Review of Managerial Science
https://doi.org/10.1007/s11846-023-00720-2

ORIGINAL PAPER

How the digital business ecosystem affects stakeholder satisfaction: its impact on business performance

Antonio Fernández-Portillo[1] · **Nuria Ramos-Vecino**[1] · **Adelaida Ramos-Mariño**[1] · **Gabriel Cachón-Rodríguez**[2]

Received: 17 January 2023 / Accepted: 20 November 2023

Abstract

Due to the digital transformation, organizations have incorporated technologies in all areas of the company, creating digital business ecosystems. These in turn, with the tools that compose it, influence the satisfaction of stakeholders and business performance. The objective of this research is to know how the digital business ecosystem affects customer and employee satisfaction and whether this satisfaction has an impact on business performance. To achieve this objective, a model is proposed to which a PLS technique is applied to a sample of 1319 Spanish SMEs. The results of this innovative study show, on the one hand, a positive relationship of the digital business ecosystem with the satisfaction of both stakeholders, and, on the other hand, and as the main contribution of this study, it has been found that employee satisfaction positively influences business performance. This research offers a novel model capable of relating how the satisfaction of both customers and employees in a digital environment improves business performance. It also contributes to the literature by widening the field of study and overcomes a new gap for SMEs.

Keywords Customers · Employees · Digital business ecosystem · Performance · Satisfaction

JEL Classification O33 · O32 · M15 · M21

✉ Nuria Ramos-Vecino
nuriarv@unex.es

Antonio Fernández-Portillo
antoniofp@unex.es

Adelaida Ramos-Mariño
adelaidarm@unex.es

Gabriel Cachón-Rodríguez
gabriel.cachon@urjc.es

[1] Departamento de Economía Financiera y Contabilidad, Universidad de Extremadura, Avenida de la Universidad s/n, 10071 Cáceres, Spain

[2] Departamento de Economía de la Empresa, Universidad Rey Juan Carlos, Madrid, Spain

Published online: 16 January 2024

1 Introduction

Digitalisation is the embedding of technology into business processes while digital transformation encompasses the embedding of technologies into the entire business ecosystem (Saariko et al. 2020). Digital transformation has completely changed traditional business models (Verhoef et al. 2021) and the embedding of technologies in companies creates competitive advantages that help improve business performance (Blichfeldt and Faullant 2021). This has led to the creation of digital business ecosystems (Kanda et al. 2021).

Digital business ecosystems are an increasingly desirable context for organisations seeking to embed digital transformation (Wang 2020). These ecosystems rely on digital platforms that bridge technologies to achieve the digitalisation of organisations (Kohtamäki 2022) and drive companies to further introduce new technologies and promote innovation in business models (Yuana et al. 2021). In addition, these tools have developed a change in the relationships with both customers and employees, transferring it to the digital ecosystem (DiPietro et al. 2020; Sun and Zhang 2021), i.e., they contribute to greater stakeholder satisfaction and can be transformed into an improvement in the economic performance of the company (Parise et al. 2016; Castellacci et al. 2019).

Previously, there have been studies that relate digital technologies to job satisfaction, but to the best of our knowledge, there are no studies that relate digitalization to improved customer (outside the company) and employee (within the company) and leads to an improvement in business results. In other words, there is a gap in the literature that measures whether, thanks to digitization, it is possible to improve intra-company and extra-company satisfaction, and this in turn has an impact on improving business performance.

Understanding the connection between digital business ecosystem, satisfaction and performance, a question arises that we seek to answer with this research: Does employees and customer's satisfaction with their organization's digital business ecosystem affect their organisation's performance?

Therefore, the main objective of this research will be to determine the satisfaction of employees with the technologies implemented in organizations and if this satisfaction has an impact on business performance.

From a methodological point of view, in order to achieve the proposed objective, a theoretical model has been developed that connects the digital ecosystem of the companies in the sample with the satisfaction of two of their stakeholders and with their performance or profitability. To this model we have applied the PLS-SEM technique (Partial Least Squares Modelling) and to ensure the reliability of the sample we have applied the FIMIX-POS technique (Prediction Oriented Segmentation), on a sample of 1319 Spanish SMEs. The PLS-SEM technique has proven useful for its ability to model composites and factors, as well as its predictive and structural equation modelling orientation (Henseler et al. 2016a, b in Nitzl et al. 2016; Hair et al. 2019; Sarstedt et al. 2020).

As a result, our model relates the digital business ecosystem of SMEs to customer and employee satisfaction and allows us to identify the impact of customer and employee satisfaction on the performance of the sample organisations.

The main contributions of this research are, firstly, that the satisfaction that employees perceive thanks to technology is slightly higher than that of customers. Secondly, and as a more relevant contribution, this research has allowed us to identify that the performance of an organisation improves mainly when the employee feels satisfied with the technologies implemented in the organisation. As a final contribution, we have been able to divide the sample into two homogeneous groups thanks to the prediction-oriented segmentation carried out by the Smart PLS tool, finding the similarity that employee satisfaction has a positive impact on business performance, thus reinforcing the results obtained in the first part of the analysis. As a final contribution, it provides a new vision of the research topic, as well as new results, because it is a topic that is currently under development and there is no extensive literature on it.

Furthermore, in practical terms, the insights from our study will help companies with characteristics similar to those in our sample to improve their business results through greater customer and employee satisfaction.

Our theoretical model strives to find out if business performance improves thanks to an improvement in the satisfaction of certain stakeholders. To the best of our knowledge, there are no previous studies that measure this in the way that is done here.

Our findings will offer valuable indications and recommendations for policy makers, society, and researchers, promoting a greater appreciation of the satisfaction of clients and employees of organizations.

This paper is structured in 4 main parts, firstly, the introduction where we identify the economic problem that gives rise to the research question, the objectives to be achieved as well as the contributions. Secondly, the theoretical framework thanks to which we can develop our theoretical model with the current literature. This is followed by the empirical framework in which we describe the methodology and show the results of the analysis of the model, as well as the relationship of the results with the literature (discussion). Finally, the conclusions of the study are presented, as well as the limitations found and future lines of research.

2 Theoretical framework

More than a decade ago, the literature showed that digital transformation affects the entire enterprise (Zott et al. 2011). But the first thing to know is how the literature defines this term. In this line, Hinings et al. (2018) define digital transformation as the result of different digital innovations that generate new actors, structures, practices and values, which can change, disrupt or complement established norms in organisations or industries, such as removing barriers to entry and exit from current markets (Li et al. 2018).

Guinan et al. (2019) states that digital transformation is the ability of an organisation to adapt, respond and position itself to the success of rapidly evolving technology, creating competitive advantages in the organisation.

Therefore, digital technologies can help to achieve a competitive advantage by transforming the organisation to take advantage of existing competences or develop new ones (Liu et al. 2011). Along these lines, we find some technologies that have become essential for the development of business activities and for customer relations, some of which are highlighted below (Fig. 1):

These technologies and others have led to digital transformation in organizations, and thus to the formation of digital business ecosystems (Winkelhaus et al. 2022).

A digital business ecosystem (hereafter DBE) is an economic community of interacting organisations and individuals producing valuable goods or services

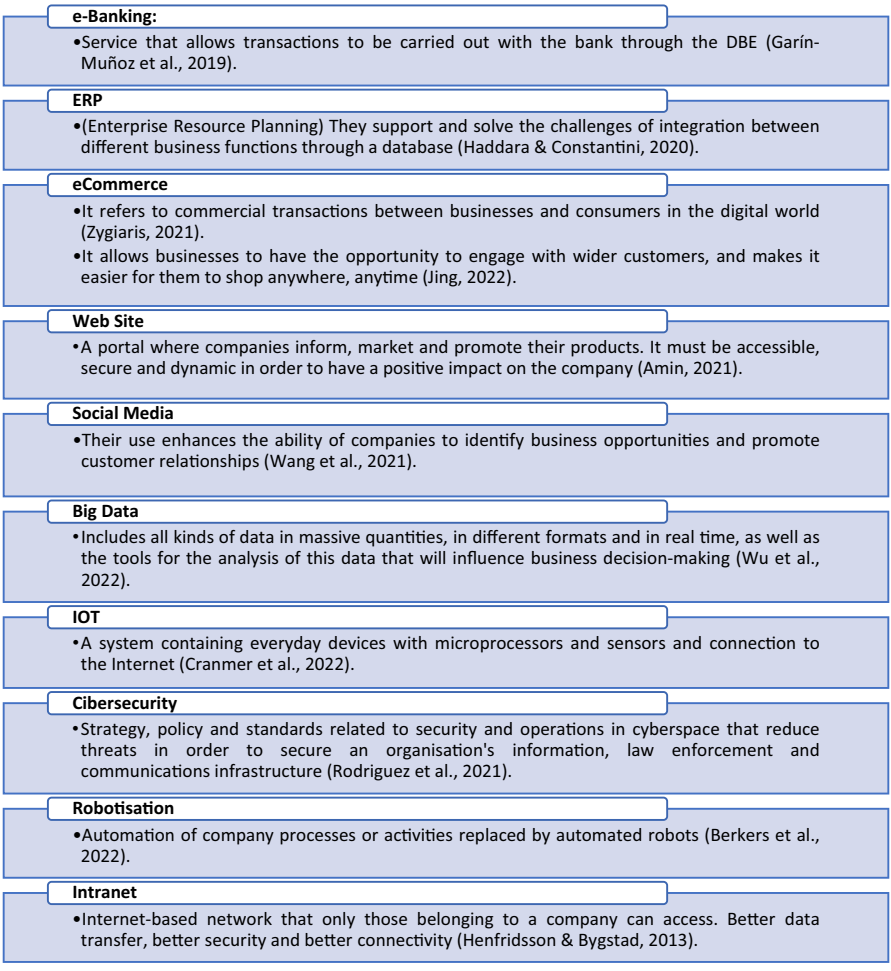

Fig. 1 Technologies within the DEE. Source: Own Elaboration

through digital tools (Moore 1993). Later authors such as Nachira et al. (2007) define the DBE as a virtual environment composed of digital entities such as software applications, hardware, and processes.

DBE refers to a virtual environment that connects a technological infrastructure with digital services through shared digital platforms (Nachira et al. 2007). So the ultimate goal of DBE is value creation through digital platforms (Senyo et al. 2019).

Digital platforms are defined as "a technological architecture that enables the development of its IT functionalities and allows the integration of information, computing and connectivity technology into platforms available to an organisation" (Sedera et al. 2016, p. 4).

Previous studies have revealed that digital platforms have helped companies to develop value-creating activities by enhancing their digital transformation processes (Warner and Wägner 2019). Digital platforms enable companies to apply new technologies and build new connections with existing equipment (Cenamor et al. 2019) and promote the innovation of their business model in terms of the learning process, training employees in gaining new knowledge and establishing new interaction capabilities (Li et al. 2020).

Such platforms are typically created and owned by a single company or entity and are part of an ecosystem composed of people, data, processes, and objects connected by the use of technologies that go beyond the scope of a single system (Henfridsson and Bygstad 2013). They thus generate services that are radically changing existing ways of working, altering internal ecosystems and business structures (Montealegre and Iyengar 2021).

These changes have influenced both positively and negatively, and one way to analyse the mode is by measuring satisfaction (Farivar and Richardson 2021).

Satisfaction is the consumer's response to wish fulfilment. Customer satisfaction "is a judgment about a characteristic of a product or service, or that the product or service itself, provides (or is providing) a pleasurable level of consumption-related satisfaction, including levels of under/over satisfaction" (Oliver 1993, p. 13). This definition implies that satisfaction is a positive state of consumers when purchasing a product or service while it satisfies their desires, including the degree of delight beyond the desired level (Brill et al. 2019). And nowadays, Digital Business Models focused on customer experience are gaining importance, as digital transformation can result in improved firm performance and new ways of creating value (Hanelt et al. 2021).

According to Kotler et al. (2017b), satisfaction is given by several factors, and one of them is improved accessibility to products, increased communication with the company and easy access to company information. This is closely linked to the insertion of technologies in the company and the use of digital platforms (Minh Duc, 2022).

Employee satisfaction can be defined as an individual's subjective viewpoint that encompasses how they feel about their job and the organisation that employs them. In terms of job satisfaction, the subjective view is related to the business processes and tasks in which employees operate.

DiPietro et al. (2020) distinguish two types of job satisfaction; firstly, the general feeling of satisfaction with the job, and secondly, feelings about aspects of the job such as benefits, salary, and work environment (Abuhashesh et al., 2019).

Several studies claim that satisfied employees tend to have higher productivity and high performance (Ilies et al. 2009). Importantly, retaining satisfied employees can help the company to reduce costs (Grissom et al. 2012) and achieve higher performance in the organisation.

At this point we propose to define the following study hypotheses:

H1 Digital business ecosystem influences customer satisfaction.

H2 Digital business ecosystem influences employee satisfaction.

H3 Customer satisfaction influences organisational performance.

H4 Employee satisfaction influences organisational performance.

2.1 Proposed theoretical model

Figure 2 below shows the proposed model, which shows the proposed relationship of the digital business ecosystem with customer and employee satisfaction, and how these in turn influence organisational performance.

The DBE is made up of twelve elements and the application of this model is intended to achieve the main objective of this research, which is to determine whether employees are satisfied with the technologies implemented in organisations and whether this satisfaction has an impact on business results.

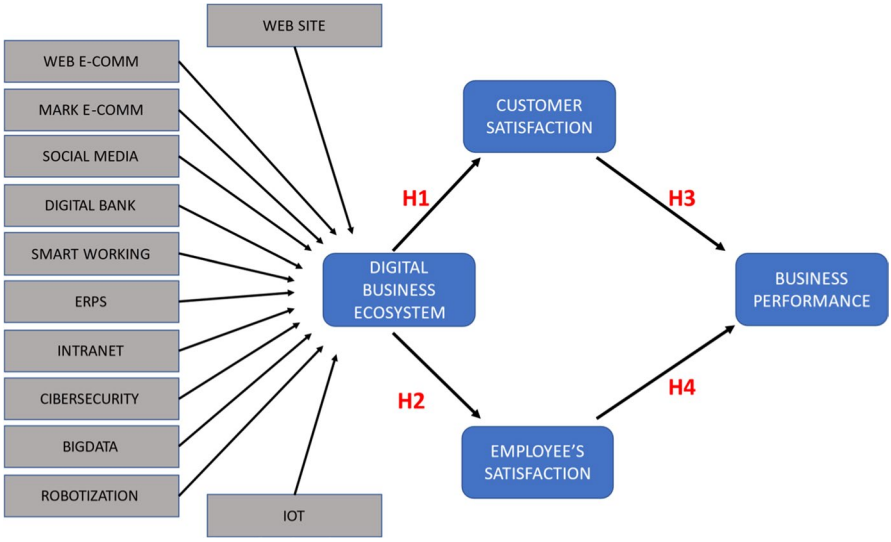

Fig. 2 Proposed theoretical model

2.2 Empirical framework

As for the empirical study, we will first describe the fieldwork. For this, part of the questionnaire by Durende et al. (2022) has been used, which has been validated by the FAEDPYME network of researchers (Faedpyme 2022), and a company specialising in business surveys has been contracted for data collection, using the CATI system. The empirical study is based on a survey of 1319 SMEs in Spain. The questions in the questionnaire that collect the necessary information can be consulted in Table 1.

To carry out the data analysis, we have used the Partial Least Squares (PLS) technique, which usually is developed in 2 steps, but we have added one step more, than it is Prediction-oriented segmentation analysis for better the results:

- Assessment of the global model
- Assessment of the measurement model
- Prediction-oriented segmentation analysis.

In addition, in order to know the effect and the relationship between these variables we have based ourselves on the use of Structural Equation Modelling, resorting to the PLS technique, using the SmartPLS 3.2.8 tool.

Different authors highlight PLS' ability to model compounds and factors (Henseler et al. 2016a, b in Nitzl et al. 2016; Marín-García and Alfalla-Luque 2019; Sarstedt et al 2020) and its prediction orientation of more complex models that are possible to deal with thanks to the emergence of techniques such as Structural Equation Modelling (SEM) (Shmueli et al. 2016; Hair et al. 2019; Sarstedt et al. 2020).

On the other hand, there are authors who prove that unobserved heterogeneity is not only a threat to the validity of any structural model but also to measurement models (Sarstedt et al. 2020; Fordellone and Vichi 2020). For this reason, it is considered necessary to analyse the existence or not of unobserved heterogeneity in this model in order to clarify whether it is ultimately valid and also to be able to identify the population group with the highest predictive capacity. For this purpose, the prediction-oriented segmentation technique FIMIX-PLS and PLS-POS (Robina-Ramírez et al. 2019) will be used. FIMIX-PLS is considered the appropriate and commonly used approach to identify heterogeneity (Fordellone and Vichi 2020; Klesel et al., 2019; Marin-Garcia and Alfalla-Luque 2019). But later, Becker et al. (2013) presented a new method called PLS-POS to detect unobserved heterogeneity with higher fit, which reveals heterogeneity in both the structural model and the measurement model giving the possibility to discover very small segments of the population (Arenas-Gaitán et al. 2019) with disparate characteristics. This methodology has been applied in other current research such as Robina-Ramírez et al. (2019), Silva et al. (2019), Zhiqiang et al. (2020), Fordellone & Vichi (2020) among others.

Finally, a breakdown analysis of the variance explained is performed to identify the variable that contributes most to the explanation of the model developed, specifically to find out which construct is the one that contributes most to entrepreneurial performance.

Table 1 Questions to form the indicators that make up the constructs. Source: Own elaboration based on (FaedPyme 2022)

Variable	ID	Question	Code
DIG. BUSINESS ECOSYST	P013_SQ001	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Own website**	WEB SITE
	P013_SQ002	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **We sell on our own e-commerce portal**	PORT. E-COMM
	P013_SQ003	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **E-commerce in Marketplace (Amazon or equivalent)**	MARK. E-COMM
	P013_SQ004	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Social networking for business purposes**	SOCIAL MEDIA
	P013_SQ005	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Digital Banking**	DIGITAL BANK
	P013_SQ006	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Technology Importance**	TECHNOLOGY IMPORTANCE
	P013_SQ007	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **ERPs (integrated management systems)**	ERPS
	P013_SQ008	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Corporate intranet**	INTRANET
	P013_SQ009	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Services to cover cyber security**	CIBERSEC

Table 1 (continued)

Variable	ID	Question	Code
	P013_SQ010	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Big data and data analytics software**	BIGDATA
	P013_SQ011	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Robotisation, sensorisation**	ROBOTISA
	P013_SQ012	Please indicate the degree of importance for your company on a scale of 1 to 5, where 1 is not very important and 5 is very important Which technologies do you use in your company and how important are they? **Robotisation, Internet of Things**	IOT
SATISFACTION	P019_SQ003	In comparison with your direct competitors, indicate how your company ranks on the following performance indicators (1-worst, 3-equal and 5-best): **Customer satisfaction**	CUSTOMER SATISFACTION
	P019_SQ007	In comparison to your direct competitors, indicate how your company ranks on the following performance indicators (1-worst, 3-equal and 5-best): **Employee satisfaction**	EMPLOYEE SATISFACTION
BUSINESS PERFORMANCE	P019_SQ006	In comparison with your direct competitors, indicate how your company ranks on the following performance indicators (1-worst, 3-equal and 5-best): **Performance**	PERFORMANCE

3 Results

The results of the analysis of the data with the PLS-SEM technique allow us to validate the measurement instrument, the structural model, and the validity of the sample as a whole (Fig. 3). The different estimates of the model provide the distribution of the internal path coefficients (Nitzl et al. 2016; Hair et al. 2019), i.e., thanks to this technique, it will be possible to estimate the impact of business digitalisation on the satisfaction of two of its stakeholders: customers and employees. And consequently, to measure the impact of satisfaction on business results.

3.1 Assessment of the global model

Following Hu & Bentler (1998) and later Hair et al. (2020), the values 0.01, 0.05, and 0.08 are used to indicate excellent, good, and mediocre accuracy, respectively, and in our case, the SRMR value for the saturated model is below the threshold of 0.05, which indicates good accuracy (Table 2). Likewise, the model estimate is below 0.08, which is very close to a good level of accuracy.

Henseler et al. (2016b), state that the SRMR values for a two-tailed Bootstrapping, must be less than the Bootstrap result at 97.5% in the relationships between variables and if the SRMR value exceeds this value, it is unlikely that the model is true. In the case of our model, we have used two-tailed bootstrapping in order to know the sign of the hypothesis and, as can be seen in Table 3, this requirement is met, and the model is considered to be true. Furthermore, if we look at

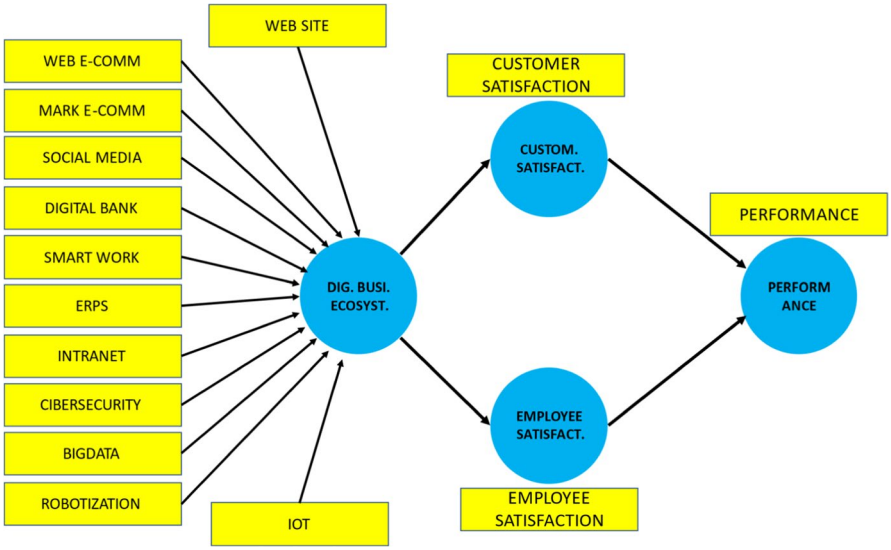

Fig. 3 Initial result of the model of the impact of business digitalisation on customer and employee satisfaction

Table 2 Accuracy rates

	Saturated model	Estimated model
SRMR	0.026	0.052
d_ULS	0.079	0.325
d_G	0.012	0.055
Chi-square	79.590	351.774
NFI	0.977	0.897

Table 3 Bootstrap accuracy test with sample size at 95% confidence

	ORIGINAL SAMPLE (O)	SAMPLE AVERAGE (M)	2,5%	97,5%	SRMR
DIG. BUSI. ECO.—> CUST. SATISFA	0.136	0.153	0.079	0.215	0.026
DIG. BUSI. ECO.—> EMPL.SATISFA	0.155	0.1720	0.097	0.232	
CUST. SATISFA—> PERFORMANCE	0.112	0.122	0.060	0.163	
EMPL.SATISFA—> PERFORMANCE	0.322	0.322	0.259	0.382	

Table 4 VIF estructural model

	DIG. BUSI. ECO	PERFORMANCE	CUST. SATISFA	EMPL.SATISFA
DIG. BUSI. ECO			1.000	1.000
PERFORMANCE				
CUST. SATISFA		1.227		
EMPL.SATISFA		1.227		

the VIF values of the structural model, we can determine that they are all within the parameters established by the literature (see Table 4).

3.2 Assessment of the measurement model

Internal consistency was assessed using Cronbach's alpha and composite reliability. According to theory, authors such as Nunnally & Bernstein (1994) or Hair et al. (2020), among others, suggest 0.7 as an adequate level for 'modest' reliability in early stages of research, although the alpha value should range from 0 to 1. The closer the alpha value is to 1, the higher the internal consistency of the items analysed, i.e. it is assumed that the items are measuring the same dimension.

As the table above shows, our model not only exceeds the acceptance threshold for composite reliability, but also shows a perfect accuracy (Table 5).

The same is true for the Dijkstra-Henseler's (ρA) indicator (rho_A) all variables analysed exceed the threshold of 0.7 showing a perfect value (Hair et al. 2020).

Table 5 Reliability and construct validity (internal consistency)

	CRONBACH'S ALPHA	RHO_A	COMPOSITE RELIABILITY	AVERAGE EXTRACTED VARIANCE (AVE)
CUST. SATISFA	1.000	1.000	1.000	1.000
EMPL.SATISFA	1.000	1.000	1.000	1.000
PERFORMANCE	1.000	1.000	1.000	1.000

The mean extracted variance was used to measure divergent validity and, on this occasion, the minimum value recommended by Hair et al. (2014) is 0.50. Interestingly, the analysis shows that these variables explain the entire model, since they all reach a value of 1.

In our model, Cronbach's Alpha, rhoA, Composite Reliability and Average Extracted Variance are equal to 1, because in type A or reflective indicators, when measured by a single indicator, these values can only be equal to 1.

The square root of the average extracted variance of each latent variable should be greater than the correlations it has with the rest of the variables (Hair et al. 2017) as shown in Table 6, this criterion is met in our model. And once again, if we look again at the VIF values of the measurement model, the parameters established by the literature for all the indicators are met again (see Table 7).

On the other hand, following Chin (2010), the evaluation has been checked both at the construct level and at the indicator level. As for the evaluation at the indicator level, it is necessary to indicate that there is no multicollinearity between the indicators, and also according to the assessment of their magnitude of the weights and their significance, it has been decided not to eliminate any of them due to their contribution to the final explained variance and to the fact that these 12 indicators, according to the theory, are those that make up the Digital Business Ecosystem (DBE).

Having determined the validity of the model, as well as the good accuracy of the model, it is necessary to test whether this model would be valid and could be successfully applied to complex models (Hair et al. 2019). For this purpose, the bootstrapping technique was used, bounded by 5000 iterations.

Looking at Fig. 4, it can be seen that the use of Social Media mainly, followed by having one's own website, are the conditions that have the most significant relationships with the digitalisation of the company and the digital business ecosystem.

Table 6 Discriminant validity. Fornell-Larcker criterion

	DIG. BUSI. ECO	PERFORMANCE	*CUST. SATISFA*	*EMPL.SATISFA*
DIG. BUSI. ECO				
PERFORMANCE	0.171	1.000		
CUST. SATISFA	0.136	0.251	1.000	
EMPL.SATISFA	0.155	0.370	0.430	1.000

Table 7 VIF values measurement model

	VIF
BANCA DIG	1.055
BIGDATA	1.490
CIBERSEG	1.334
ERPs	1.413
INTRANET	1.483
IOT	1.386
MARK. E-COMM	1.336
P019_SQ003	1.000
P019_SQ006	1.000
P019_SQ007	1.000
PAG.WEB	1.000
PORT.E-COMM	1.326
ROBOTIZ	1.469
RRSS	1.300
TELETRAB	1.310
BANCA DIG	1.186

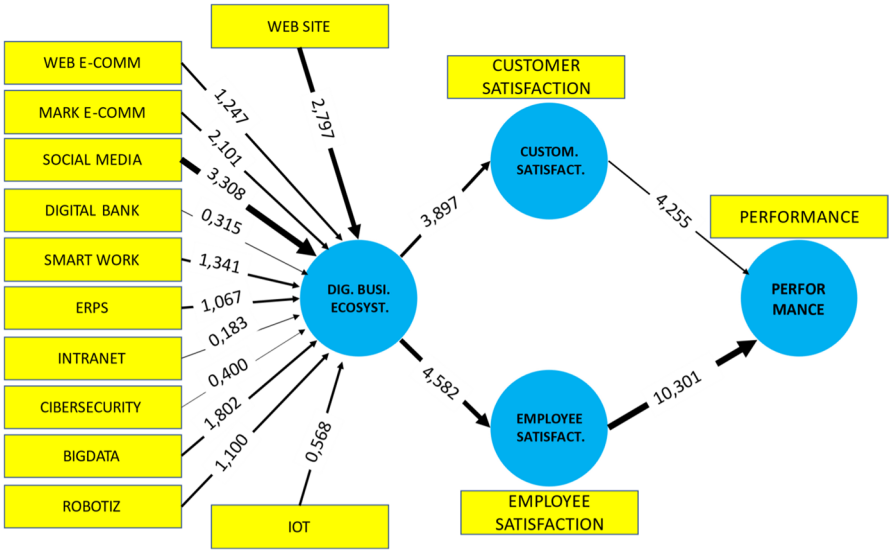

Fig. 4 Bootstrapping algorithm: model after bootstrap procedure (5000 iterations)

In turn, the model shows that, thanks to business digitalisation, both customers and employees are satisfied with this digitalisation, although the satisfaction value of employees is slightly higher, probably because internal processes have improved for them, and they find it easier to carry out their work activities.

Table 8 Path bootstrapping coefficients (5000 iterations)

	STADISTICS T	P VALUES
DIG. BUSI. ECO. → *CUST. SATISFA*	3.897	0.000
DIG. BUSI. ECO. → EMPL. SATISFA	4.582	0.000
CUST. SATISFA → PERFORMANCE	4.255	0.000
EMPL. SATISFA. → R PERFORMANCE	10.301	0.000

Table 9 Level of R^2 and predictive relevance of the model

	R^2	R^2 accuracy	Q^2
Performance	0.147	0.146	0.144
Cust. Satisfa	0.018	0.018	0.008
Empl. Satisfa	0.024	0.023	0.013

Furthermore, as the main contribution, the model shows how employee satisfaction has an impact on the company's performance and stands out above customer satisfaction, as the value is more than twice as high as that of customer satisfaction.

Following the theory described (Hair et al., 2017), the closer the P-values are to zero, the more accepted they will be. As the Table 8 shows, all the relationships between variables have a zero value, but if we look at the T-statistics and as already anticipated in Fig. 4, the improvement in performance due to employee satisfaction stands out above the other relationships. Therefore, it can be concluded that digitalisation has a positive influence on employee satisfaction, which in turn influences an improvement in organisational performance.

As for the variance explained (R^2) the value required according to theory (Falk and Miller 1992) must be greater than 0.10 and a value of 1.0 indicates a perfect accuracy and, therefore, a very reliable model for future forecasts. The higher the value, the more predictive the model is. In our case, the value exceeds the value for the performance variable exceedsthis acceptance threshold.

Moreover, according to the theory expounded by Chin (1998) and later by Hair et al. (2019), the predictive relevance of the model will be low if $Q2 > 0$, will be medium if $Q2 > 0.25$ and will be high if $Q2 > 0.50$. In this case the predictive relevance is at a low level, for all variables (Table 9).

Subsequently, we searched for unobserved heterogeneity in the model. This analysis of unobserved heterogeneity indicates that there are no significant differences within the sample, which allows us to ensure that we have a homogeneous sample in relation to the dependent variable, and with the structural model defined, therefore, we have a robust sample for the purpose of our study.

In order to deepen our knowledge of the dependent variable, we have Proceed to analyse the decomposition of the variance explained by this variable, based on the previous constructs, as we can see in Table 10.

When analysing the decomposition of the Explained Variance of Performance (14.7%), we see that substantial differences can be observed, as employee

Table 10 Analysis of the contribution to the explained variance

Variable	Path	Correlations	Variance explained
CUS. SATISFA. → PERFORMANCE	0.112	0.251	2.8%
EMPL. SATISFA. → PERFORMANCE	0.322	0,.370	11.9%
PERFORMANCE			14.7%

satisfaction has a contribution to the explained variance of almost 11.9%, much higher than customer satisfaction with only 2.8%.

4 Discussion

Digital tools bring several advantages to the business world, favouring the competitive positioning of organisations (Valdez-Juárez et al. 2020). In turn, these tools have developed a change in both external relationships with customers and internal relationships with employees (DiPietro et al. 2020; Sun & Zhang 2021) i.e., they contribute to greater stakeholder satisfaction and can be transformed into improved economic performance of the company (Parise et al. 2016; Castellacci et al. 2019).

Based on this, we established an objective in line with the beginning of the research, which consisted of analysing the satisfaction of customers and employees of a sample of Spanish SMEs, in terms of the digital ecosystem of their company and, once this satisfaction or dissatisfaction had been identified, identifying how it affects the performance of these organisations.

This research consisted of two steps: firstly, a confirmatory study based on hypotheses, specifically 4. Starting with the stakeholder satisfaction analysed, we found a positive relationship of customer satisfaction with the Digital Business Ecosystem (H1) of 0.136 and another positive but slightly stronger relationship of employee satisfaction with the Digital Business Ecosystem (H2) of 0.155. These results are in line with the literature as it has previously been shown that the application of digital tools as well as the development of a DBE not only improves the internal processes of organisations, but also enhances employee relations (Zhu & Smith 2019; Winkelhaus et al. 2022).

Furthermore, authors such as Hanelt et al. (2021) already identified that digital business models focused on customer satisfaction are gaining importance, as this, as we have confirmed with this analysis, results in their positive influence on business performance.

Following Williams et al. (2009) and Henseler et al. (2016a), the root mean square residual (SRMR) value shows a good model accuracy.

The Bootstrapping analyse shows that the most significant relationship is the one corresponding to the fourth hypothesis (H4) which relates employee satisfaction with an improvement in organisational performance. Again taking employee satisfaction as a reference, the literature shows that a satisfied or motivated employee is one of the most important sources of improvement in business performance (Yunis

et al. 2018; Martínez et al. 2020; Grecco et al. 2021) in addition it has also been previously demonstrated that digitalisation favours this satisfaction (Castellacci & Viñas 2019; Torre et al. 2021; Winkelhaus et al. (2022) with this research further reinforcing these theories. In another vein, there is some research contrary to these findings, claiming that the use of these technologies exacerbates work-life conflicts and negatively impacts employee satisfaction, especially in the wake of COVID 19 and the forced digitalisation of organisations (Farivar & Richardson 2021; Nemteanu & Dabija 2021). However, this research provides empirical evidence of the influence of DBE and job satisfaction on the new normal, as the data are for the year 2022.

But what is really important from the analysis is that there is a strong relationship of the employee satisfaction variable with the corporate performance variable. This is again in line with the theory that satisfied employees are one of the causes of good company performance (Grecco et al. 2021). Finally, if we look at the contribution to the variance explained, we again find that the employee satisfaction variable is the one with the highest variance explained and therefore it is the one that has a contribution to business performance thanks to the technologies that are part of the digital business ecosystem.

5 Conclusions, limitations and future research line

Digital business ecosystems are an increasingly desirable context for companies seeking to embrace digital transformation (Wang 2020). The tools that are part of this ecosystem have developed a change in both internal and external relationships, contributing to greater stakeholder satisfaction (DiPietro et al. 2020; Sun and Zhang 2021). This, in turn, can lead to improved business performance (Parise et al. 2016; Castellacci et al., 2019).

The digital business ecosystem and its component technologies have been found to contribute to both customer satisfaction (H1) and employee satisfaction (H2). It was previously shown that the application of digital tools, as well as the development of a DBE, not only improve the internal processes of organizations, but also improve relationships with internal agents, such as employees (Zhu & Smith 2019; Winkelhaus et al. 2022). Furthermore, in the analysis of performance through stakeholder satisfaction, it was confirmed throughout the process that employee satisfaction contributes to a greater extent to improved business performance (H4). Again, taking as a reference the research by Zhu & Smith (2019) and Winkelhaus et al. (2022), where they related the improvement of employee satisfaction with the application of digitization to companies. Furthermore, the analysis of the contribution to the explained variance further reinforces these results.

Therefore, we can conclude that our results show that a good digital business ecosystem and the technological tools that compose it contribute to improved customer and employee satisfaction, and more satisfied employees lead to improved organisational performance. These results are in line with the theories proposed by authors such as Yunis et al. (2018) or more recently by Grecco et al. (2021)

and therefore this research provides new evidence on this line, adding that all the hypotheses are contrasted and highlighting hypotheses H2 and H4, related to employee satisfaction.

Moreover, this work not only has a theoretical application but also a practical one. Therefore, we recommend that the business ecosystem of Spanish SMEs, or those with similar characteristics to Spanish SMEs, focus their investments on digital innovations in order to increase stakeholder satisfaction, as it has been shown that greater stakeholder satisfaction will lead to improved business results. The findings of this study have significant implications for organizational managers, as they illustrate how the relationships between the model variables exert different impacts. Consequently, managers must devise strategies to encourage innovation and investment in digitization to improve the satisfaction of their stakeholders both inside and outside organizations, specifically customers and employees. Promoting innovation and digitalization of processes is essential not only because it contributes to improving satisfaction, but also because it allows companies to remain viable in a globalized and fiercely competitive economy, since it contributes to improving their business results.

It should be pointed out that the main limitation of the research is that this study is based on a survey carried out in a specific year (2022) and although the results are very current, they could vary if the survey were carried out at a different point in time. Another limitation is that performance is measured on the basis of perceptions and not numerically, so that carrying out this study on the basis of real economic figures could lead to variations in the results. And from this limitation, a new future line of research is proposed. Finally, it is possible that we have not considered all of the publications related to the research topic. However, the collected studies clearly address the situation of digitalization, satisfaction, and performance.

Furthermore, it is proposed to analyse the relationship between employee satisfaction and customer satisfaction in order to find out how employee satisfaction affects employee satisfaction in the improvement of processes and products to improve customer satisfaction. And to analyse how employee satisfaction affects not only business performance, but also the efficiency and effectiveness of production processes.

Authors' contributions Conceptualization: [AR-M; NR-V; AF-P; GC-R]; Methodology: [NR-V; GC-R]; Formal analysis and investigation: [NR-V; AR-M]; Writing—original draft preparation: [NR-V; AR-M]; Writing—review and editing: [AF-P]; Funding acquisition: [AF-P]; Supervision: [AF-P].

Funding Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature. This work is financed by the IB20183 project, co-financed by the Regional Ministry of Economy, Science and Digital Agenda of the Regional Government of Extremadura and by the European Regional Development Fund (FEDER) of Extremadura at 80%, by means of UEx Call: Rectoral Resolution No. 1082 dated 30 September 2021, and UEx Award Resolution: Act No. 131 dated 26 October 2021.

Declarations

Conflict of interest None.

References

Berkers HA, Rispens S, Le Blanc PM (2022) The role of robotization in work design: a comparative case study among logistic warehouses. Int J Human Resour Manag 102:1–24. https://doi.org/10.1080/09585192.2022.2043925

Blichfeldt H, Faullant R (2021) Performance effects of digital technology adoption and product & service innovation–a process-industry perspective. Technovation 105:102275

Brill TM, Munoz L, Miller RJ (2019) Siri, Alexa, and other digital assistants: a study of customer satisfaction with artificial intelligence applications. J Mark Manag 35(15–16):1401–1436

Castellacci F, Viñas-Bardolet C (2019) Internet use and job satisfaction. Comput Hum Behav 90:141–152. https://doi.org/10.1016/j.chb.2018.09.001

Cenamor J, Parida V, Wincent J (2019) How entrepreneurial SMEs compete through digital platforms: the roles of digital platform capability, network capability and ambidexterity. J Bus Res 100:196–206

Chin W (1998) Issues and opinion on structural equation modeling. MIS Quart 22(1):7–16

Cranmer EE, Papalexi M, Tom Dieck MC, Bamford D (2022) Internet of things: aspiration, implementation and contribution. J Bus Res 139:69–80. https://doi.org/10.1016/j.jbusres.2021.09.025

Dipietro RB, Moreo A, Cain L (2020) Well-being, affective commitment and job satisfaction: influences on turnover intentions in casual dining employees. J Hosp Market Manag 29(2):139–163. https://doi.org/10.1080/19368623.2019.1605956

Durende A, García D, Marín S, Meroño A, Somohano FM (2022) Informe PYME 2022 La digitalización y el desarrollo sostenible en la PYME–España

FAEDPYME (2022). Listado de Investigadores. Avaible on: http://faedpyme.upct.es/listado_investigadores

Falk RF, Miller NB (1992) A primer for soft modeling. University of Akron Press, Akron, OH

Farivar F, Richardson J (2021) Workplace digitalisation and work-nonwork satisfaction: the role of spillover social media. Behav Inform Technol 40(8):747–758

Fordellone M, Vichi M (2020) Finding groups in structural equation modeling through the partial least squares' algorithm. Comput Stat Data Anal 147:106957

Garín-Muñoz T, Perez-Amaral T, Lopez R (2020) Consumer engagement in e-tourism: micro-panel data models for the case of Spain. Tour Econ 26(6):853–872

Grecco ABB, Velázquez DRT, Mastrapa LH (2021) Managerial styles and their relationship with job satisfaction in information technology companies. Ind J Manag Prod 12(4):1123–1138

Grissom JA, Nicholson-Crotty J, Keiser L (2012) Does my boss's gender matter? Explaining job satisfaction and employee turnover in the public sector. J Publ Adm Res Theory 22(4):649–673. https://doi.org/10.1093/jopart/mus004

Guinan PJ, Parise S, Langowitz N (2019) Creating an innovative digital project team: levers to enable digital transformation. Bus Horiz 62(6):717–727

Haddara M, Constantini A (2020) Fused or unfused? The parable of ERP II. Int J Inf Syst Proj Manag 8(3):48–64

Hair J, Sarstedt M, Hopkins L, Kuppelwieser V (2014) Partial least squares structural equation modeling (PLS-SEM) an emerging tool in business research. Europ Bus Rev 26(2):106–121

Hair JF Jr, Howard MC, Nitzl C (2020) Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. J Bus Res 109:101–110

Hair J, Hult G, Ringle C, Sarstedt M, Castillo-Apraiz J, Cepeda-Carrión G, Roldán JL (2019) Manual de partial least squares structural equation modeling (pls-sem). Omnia Science Scholar. SAGE publishing. E spaña. 2nd Edition.

Hanelt A, Bohnsack R, Marz D, Antunes Marante C (2021) A systematic review of the literature on digital transformation: insights and implications for strategy and organizational change. J Manag Stud 58(5):1159–1197. https://doi.org/10.1111/joms.12639

Henfridsson O, Bygstad B (2013) The generative mechanisms of digital infrastructure evolution. MIS Quart 13:907–931

Henseler J, Hubona G, Ray P (2016a) Using PLS path modeling in new technology research: updated guidelines. Ind Manag Data Syst 116(1):2–20

Henseler J, Ringle C, Sarstedt M (2016b) Testing measurement invariance of composites using partial least squares. Int Mark Rev 33(3):405–431

Hinings B, Gegenhuber T, Greenwood R (2018) Digital innovation and transformation: an institutional perspective. Inf Organ 28(1):52–61

Hu L, Bentler P (1998) Fit indices in covariance structure modeling: sensitivity to underparameterized model misspecification. Psychol Methods 3(4):424

Ilies R, Fulmer IS, Spitzmuller M, Johnson MD (2009) Personality and citizenship behavior: the mediating role of job satisfaction. J Appl Psychol 94(4):945. https://doi.org/10.1037/a0013329

Jing W (2022) Construction of an E-commerce system based on 5G and internet of things technology. Int J Information Syst Supply Chain Manag 15(2):1–19. https://doi.org/10.4018/ijisscm.287630

Kanda W, Geissdoerfer M, Hjelm O (2021) From circular business models to circular business ecosystems. Bus Strateg Environ 30(6):2814–2829

Kohtamäki M, Rabetino R, Parida V, Sjödin D, Henneberg S (2022) Managing digital servitization toward smart solutions: framing the connections between technologies, business models, and ecosystems. Ind Mark Manag 105:253–267

Kotler P, Kartajaya H, Setiawan I (2017) Marketing 40: moving from traditional to digital. Wiley, New Jersey, p 101

Li L, Su F, Zhang W, Mao JY (2018) Digital transformation by SME entrepreneurs: a capability perspective. Inf Syst J 28(6):1129–1157

Li J, Qiu JJ, Zhou Y, Wen S, Dou KQ, Li Q (2020) Study on the reference architecture and assessment framework of industrial internet platform. IEEE Access 8:164950–164971

Liu DY, Chen SW, Chou TC (2011) Resource fit in digital transformation–lessons learned from the CBC bank global e-banking project. Manag Decis 49(10):1728–1742

Marín-García J, Alfalla-Luque R (2019) Protocol: how to deal with partial least squares (PLS) research in operations management. A guide for sending papers to academic journals. WPOM-Work Papers Operat Manag 10(1):29–69

Martínez MAD, Salinas RVR, Santiago ADS, Barrios CM, Cruz RZ (2020) Industria 4.0 y la digitalización hacia la satisfacción laboral de las organizaciones en Tampico, Tamaulipas, México. Revista De Métodos Cuantitativos Para La Economía y La Empresa 30:43–57

Minh Duc P (2022) Customer satisfaction in digital banking sector in vietnam: a meta-case approach. Telos Revista De Estudios Interdisciplinarios En Ciencias Sociales 24(3):819–836. https://doi.org/10.36390/telos243.22

Montealegre R, Iyengar K (2021) Managing digital business platforms: a continued exercise in balancing renewal and refinement. Bus Horiz 64(1):51–59

Moore JF (1993) Predators and prey: a new ecology of competition. Havard Business Rev 71(3):75–83

Nachira F, Dini P, Nicolai A (2007) A network of digital business ecosystems for Europe: roots, processes and perspectives. European Commission Information Society and Media, In Digital Business Ecosystem

Nemteanu MS, Dabija DC (2021) The influence of internal marketing and job satisfaction on task performance and counterproductive work behavior in an emerging market during the COVID-19 pandemic. Int J Environ Res Public Health 18(7):3670

Nitzl C, Roldan JL, Cepeda G (2016) Mediation analysis in partial least squares path modeling: helping researchers discuss more sophisticated models. Ind Manag Data Syst 116(9):1849–1864

Nunnally J, Bernstein I (1994) Psychometric theory. McGraw-Hill, New York

Oliver RL (1993) Cognitive, affective, and attribute bases of the satisfaction response. J Cons Res 20(3):418–430

Parise S, Guinan PJ, Kafka R (2016) Solving the crisis of immediacy: how digital technology can transform the customer experience. Bus Horiz 59(4):411–420

Robina-Ramírez R, Fernández-Portillo A, Díaz-Casero JC (2019) Green start-ups' attitudes towards nature when complying with the corporate law. Complexity 21:2019
Rodríguez MÁS, Higuera JB, Higuera JRB, Montalvo JAS, Crespo RG (2021) A systematic approach to analysis for assessing the security level of cyber-physical systems in the electricity sector. Microprocess Microsyst 87:104352. https://doi.org/10.1016/j.micpro.2021.104352
Saarikko T, Westergren UH, Blomquist T (2020) Digital transformation: five recommendations for the digitally conscious firm. Bus Horiz 63(6):825–839. https://doi.org/10.1016/j.bushor.2020.07.005
Sarstedt M, Ringle CM, Cheah JH, Ting H, Moisescu OI, Radomir L (2020) Structural model robustness checks in PLS-SEM. Tour Econ 26(4):531–554
Sedera D, Lokuge S, Grover V, Sarker S, Sarker S (2016) Innovating with enterprise systems and digital platforms: a contingent resource-based theory view. Information Manag 53(3):366–379
Senyo PK, Liu K, Effah J (2019) Digital business ecosystem: literature review and a framework for future research. Int J Inf Manag 47:52–64. https://doi.org/10.1016/j.ijinfomgt.2019.01.002
Shmueli G, Ray S, Estrada JM, Chatla S (2016) The elephant in the room: predictive performance of PLS models. J Bus Res 69(10):4552–4564
Sun X, Zhang Q (2021) Building digital incentives for digital customer orientation in platform ecosystems. J Bus Res 137:555–566
Torre C, Tommasetti A, Maione G (2021) Technology usage, intellectual capital, firm performance and employee satisfaction: the accountants' idea. TQM J 33(3):545–567. https://doi.org/10.1108/tqm-04-2020-0070
Verhoef PC, Broekhuizen T, Bart Y, Bhattacharya A, Dong JQ, Fabian N, Haenlein M (2021) Digital transformation: a multidisciplinary reflection and research agenda. J Bus Res 122:889–901
Wang B, Liu Y, Parker SK (2020) How does the use of information communication technology affect individuals? a work design perspective. Acad Manag Ann 14(2):695–725
Warner KS, Wäger M (2019) Building dynamic capabilities for digital transformation: an ongoing process of strategic renewal. Long Range Plan 52(3):326–349
Winkelhaus S, Grosse EH, Glock CH (2022) Job satisfaction: an explorative study on work characteristics changes of employees in Intralogistics 4.0. J Bus Logist 43(3):343–367
Wu X, Liang L, Chen S (2022) How big data alters value creation: through the lens of big data competency. Manag Decis 60(3):707–734. https://doi.org/10.1108/md-09-2021-1199
Xie X, Han Y, Anderson A, Ribeiro-Navarrete S (2022) Digital platforms and SMEs' business model innovation: Exploring the mediating mechanisms of capability reconfiguration. Int J Inf Manage 65:102513. https://doi.org/10.1016/j.ijinfomgt.2022.102513
Yuana R, Prasetio EA, Syarief R, Arkeman Y, Suroso AI (2021) System dynamic and simulation of business model innovation in digital companies: an open innovation approach. J Open Innov Tech Market Compl 7(4):219
Yunis M, Tarhini A, Kassar A (2018) The role of ICT and innovation in enhancing organizational performance: the catalysing effect of corporate entrepreneurship. J Bus Res 88:344–356
Zhu Y, Smith SA (2019) Information and communication technology support for contextualization, polychronic values, and job satisfaction: evidence from virtual teams. Int J Bus Commun. https://doi.org/10.1177/232948841983207
Zott C, Amit R, Massa L (2011) The business model: recent developments and future research. J Manag 37(4):1019–1042
Zygiaris S (2022) The impact of innovation systems on E-commerce capacity. J Knowl Econ 13(1):276–289