite clear. Intangible investments focus on »computerised information«, which comprises only software and databases, while digitalisation and new technology implementation is much broader and primarily encompasses a lot of tangible investments in new equipment and machinery. The two are not independent (Erjavec and Redek, 2022), which was also tested in this model, yet they should be distinguished.

investments in ICT or software, databases, networks and online activities. Investments of this type account for just 7% of all investments, while the average company in the EU invests 13% (European Investment Bank, 2021).

The above discussion leads to our next hypothesis:

H2: Intangible investment will have a positive impact on non-financial performance of the firm.

Digitalisation and the company's attitude to digitalisation relative to its expected effects in the company

Firms assume that positive effects will flow from the introduction of new technologies, namely: (1) short-term impacts on business (often financial) performance; and (2) long-term, strategic advantages for companies resulting from new technologies such as increased productivity, the development of new business models (Hess et al., 2016), modular and cross-functional global strategies that enable business processes to be established beyond the boundaries of time, distance or function (Wheeler, 2002), and the provision of unique and integrated business functions (Sebastian et al., 2020), which are closely related to the above-mentioned non-financial performance (B. Čater et al., 2019b; Černe et al., 2017; Prašnikar, Redek and Koman, 2017). These expected positive impacts may be considered as factors or motivators that encourage companies to introduce new technologies. Among them, the most important factors or motives are the expected competitive advantage, the related strengthening of the market position and the growth of revenues and turnover (Čater et al., 2019b; Maravić et al., 2022). Studies reveal that technology brings more benefits on average, which strengthens the motivation to invest. Deloitte (2015) shows that 84% of companies in Switzerland agreed or strongly agreed that 14 technologies could significantly increase the country's competitiveness in global markets, while almost half the companies agreed or strongly agreed that digital transformation will slow down offshoring or outsourcing (mainly in countries with cheaper labour). Companies invest in certain assets because they anticipate positive outcomes, yet the environment can also force them to invest in order to protect and enhance their market position (Bavdaz and Redek, 2022; Maravić et al., 2022). A firms' attitude is strongly related to motives, which may be divided into: (1) proactive motives (i.e., profit and growth goals, technology competency, unique product, foreign market opportunities, market information, tax benefits, economies of scale (Coviello et al., 1998)); and (2) reactive motives (competitive pressures, overproduction, extending sales of seasonal products, proximity to international customers). Lin and Tang (2009) claim that technology innovation was considered to be

most important by executives in the integrated circuit (0.277), communication (0.337), computer (0.385) and optoelectronic industries (0.422).

Llopis-Albert et al. (2021) studied the effect of a digital technology (DT) strategy on business performance models and stakeholder satisfaction in the auto industry. The authors suggest that a DT brings greater profits, productivity and competitiveness, again supporting the conclusion that expected enhanced performance is substantiated and can drive increased investment in technology. Several researchers (Farhoomand et al., 1990; Naicker and Van Der Merwe, 2018) studied managers' attitude to the potential positive effects of implementing novelties that are motivated by the perceived ease of use, usefulness, complexity and perceived cost. However, perceived risk is recognised as a key factor while deciding on the adoption of new technology. Moreover, improved flexibility and product quality influence a firm's intention to raise its level of technological sophistication (Abdel-Maksoud et al., 2010).

The discussion above leads to the following hypotheses:

H3: The importance of digitalisation in the firm (attitude to digitalisation) will have a positive effect on the level of digitalisation it implements.

H4: Expected long-run benefits from digitalisation will have a positive impact on the importance attributed to digitalisation by the firm.

H8: Expected long-run benefits of digitalisation will positively impact the level of digitalisation.

Differences by industry and between firms by engagement in global value chains

Firms heavily involved in international exchange must be more competitive to achieve a satisfactory performance. While digitalisation has become the standard for companies that wish to be competitive (Ahmad and Murray, 2019; Gal et al., 2019; Parviainen et al., 2017), firms that invest heavily in intangible capital (including new technologies) are recognised as those with more competitive advantages (Bajgar et al., 2021; Gómez and Vargas, 2012; Ilmakunnas and Piekola, 2014). Proactive market strategies aim to strengthen a firm's competitiveness in a global context and ensure rapid economic development. Helpman et al. (2004) showed that only the most productive companies are able to serve global markets and do so through foreign subsidiaries. External sources of knowledge are an important aspect of innovation. More specifically, successful innovation is dependent on the creation and incorporation of new knowledge into the innovation process.

External sources will provide some of this knowledge to the firm. Firms that serve more developed markets collaborate more deeply with often more innovative and technologically advanced suppliers, and face more intense competition (Cassiman and Veugelers, 2006). A presence in global (developed) markets implies that connections with buyers, competitors or other sources of information (like scientific, commercial, technical journals) will come from more developed (better ideas) and thus more demanding markets (additional stimulus). The indirect impact on firm performance was found to be strong and significant (Prašnikar, Redek and Drenkovska, 2017).

There is accordingly a need to develop new products and systems, particularly in segments where the competition is relatively weak. R&D and innovative technologies have to be developed for performing innovation-orientation-driven activities. This focus on more radical innovation is consistent with proactive behaviour. Still, the environment provides both opportunities and restrictions (Levin et al., 1985). It has also been shown that productivity growth is maintained by organisational activity and related to global markets engagements and thus firms with international links have more intangible capital and their organisational work is more productive (Prašnikar, Redek and Drenkovska, 2017). New investments in organisational capital activities are therefore a path towards higher growth. This leads to our next hypothesis:

H5: Trade involvement will have a positive impact on digitalisation of the firm.

H7: Trade involvement will have a positive impact on a firm's non-financial performance.

Agility and non-financial performance

A recent study (Solheim et al., 2022) showed that the ability to increase agility depends on the use of digitalisation because it improves product solutions, increases the reach of new customers through digital channels, and brings benefits due to being better at digitalisation than the competition. Research analysing Hungarian companies revealed that those companies using a cyber-physical system, a cyber-physical production system and big data technologies were evaluated as having a higher level of logistic service, more efficient processes with their partners, improved cooperation between certain logistic functions, and being more competitive (Nagy et al., 2018). It was further found that digitalisation of internal company processes offers new and disruptive market opportunities for firms seeking to develop and launch innovations based on entrepreneurial ideas (Heirman

and Clarysse, 2007; Kuester et al., 2018). A very thorough description of the benefits of introducing new technologies is provided by Mueller and his co-authors who classify the effects in four major groups: technical, economic, ecological and wider social (Müller et al., 2018).

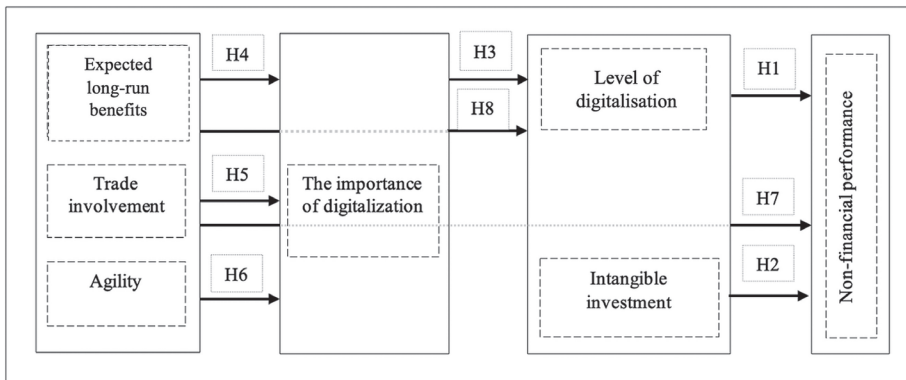
This leads to the following hypothesis:

H6: The agility of a firm will have a positive impact on the importance attributed to digitalisation by the firm.

Conceptual model of the relationship between digitalisation, intangible investment and firm performance

Figure 1 presents the conceptual model and summarises the links between the variables of interest as presented in the hypotheses.

Figure 1: CONCEPTUAL MODEL OF THE RELATIONSHIP BETWEEN DIGITALISATION, INTANGIBLE INVESTMENTS AND PERFORMANCE



Source: own.

The model hypothesises the following based on the literature. First, it is contended that a higher level of digitalisation has a positive impact on the non-financial performance of firms and that intangible investments also have a positive impact on non-financial performance. Second, the importance of digitalisation in the company (attitude to digitalisation) has a positive impact on the level of digitalisation, while the expectation of long-term benefit arising from digitalisation has a positive impact on the importance attributed to digitalisation by the company. We assume that the expectation of a long-term benefit of digitalisation additionally has a positive impact on the level of digitalisation. Next, involvement in international exchange has a positive impact on the importance of digitalisation and on non-financial

performance. We contend that firm agility has a positive impact on the importance attributed to digitalisation by a firm.

Empirical analysis

Methodology

Data were collected using a questionnaire containing 31 questions, where 28 were substantive in nature and 3 concerned the respondent. The content of the questionnaire was based on several different sources (B. Čater et al., 2019a; Deloitte, 2015; Domadenik et al., 2019; Gao et al., 2012; Maravić et al., 2022; Müller et al., 2018; Prašnikar, 2010; Prašnikar, Redek and Drenkovska, 2017; Statistični urad Republike Slovenije, 2019). The questionnaire was divided into several substantive sections³: (1) general information about the company where information about the firm was collected; (2) features of digitalisation; (3) digitalisation factors; (4) analysis of obstacles to digitalisation; (5) innovativeness of the company; (6) investments in intangible capital; (7) effects of digitisation; (8) strategic aspects and digitisation; and (9) the role of the state. The latent variables used in this analysis were formed based on several items from the following analyses: (1) level of digitalisation is based on a new scale, although motivated by two existing scales, adapted based on two sources Čater et al. (2019) and Deloitte (2015); (2) non-financial performance was based on Mueller et al. (2018), as confirmed by other sources (T. Čater et al., 2021; Maravić et al., 2022). Agility and intangible investments were based on the Globalinto project (Caloghirou et al., 2022) although, instead of using actual percentages, respondents could choose from either pre-prepared value brackets as the Italian statistical office did in its survey (Perani and Guerrazzi, 2012). The importance of digitalisation was based on Mueller et al. (2018), Gao et al. (2012) and Čater et al. (2019a) whereas expected long-term benefits was based on Čater et al. (2019a) who used several sources as well, principally building on Gao et al. (2012) and Müller et al. (2018).

Data were collected in September and October 2022. A total of 135 fully completed questionnaires was submitted as part of the total sample of 250 at least partly completed questionnaires.

Descriptive statistics

The studied sample included about 24% of microenterprises with a maximum of 9 employees, 37% of small enterprises (10–49 employees), 25% of

³ Details provided in (Redek and Erjavec, 2023).

medium enterprises (50–249 employees) and 13.5% of large enterprises. Micro companies, despite their relative share in the total number of companies, make up only one-quarter of the sample⁴, which is appropriate in view of the purpose of the analysis. Eurostat, for example, surveys the use of digital technologies in companies with at least 10 employees (Eurostat, 2022). The literature also shows that digitisation processes are more intensive in larger companies. Since the purpose of the research was not to analyse the causes of lagging, but chiefly to understand the process and the effects, we were mainly interested in companies that have greater experience with it.

The biggest share of companies comes from the manufacturing sector at almost 35%, followed by trade with 12.9% and “professional, scientific and technical activities” with 9.6%, and then transport and storage, ICT activities and construction. Data on the employment structure by education show that 62.3% of employees in the surveyed companies had less than a university degree, 29.9% held a university education, and the rest a master’s degree or doctorate. The education structure was the best in micro-companies where just over half the employees had at least a university education, followed by large companies, where just over one-third of all employees at least held a university education.

Cooperation with foreign markets could have an influence on the introduction of new technologies, pressure from competitors and suppliers, and knowledge transfer. For almost 60% of the companies, the domestic market is important or very important as a source of inputs, materials and components, and for more than half the companies the EU-15 countries are also important. Other EU countries are important or very important for about one-fifth of the companies from a purchasing point of view, and the markets of the former Yugoslavia for a good one-tenth.

Larger companies reported using more technologies on average than medium-sized ones (followed by small ones), which was expected. The diversity and complexity of business processes mean that several technologies are suitable and cost-effective. When assessing the level of digitalisation, about 37% of companies have highly digitised business processes in place. Over 30% of the companies had reached a high level of intensity in the use of new digitisation technologies and 30% perceived themselves as an above-average digitised company. The importance attributed to digitalisation was considerable. Between 60% and 70% of companies found digitalisation, the introduction of new technologies, and related company transformation as one of the critical success factors. Still, the high level of importance was

⁴ *In the total population of Slovenian companies, micro companies represent 95% of all companies, which is also similar to their respective share in other EU countries (Statistični urad Republike Slovenije, 2022).*

not always also accompanied by high investments. Companies on average allocated relatively few resources to digitalisation, with 39.4% of respondent firms having allocated up to 1% of their revenues to digitalisation, while only 12.8% of companies allocated more than 5%. Micro-enterprises spent the least on digitalisation since over 60% of respondents reported that up to 1% of revenues were allocated to digitalisation, while only a good 8% allocated at least 3% of revenues. Large companies spent the most on digitalisation, with just under one-fifth of respondents reporting they had allocated more than 5% of their revenues to digitalisation, and another tenth between 3% and 5% of their revenues.

On average, the companies were also quite agile. Over 63% of respondents agreed or strongly agreed that they react quickly to the moves of the competitors, whereas more than 80% of respondents agreed or strongly agreed that they change practices based on customer feedback. Three-quarters of respondents also agreed or strongly agreed that they quickly identify new opportunities to improve the offer to their customers. Agility was also recognised as one of the factors that contributed to the more successful transition of companies through the crisis created by the pandemic (Redek et al., 2022). Respondents in the company were also asked to rate their non-financial performance relative to their peers, where respondents rated their performance compared to their competitors to be the highest in terms of customer loyalty and product quality, followed by the company's reputation. On average, large and medium-sized companies and companies in manufacturing activities were more confident about their relative performance.

Constructs and correlations

Validated scales were used for all the key constructs, except for trade involvement and intangible investments, with only the number of items per scale being lowered. The structure of the scales is provided in Appendix 1 (Table A1). There is no suitable validated scale for trade involvement, except for the partially validated scale on exports (Drenkovska and Redek, 2015). To obtain a measure of trade involvement, involvement in exports and imports was merged in line with the example used in Erjavec (2023)⁵. Similarly, the scale for intangible capital measurement and agility was generated using a modified approach presented in Bavdaž and Redek (2022) (part of the Globalinto approach (Globalinto, 2021)). Table 1 shows Cronbach's

⁵ *The questionnaire and results of the survey on intangible capital in Slovenian companies and the factors that impact intangibles. The same scale was used and the alpha and AVE were satisfactory, as was the use of the latent »trade« variable in the analysis.*

alphas and correlations for all the main constructs. The level of digitalisation was measured using a modified self-evaluation (1-5) scale based on Deloitte (2015). Details of the constructs may be found in Erjavec (2022).

Table 1: RELIABILITY AND CORRELATIONS*

				Non-financial performance	Digitalisation level	Importance of digitalisation	Expected long-term benefits	Intangible investments	Trade involvement	Agility
Non-financial performance	PERF_NF	$\alpha = 0.77$	corr	1.000						
			sig							
Level of digitalisation	DIG	$\alpha = 0.91$	corr	0.5201	1.000					
			sig	0.000						
Importance of digitalisation	IMP_DIG	$\alpha = 0.87$	corr	0.5227	0.6995	1.000				
			sig	0.000	0.000					
Expected long-term effects	LR_EFF	$\alpha = 0.83$	corr	0.6010	0.6010	0.7182	1.000			
			sig	0.391	0.000	0.000				
Intangible investments	INTAN	$\alpha = 0.88$	corr	0.5530	0.2816	0.3148	0.2223	1.000		
			sig	0.000	0.002	0.000	0.008			
Trade involvement	TRADE	$\alpha = 0.81$	corr	0.1018	0.1018	0.2712	0.1705	-0.0979	1.000	
			sig	0.1919	0.1296	0.000	0.0108	0.1451		
Agility	AGILITY	$\alpha = 0.78$	corr	0.4711	0.4793	0.5544	0.4519	0.1531	0.1488	1.000
			sig	0.0000	0.000	0.000	0.002	0.022	0.026	

Source: Own. Correlations between constructed latent variables, postestimation.

Estimation was performed using the Stata SEM package. A maximum-likelihood estimation with missing values was used to maximise the number of observations (185 were included in the estimation). The conceptual model was evaluated and standard measures were employed to evaluate the model fit. CFA determined the model's goodness of fit, with $\text{Chi}^2(22) = 317.69$ ($p = 0.000$) and $\text{RMSEA} = 0.054$ (Hu and Bentler, 1999). CFI and TLI were 0.929 and 0.914, respectively.

Test of the hypotheses

Structural equation modelling was relied on to analyse the paths. Results, both standardised coefficients and significance, are reported in Table 2. The two key hypotheses were related to the impact of the level of digitalisation ($H1$) and intangible investments on the firm's non-financial performance ($H2$). The results show that both impacts are, as hypothesised, positive and statistically significant. The model also tested the impact of trade involvement (export and imports to EU-15 and other EU markets) on non-financial performance ($H7$), yet the impact, although positive, was not statistically significant. The measures of non-financial performance in the model included product quality, innovativeness, and cooperation with the best companies in the industry (Table A1 describes all the latent variables and

items). Digitalisation level studied the intensity of use of new technologies, the digitalisation level of business processes and the comparative digitalisation level. Intangible capital considered the intensity of investments in the core intangible categories, which include informational capital, research and development, organisational investments, and training.

Table 2: MODEL RESULTS (STANDARDISED COEFFICIENTS ARE REPORTED)

	Hypothesis	Path			Coeff	Sig
<i>Non-financial performance</i>						
Level of digitalisation	H1	DIG_LEV	to	PERF	0.326	0.002
Intangible investments	H2	INTANT	to	PERF	0.416	0.000
Trade	H7	TRADE	to	PERF	0.149	0.133
<i>Level of digitalisation</i>						
Importance of digitalisation	H3	IMP_DIG	to	DIG_LEV	0.544	0.000
Expected long-run benefits	H8	EXP_BEN	to	DIG_LEV	0.175	0.158
<i>Importance of digitalisation</i>						
Expected long-run benefits	H4	EXP_BEN	to	IMP_DIG	0.529	0.000
Trade involvement	H5	TRADE	to	IMP_DIG	0.121	0.112
Agility	H6	AGILITY	to	IMP_DIG	0.281	0.001

Source: Own.

The results for Slovenia confirm the findings of other studies that looked at the importance of intangible capital and digitalisation on firm (non)financial performance either separately or jointly. For example, Bonfour and Etienne (2022) reveal how digitalisation is linked to organisational change and performance. Nonnis et al. (2023) show for a sample of 13 EU countries how knowledge (intangible capital) causes spillover effects and is linked to innovativeness, with Audretsch and Beltski (2020) similarly showing this for the UK. Intangible investments and digital transformation were also linked positively in both our results and those of others. For instance, Lobejko (2020) argues that digital transformation is positively linked to firm innovativeness, which we use as an indicator of non-financial performance. Ivančić et al. highlight the link between digital transformation and quality (2019), while digital transformation is also linked to firms' cooperation within the value chains, especially the advanced suppliers, where digital transformation is often required to maintain such relationships (Domadenik et al., 2022). Therefore, these results corroborate that the findings in the literature are also relevant for the Slovenian environment. Interestingly, inclusion in trade did not have a significant impact, although the impact was positive. A positive impact was expected according to previous studies which emphasised the importance of trade (e.g., Prašnikar, 2010; Prašnikar, Redek, and Drenkovska, 2017) for firms' behaviour. The difference could be due to the sample structure (both SMEs and services dominating) and the fact that

companies were comparing their performance to their peers, which implies that a company mostly operating in the domestic market had to compare itself with its domestic peers.

The results show that, as expected (H3), the level of digitalisation first depends on the importance attributed to digitalisation by the firm, which has a strong and significant impact on the level of digitalisation implemented. The importance of digitalisation was investigated via the perceived strategic importance of digitalisation for corporate success, the importance of new technology implementation for the firm's performance, and the importance of digital transformation. Our results confirm that digitalisation is stronger in companies that acknowledge the strategic importance of digitalisation, which is again supported by other findings. For example, Henriette et al. (2016) claim that "digitalization represents strategic, organizational and cultural stakes for the company and requires the commitment and involvement of top management", while Gobble (2018) stresses that digitalisation and digital transformation require "a clear roadmap driven by a digital strategy".

We also hypothesised that the level of digitalisation directly (as well as indirectly) depends on the expected long-term benefits of digitalisation (H8), which in fact has a positive, albeit a non-significant, direct impact on the level of digitalisation in the company. Nonetheless, the indirect effect was positive and significant (Table 3). Namely, the importance of digitalisation depends first on the expected long-run benefits of digitalisation for the firm (H4). The impact is strong and statistically highly significant. The expected long-run benefits were measured via perceived/expected impacts on new business model development, generating higher value added per employee, and creating higher value products than conventional technologies. The results are in line with other findings in the literature which highlight, for example, that digital transformation is driven by the "perceived or expected advantages that arise with the technology use" (Liere-Netheler et al., 2018) and that there are numerous proactive and reactive motives (directly linked to the expected benefits) driving the digital transformation, as was also shown for Slovenia (T. Čater et al., 2021; Černe et al., 2023). These results thereby further confirm that the expected benefits impact the importance attributed to digital transformation by the firm directly (and indirectly also the level of digitalisation).

Agility of the firm additionally impacts the importance of digitalisation for firms (H6), less strongly than the expected benefits, yet still highly significantly. Firm agility was measured using scales from the H2020 Globalinto project (Bavdaž and Redek (2022), that is, part of the Globalinto approach (Globalinto, 2021). The analysis showed that firms that quickly respond to competition, adapt their practices to the competition, and aim to identify new opportunities also attribute greater importance to digitalisation. The

causality between agility and digitalisation in our case is on the side of agility⁶. Still, in the literature the debate is still open, even stressing that the agility of firms depends on digitalisation on the country level (Škare and Soriano, 2021). The impact of trade involvement is positive, yet quite weak and also non-significant (H5). The explanation for this might be similar as for the aspect of comparative firm performance.

Table 3: TOTAL, DIRECT AND INDIRECT EFFECTS ON NON-FINANCIAL PERFORMANCE OF THE FIRM (STANDARDISED COEFFICIENTS AND SIGNIFICANCES)

	Direct effects		Indirect effects		Total effects	
	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
<i>Level of digitalisation</i>						
Importance attributed to digitalisation	0.544	0.000			0.544	0.000
Agility			0.153	0.014	0.153	0.014
Expected long-run benefits	0.175	0.164	0.287	0.001	0.462	0.000
Trade involvement			0.066	0.123	0.066	0.123
<i>Non-financial performance</i>						
Level of digitalisation	0.326	0.003			0.326	0.003
Importance of digitalisation			0.177	0.017	0.177	0.017
Agility			0.049	0.059	0.049	0.059
Intangible investments	0.416	0.001			0.416	0.001
Expected long-run benefits			0.151	0.012	0.151	0.012
Trade involvement	0.149	0.144	0.021	0.173	0.171	0.098
<i>Importance of digitalisation</i>						
Agility	0.281	0.003			0.281	0.003
Expected long-run benefits	0.529	0.000			0.529	0.000
Trade involvement	0.121	0.113			0.121	0.113

Source: Own; *Models always included relevant covariances between the variables.

Table 3 presents the total, indirect and direct effects on firm performance, which consider the linkages between the latent variables, including covariations. While the digitalisation and intangible investments have positive and significant total impacts on non-financial performance, Table 3 also shows that the importance attributed to digitalisation by the firm has a positive and significant indirect effect on non-financial performance while expected long-term benefits has a positive and significant impact on non-financial performance. Firm agility had a positive, albeit marginally non-significant effect, while the impact of trade involvement had positive both direct and indirect effects, but they were not significant, with the total effect also not being significant. Both agility and expected long-term benefits had

⁶ Several model specifications were tested.

positive and statistically significant indirect effects on the level of digitalisation, while trade involvement again had a weak positive and non-significant effect on the level of digitalisation implemented.

Discussion

Recent literature states that digitalisation and intangible capital are ever more important factors affecting firm performance (C. Corrado et al., 2009, 2019; Hintzmann et al., 2021; RegInsights, 2020; Szabo et al., 2020). While this article addresses the importance of intangible investments and digitalisation as determinants of non-financial firm performance, it also investigates what influences the digitalisation level.

Theoretical contributions

The article addresses the challenge of identifying the contributions made by digitalisation and intangible investments to non-financial firm performance. Non-financial firm performance was measured as firms self-evaluated their comparative performance in the industry with respect to product quality, innovativeness, and cooperation with the best companies in the industry (if a firm was B2B). In short, non-financial performance reflects firms' competitiveness and its main determinants in the long run. The study extends the existing body of knowledge by linking both digitalisation and intangible investments to non-financial performance of the firm. In addition, it shows via indirect effects that the non-financial performance is indirectly linked to the importance attributed to digitalisation by the firm, as well as the perceived long-term impacts of digitalisation. Our results further highlight the importance of firm agility as another driver of digitalisation. The presented study is also the first of this kind for Slovenia, directly linking intangible investments and digitalisation by also studying the drivers of digitalisation. The study also again confirms the importance of both intangible capital and digitalisation for non-financial performance of the firm, adding to the findings of Erjavec and Redek (2022) that stress the complementarity between the two aspects as determinants of value added in SMEs in Slovenia using administrative data. The study also validated one new scale and further validated two existing ones: the level of digitalisation as the new scale, while the adapted trade involvement (based on (Drenkovska and Redek, 2015)) and intangible investments (based on the Globalinto survey (Caloghirou et al., 2022; Globalinto, 2021)) were further validated.

Practical contributions

The study makes several practical contributions to the business community. First, it confirms the importance of digitalisation and intangible investments for firms' non-financial performance, which in essence are the aspects driving firms' long-term competitiveness. Both are increasingly important for productivity growth that further facilitates investments and leads to a positive growth spiral, in turn accelerating both intangible investments and digitalisation. Managers should accordingly focus on strengthening their investments in these factors of growth. In addition, the results show that the importance attributed to digitalisation by the firm and digitalisation itself importantly depend primarily on internal firm factors (as also found by (T. Čater et al., 2021)), arising from strategic importance, firm agility as well as perceived benefits. Trade, as a proxy for external pressure and learning opportunity as emphasised by Prašnikar (2017), is less important. These findings on the importance of internal motives and "desire to succeed" are similar to those found for seven EU economies by Bavdaž and Redek (2022). Therefore, managers should be more proactive in implementing new technologies because the main driver is the companies themselves and, given the importance of digitalisation and intangibles for their non-financial performance, they should invest in both. Namely, in Slovenia the data show that companies are lagging behind in intangible investments relative to the average company in an EU country. Slovenia even ranks in the bottom quarter of countries by the share of total investments channelled into intangible investments (European Investment Bank, 2021).

Limitations and challenges for future research

This study and its results are limited by the specific sample structure and the relatively small sample size. This could affect some results. Although the analysis focused on the impacts of technology and intangible investments on companies and not on the impact of firm demographics, the sample size prevented the testing of differences by groups (e.g., based on company size, industry etc.) or the conducting of an in-depth multilevel analysis, the testing of some hypotheses possibly did not bring the expected results. A much larger sample would also allow the comparative importance of different technologies to be assessed. Further, since the survey was anonymous, it was impossible to link the survey results to other financial indicators, which could highlight some additional differences. Given that it may be assumed that over time the impacts of both technology and intangible investments are not uniform across firms, in the future it would be worthwhile to investigate the impact in the case of Slovenia. This would require repeating the survey to obtain panel data.

Conclusion

The study investigated the impact of digitalisation and investments in intangible capital on firms' performance. The SEM approach using survey data shows that, as hypothesised, the effects of the level of digitalisation implemented and intangible investment on the non-financial performance of firms are positive and statistically significant. As expected, the level of digitalisation depends on the importance attributed to digitalisation by the firm (via perceived strategic importance) while the importance of digitalisation depends on the expected long-term benefits of digitalisation for the company. The level of digitalisation is dependent on the expected long-term benefits of digitalisation, which in fact has a positive, albeit non-significant impact on the level of digitalisation in the company. Although business agility has an impact on the importance of digitalisation for businesses that is less than the expected benefits, it is still highly significant. The results also show that the impact of being involved in commerce on the importance attributed to digitalisation by the firm is positive, yet quite weak and also not significant and, similarly, the impact of trade involvement (export and imports to EU-15 and other EU markets) on non-financial performance, albeit positive, was not statistically significant. The research confirms the importance of digitalisation and intangible investments for firm performance and that both are becoming increasingly important for productivity growth. While Slovenian companies are relatively well acquainted with the latest digital technologies in their industry, they should invest more in intangible capital because they are lagging behind in intangible investments. The biggest challenge is to find qualified personnel to support the transformation process, whereby the company's strategy is very important. The research revealed major differences exist in terms of digital transformation between companies in the manufacturing and service sectors on one hand and between companies embedded in global value chains on the other.

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Appendices

Table A1: DESCRIPTIVE STATISTICS AND SCALE DESCRIPTION

		Variable	Mean	Std.	Dev.	Min
Latent variable	Agreement with the statements (Likert scale, 1–5)					
Level of digitalisation	Our business processes are highly digitised	Q28a	3.155	0.891	1.000	5.000
	The level of intensity of the use of new technologies and digitisation in our company is very high.	Q28c	3.111	0.828	1.000	5.000
	We see ourselves as a company with an above-average level of digitalisation intensity.	Q28d	3.009	1.013	1.000	5.000
Non-financial performance	Product quality	Q19a	3.768	0.731	2.000	5.000
	Company innovation	Q19c	3.581	0.866	2.000	5.000
	The company's commitment to working with the best suppliers or buyers (if B2B) in the industry	Q19k	3.568	0.838	1.000	5.000
Agility	At our company, we react quickly to the moves of our competitors.	Q26b	3.686	0.813	1.000	5.000
	We change our practices based on customer feedback.	Q26c	3.975	0.722	1.000	5.000
	We quickly identify new opportunities to improve our offer to our customers.	Q26f	3.803	0.768	1.000	5.000
Intangible investment**	Organisational and business process improvement	Q21e	2.911	1.520	1.000	8.000
	Purchase of software and databases	Q21b	3.200	1.760	1.000	8.000
	Research and development	Q21c	3.818	2.070	1.000	8.000
	Training due to new technology implementation	Q21f	2.748	1.550	1.000	8.000
	Training and education of employees	Q21g	2.779	1.405	1.000	7.000
Importance of digitalisation	Digitalisation is one of the key success factors.	Q27c	3.814	0.915	1.000	5.000
	The introduction of new technologies is one of the key success factors.	Q27b	3.644	0.920	1.000	5.000
	Digital transformation is important for our business.	Q28e	3.752	0.850	1.000	5.000
Expected long-term benefit	Digitalisation is creating new business models.	Q18a	3.717	0.776	1.000	5.000
	Digitalisation is creating more value than conventional ways of doing business.	Q18d	3.732	0.791	1.000	5.000
	Digitalisation is adding more value per employee than using conventional technologies.	Q18e	3.897	0.691	1.000	5.000
Trade involvement*	Imports from EU-15	Q8c	3.068	1.669	0.000	5.000
	Imports from other EU markets	Q8d	2.194	1.674	0.000	5.000
	Exports to other EU markets	Q7d	2.012	1.515	0.000	5.000

*In case of trade involvement, the scale was 0–5, evaluating the importance of the relationship, “not at all, very little, little, the market is of mediocre importance, important, very important”.

**Intangible investment was measured using the following scale: 1 = 0%, 2 = up to 0.5%, 3 = 0.5%–1%, 4 = 1%–2%, 5 = 2%–3%, 6 = 3%–5%, 7 = 5%–10%, 8 = more than 10%. Maximum value from the sample is displayed as the maximum, implying that no firm invested more than 10% in training.

Source: Own.