**ORIGINAL ARTICLE**

# The contribution of organizational culture, structure, and leadership factors in the digital transformation of SMEs: a mixed-methods approach

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## Abstract

Contributing to the scarce literature on how companies can deal with their business model of digital transition, this work explores the digital transformation (DT) process in small and medium enterprises (SME), investigating how organizational culture, structure, and leadership influence it. While such three factors are deemed essential components to facilitate DT, how they operate and how they relate to each other are still not very well-defined issues in need of in-depth investigation. This study employed a mixed-methods approach, following an exploratory sequential design. First, a conceptual model was developed based on qualitative data collected from expert interviews and analyzed through grounded theory. This stage uncovered 25 first-order concepts about culture, structure, and leadership, further organized into 6 constructs and hypothesis paths. Then, with a sample of 192 SMEs, the structural model was measured and validated using exploratory factor analysis and PLS-SEM. As a result, our study offers robust and timely research, whose conceptual model condenses a knowledge corpus that future research can benefit from, and it provides statistical extrapolations about how and how much those factors relate to each other in SME context; moreover, given the traditional scarce resources and lack of flexibility in SMEs, it provides orientation and guidelines to managers facing DT and needing to understand the organizational factors they should be aware of, where to focus energy, and what to expect as results. From a large-scale perspective, this study carries an impactful contribution to the many countries where SMEs play a major economic and social role.

## 1 Introduction

The current competitive environment is characterized by a number of major and intertwined phenomena that contribute to reshaping its strategic and organizational landscape.

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These phenomena include (1) the rise of digital competitors that renew industries (e.g., Spotify, UBER, Airbnb); (2) increasingly informed and demanding consumers (Fernández-Rovira et al. 2021; Shakina et al. 2021; Warner and Wäger 2019); (3) the constant emergence of disruptive digital technologies (e.g., Internet of Things, artificial intelligence, big data, blockchain) that, among other things, create new business opportunities (Müller et al. 2018), enable the more accurate insights and information of the needs and requests of consumers (Rialti et al. 2019), and encourages the creation of flexible and interconnected firm systems (Magni et al. 2021); and (4) a global crisis caused by the coronavirus outbreak (COVID-19) which accelerated the conditions of development and adoption of technologies and capabilities (Fregnan et al. 2022). The result is a scenario that challenges companies' business models and pushes them to remain successful (or to survive) through ways to deliver their products and services digitally (Seetharaman 2020;

Scuotto et al. 2022). In these conditions, one of the most prominent issues involves understanding digital transformation (DT), which can be defined as a change in how a firm employs digital technologies to develop a digital business model that helps create and appropriate more value (Verhoef et al. 2021). Rather than being merely about technology, DT is an effort of strategic renewal and holistic change that takes advantage of digital technologies to generate greater value for customers by creating or updating business models, processes, structures, and cultural approaches (Gong and Ribiere 2020; Chanias et al. 2019; Vial 2019; Warner and Wäger2019).

Research on DT is multidisciplinary and still developing, with growing interest from researchers (Vaska et al. 2021; Verhoef et al. 2021). However, with little conceptual or empirical research examining how organizations are digitally transformed, scientific literature seems to lag behind the practical world (Fernández-Rovira et al. 2021; Warner and Wager 2019; Li 2018). In such a context, Vial (2019) pointed out that firms' ability to design mechanisms that enable repeatable and continuous adaptation is a significant question, and some researchers endeavored to comprehend DT through the lens of dynamic capabilities theory (e.g., Warner and Wäger 2019; Matarazzo et al. 2021; Soluk and Kammerlander 2021). In this inspiring venue, understanding the organizational antecedents par rapport with the adaptability of companies represents a significant theme for contributions (e.g., Dhir et al. 2016), with particular attention to the understanding and further theorizing about organizational factors such as culture and structure and individual factors such as leadership (Schilke et al. 2018; Verhoef et al. 2021), how they interact with each other and their interrelationship with digital technologies.

Organizational culture contemplates values, beliefs, principles, and the way people work (Chanias et al. 2019; Warner and Wäger 2019), and, in line with Peter Drucker, according to whom 'culture eats strategy for breakfast,' it can determine a company's fate on the DT journey. For instance, it can affect employee commitment to change (Holbeche 2018), can enable crucial dynamic capabilities to deal with DT (Warner and Wäger 2019), and represents a key driver of organizational change (Hogan and Coote 2014) as, according to Hock et al. (2015), it relates to firms' ability to innovate their business models. Nevertheless, although DT represents mostly a cultural change that has to happen within the company (Mergel et al. 2019), cultural factors such as values, beliefs, principles, and mentalities have been associated with few practical and scientific exploitations concerning business performance and innovative results (Holbeche 2018) or organizational capabilities in dynamic conditions (Narayanan et al. 2009). Similarly, the organizational structure also represents an essential role in comprehending firm success in uncertain, complex, and dynamic environments

(Seetharaman 2020). For example, cross-functional collaboration has been indicated as a critical element of agility and ambidexterity, both crucial to advance in the DT, as agile structures are arguably more capable of detecting business opportunities and threats early and implementing changes since their flexible structures can be quickly modified (Chan et al. 2019; Holbeche 2018; Teece et al. 2016). However, research on organizational structures that allow firms to execute DT requires further investigation (Verhoef et al. 2021). Concerning the role of leadership, it is deemed that DT requires superior change management capabilities (Sousa and Rocha 2019) and, according to Elbanna and Newman (2022), the positive role of top management support has become a mantra in information systems (IS) research. For instance, He et al. (2022) highlight the role of leadership that drives digitalization in empowering capable individuals and providing systematic support against crises. Also, AlNuaimi et al. (2022) confirmed that digital transformational leadership significantly influences DT. However, following Elbanna and Newman (2022), there is also a negative side of top management support in IS implementation that has been largely unrecognized by previous research. Hence, their role in stimulating a digital culture and how they support the organization in DT are still open questions (Singh et al. 2019; Uhl-Bien and Arena 2018; Vial 2019). Furthermore, we know that culture, leadership, and organizational change have significant positive associations with organizational performance (Dalvi et al. 2013), so how they operate and relate to each other (or not relate) is also an attractive gap inside the DT discussion (Vaska et al. 2021; Priyono et al. 2020). While some capabilities grew in importance during the pandemic suggesting a new work culture (Fregnan et al. 2022), according to Vaska et al. (2021), the culture shift in companies that transitioned to digital requires more research. Also, Ko et al. (2021) conclude that decision-makers are the drivers of DT in organizations, and for Vial (2019), leaders can ensure that companies develop digital orientation and the necessary agility to respond to digital technology's context. However, to what extent leadership influences those and other matters (Singh et al. 2019), and the importance of the company's mission of mobilizing people to develop DT (Porfírio et al. 2021) are still open for examination.

Those concerns can be particularly challenging for small and medium-sized organizations (SMEs) (Verhoef et al. 2021; Müller et al. 2018). According to Scuotto et al. (2021), to evolve, SMEs must have their business model digitalized; however, reality confronts them with several difficulties. For example, they often lack leadership guidance and prioritization, bringing uncertainty about DT's potential gains and implications (PWC 2018; Mittal et al. 2018; Gruber 2019; Rafael et al. 2020). They also tend to have limited investment capacity and lack adequate resources, digital awareness, experience, competencies, and confidence to handle

data management and security (Giotopoulos et al. 2017; Gruber 2019; Rafael et al. 2020), along with resistance to change (Soluk and Kammerlander 2021). SMEs are frequently hindered by rigid organizational structures and cultures that do not experiment with cutting-edge technologies and lack networking opportunities (Matarazzo et al. 2021; Rafael et al. 2020; Machado et al. 2019). Also, Cazeri et al. (2021) indicate that, while world-class companies will continue their projects and organizational changes, the COVID-19 crisis significantly impacts most companies' transition (mainly SMEs). So, identifying elements and factors that may help SMEs succeed in DT represents an open field to practical implications and more in-depth research (Scuotto et al. 2021; Soluk and Kammerlander 2021; Priyono et al. 2020; Bouwman et al. 2019; North et al. 2019).

Its main objectives are to identify the cultural, structural, and leadership factors influencing DT and depict how they relate to it and each other. The research combines qualitative and quantitative research. First, a conceptual model of six constructs and hypotheses paths was developed based on data collected from thirteen expert interviews and analyzed using the grounded theory method. Then, in the quantitative part, an instrument for measuring the model was developed and validated with a sample of 192 organizations. Its reliability and validity were tested using Exploratory Factors Analysis (EFA), and the model paths were examined using Partial Least Squares Structural Equation Model (PLS-SEM).

Therefore, this study provides a necessary socio-technical perspective of different DT factors linked to the organizational behavior and information technology fields. Its main contribution is the proposal and test of a conceptual model composed of six different cultural, organizational, and leadership factors in the DT context: (1) promoting an innovation culture, (2) cultivating a digital and entrepreneurial awareness, (3) nurturing an experimental environment, (4) encouraging an agile structure, (5) setting a cultural alignment, and (6) leading the transformation. Such a model advances knowledge on the interface between technology, work, and people in SMEs, inspiring theoretical advances in how organizations deal with the DT. Moreover, this study contributes to the literature on companies transitioning to digitalized business models (Matarazzo et al. 2021; Seetharaman 2020), helping to structure the foundation for further exploration—a need highlighted by Kadir and Broberg (2020). For instance, it demonstrates how and how much organizations can ensure the development of necessary cognitive aspects (such as tolerance to failures, trust, the propensity to take risks, and openness to change—Roblek et al. 2021) to respond to modern digital technology's context through the understanding of the constructs digital and entrepreneurial awareness and nurturing an experimental environment. In the same way, it explains the impact of agile structures in

supporting the creation of an innovation culture to advance DT and confirms a dual (negative and positive) influence on leaders' behavior in such a context (Weber et al. 2022). Furthermore, this study elaborates how those factors relate to dynamic capabilities (Teece 2007), helping SMEs to set the ability to design and maintain high-order mechanisms that enable repeatable, continuous adaptation in a dynamic environment as the DTs—answering a question pointed out by Vial (2019). Also, from a more practical point of view, such contributions can be associated with a potential economic contribution (Keen and Williams 2013) as SMEs constitute an essential part of the economy in many countries (Gruber 2019) and, following OECD (2017), are lagging behind in the digital transition. Following the introduction, the article has five sections: a theoretical background (addressing DT and aspects related to culture, organizational structure, and leadership), method, results, and discussion and conclusion.

## 2 Theoretical background

### 2.1 Digital transformation

In recent years, academia and practitioners have shown an increasing interest in DT (Vaska et al. 2021), a field that is still structuring its best definition. Recent studies have made efforts to address it (Gong and Ribiere 2020; Vial 2019; Warner and Wäger 2019), and, in this study, we follow Verhoef et al. (2021, p.1): DT is the way in which "*a firm employs digital technologies to develop a new digital business model that helps to create and appropriate more value for the firm*". This definition allows us to comprehend the phenomenon in a holistic instance and removes the confusion in the literature about the terms digital transformation, digitization, and digitalization (Mergel et al. 2019). Those three concepts (often used interchangeably by management scholars) can be understood as phases (Soluk and Kammerlander 2021; Verhoef et al. 2021) or domains (Saarikko et al. 2020) characterized by specific kinds of technology use and have their own layers of complexity amid their implications for value creation, technology management, business strategy, and organizational culture (Saarikko et al. 2020). To Verhoef et al. (2021), digitization describes the action of converting analog information into digital information; and digitalization describes how IT or digital technologies can be used to alter existing business processes.

Mergel et al. (2019) stated that DT might be accused of being "old wine in new bottles" with topics such as ERP (Enterprise Resource Planning) implementation. About it, it is essential to direct our attention to two points. The first is that DT' frequently involve advanced digital technologies like the Internet of Things, big data, cloud

solutions, blockchain, and artificial intelligence, among others (Fernández-Rovira et al. 2021; Hinings et al. 2018; Shakina et al. 2021). The second point concerns the term transformation itself: as Gong and Ribiere (2020, p.9) pointed out, while all transformation is a change, not all change is a transformation. Research on DT has so far shown that it requires not just technological implementation but a redefinition of crucial business model elements (Caputo et al. 2021). So, to increase customer satisfaction, expand customer base, and improve value delivery (Li 2018; Mergel et al. 2019; Warner and Wäger 2019), the central structure of the value proposition must be reassessed, encompassing value creation and appropriation, value network articulation, orchestration, and governance (Latilla et al. 2020). DT may also involve the development of new organizational forms (Hinings et al. 2018), team decentralization, and space for new places, new relationships, and new knowledge to deal with and support new digital processes (Heinze et al. 2018). In other words, DT comprises an overall evolving process that requires adopting and using new technologies in a strategic change perspective (Warner and Wäger 2019).

We perceive some interesting streams among the works trying to comprehend DT in SMEs. In particular, research efforts have been made toward comprehending the necessary capabilities for DT through the dynamic capabilities lens (Teece 2007). For instance, Matarazzo et al. (2021), a multi-case study with six SMEs operating in the Made in Italy context, examines the impact of DT on customer value creation. Although the authors could not provide static generalizations, they indicate that learning is crucial for SMEs, and it requires effective capabilities to integrate technology, business, and learning strategies. Besides, Soluk and Kammerlander (2021) explored fifteen SMEs and proposed three stages to understanding the DT journey—process digitalization, product and service digitalization, and business model digitalization. Again, the authors could not provide statistical generalizability but pointed out the dynamic capabilities needed for each stage. Supported by the micro-foundations lens, Scuotto et al. (2021) and Scuotto et al. (2022) explore different SMEs' capabilities to deal with DT. The former highlights SMEs' need for internal digital capabilities to respond rapidly to market changes and how individual digital capabilities play a crucial role in growth and innovation. The latter explores SMEs' technology absorptive capacity (TAC) and the relevant role of Chief Information Officers (CIOs). Furthermore, recent research explored the capabilities that grew in importance during the COVID pandemic (Roblek et al. 2021).

In another stream, authors highlight the possibility of analyzing DT through a maturity perspective as it softens the magical and instant idea that the word transformation carries. As Remane et al. (2017) indicated the maturity

perspective removes the linear perception of the transformation. Organizations mature in different ways, at different rates, and in different directions, depending on several organizational characteristics (company size, business model, and industry sector). Also, it presumes that a stage of maximum perfection is rarely reached as technology continuously evolves (Mettler and Pinto 2018), so it is better to understand DT continuously varying according to the work environment and time. Finally, digital maturity considers the company as a whole and requires synchronizing talent, organizational structure, and culture with the digital environments around them to take advantage of opportunities made possible by technological infrastructure (Kane 2019; Kane et al. 2018).

Moreover, the digital maturity perspective represents a significant source of inspiration for DT analysis due to its model propositions, and, regarding the scientific corpus with a focus on SMEs, we can highlight some digital maturity models (e.g., Axmann and Harmoko 2020; Chonsawat and Sopadang 2020; Colli et al. 2019; Heinze et al. 2018; Pirola et al. 2019; Rafael et al. 2020; Ramantoko et al. 2018). By exploring such models, it is possible to perceive the main variables that characterize what a digital maturity SME company looks like. For instance, it is possible to perceive the importance given to competencies, activities, and resources, such as the adoption of information systems and forward-looking digital technology (Axmann and Harmoko 2020), data integration capability (Pirola et al. 2019), product and service digitalization (Axmann and Harmoko 2020; Chonsawat and Sopadang 2020), innovation management (Rafael et al. 2020), financial resources (Chonsawat and Sopadang 2020), and digital competence and experience (mainly by Pirola et al. 2019). However, although some models highlight aspects such as customer experience (Heinze et al. 2018; Ramantoko et al. 2018) and leadership competencies and attitudes (Chonsawat and Sopadang 2020), little attention has been given to variables associated with organizational structure, culture, and leadership, which we explored further in the sequence.

## 2.2 Organizational culture, structure, and leadership

Considering that the dynamics of the DT process are based on an organization's ability to establish appropriate routines to operate digitally, it strongly relates to organizational culture (Martínez-Caro et al. 2020). As organizational culture contemplates collective values, beliefs, principles, mentalities, how people work, historical values, and technological and governance structure (Chanias et al. 2019; Warner and Wäger 2019), such aspects can mainly affect the process of DT. For example, following Hock et al. (2015) firms' capability to innovate

the business model depends on the workforce's collective organizational values. Also, in this vein, according to Holbeche (2018), leading organizations recognize culture as a critical enabler of innovation because it tends to create the conditions to have the 'right' people who 'fit' the company and ensure that people with the right skills can thrive within the culture—creating commitment to change. Reinforcing such an argument, Verdu-Jover et al. (2018) indicate that organizations that have internalized the need for a reflective cognitive level (the capacity to reconsider internal values according to new demands) tend to be more comfortable in achieving changes. Finally, organizational culture enables crucial dynamic capabilities to deal with the DT process (following Warner and Wäger 2019), being a critical driver of organizational change (Hogan and Coote 2014). In a general sense, thus, organizations should support values and political guidelines such as experiment orientation, customer-centered thinking, and cultivating an open and creative mind (Chanias et al. 2019).

Concerning such cultural factors, a particular mentality (sometimes referred to as 'digital awareness') can be perceived in digitalized organizations (Colli et al. 2019; Imgrund et al. 2018). It tends to encompass a particular attitude toward new technologies, general trust in technology (Kampker et al. 2018), and a continuous focus on digital prioritization, assuming digital technologies as the primary source of development and improvements (Crittenden et al. 2019). Besides, this distinct mentality tends to contribute to DT success as it favors the process of rethinking a competitive advantage (Verdu-Jover et al. 2018), the development of detection routines for new technologies (Warner and Wäger 2019), and supports companies to remain competitive in the face of digital disruptions (Crittenden et al. 2019).

Moreover, Mergel et al. (2019) suggest the cultural importance of supporting a change-oriented disposition towards the DT process. Such a disposition, present in some digital maturity models (e.g., Imgrund et al. 2018), is a characteristic feature of entrepreneurial spirit and engagement among employees (Tekic and Koroteev 2019), which, according to Heinze et al. (2018), is essential to a digital organization's continued success, as it provides the energy necessary for constant evolution. It seems crucial to promote and nurture it at the employee and management levels, as it supports organizations' capacity to transform in rapidly changing environments and ports the comprehension that the DT makes sense for the organization (Colli et al. 2019; Kampker et al. 2018; Schumacher et al. 2019).

In the sequence, the organizational structure concerns how activities are orchestrated to achieve the company's objectives, and they represent a fundamental issue to be considered in the DT (Eggers and Park 2018; Latilla et al. 2020; Warner and Wäger 2019). According to Mergel et al. (2019), organizational changes resulting from the DT are considered the most critical overall result of the process, and there are still open questions about which organizational structures allow companies to better execute DT strategies (Verhoef et al. 2021). So far, hierarchical organizational schemes with multiple layers of management and a robust top-down approach, very particular in SMEs (Matarazzo et al. 2021), tend not to be the most effective for rapidly changing digital environments, as the bureaucracy involved in such schemes reduces response speed and innovation (Verhoef et al. 2021). According to Matarazzo et al. (2021), developing cross-functional teams and flexible organizations represents a fundamental instrument for integrating and coordinating digital knowledge throughout an SME organization. Besides, structural flexibility helps anchor the importance of change (Verdu-Jover et al. 2018), and several aspects must be taken into account, such as, e.g., internal collaboration and cooperation, the capacity to operate in agile and flexible organizational forms (Stich et al. 2018).

Specifically, agility and collaboration allow organizations to successfully navigate the uncertainty and unpredictability of environments dominated by digital disruptions (Troise et al. 2022; Roblek et al. 2021; Chan et al. 2019) and respond quickly to multiple heterogeneous and external environmental changes (Shams et al. 2020). Agility can be defined as "the ability of an organization to efficiently and effectively redistribute/redirect its resources to create value and protect (and capture) higher-performing activities as justified by internal and external circumstances" (Teece et al. 2016, p. 17). In SMEs, agility is an emergent topic of organizational structures linked to understanding how to respond to changing environments by mitigating organizational rigidity and developing innovative capability (Chan et al. 2019).

For Tronvoll et al. (2020), the absence of rigidity in procedures is an essential component of organizational agility and facilitates DT. Although how this relationship takes place is still not very well defined, agile organizations tend to perform better in explorative activities to detect and exploit market opportunities, promoting the recombination and development of new products, services, and business models that increase value for the client (Karimi and Walter 2015). Also, agile organizations recognize each employee's importance and autonomy and exalt collaborative and decentralized work. However, for this to happen it is necessary to make work arrangements more flexible to create a change-oriented environment (Schumacher et al. 2019) and value different ways of working (Kampker et al. 2018). Finally, from a maturity perspective, according to Kane (2019), digitally mature organizations are less hierarchical, increasingly organized around multifunctional teams, and drive decision-making to the company's lowest levels, where they can be done quickly and in a more informed way.

Finally, leadership is strategic to advance in DT (Chanias et al. 2019; Yeow et al. 2018). The literature on the role of

leadership in DT is still nascent (Porfírio et al., 2021), with a little exploration of how it stimulates a digital culture and supports the organization in DT (Singh et al. 2019; Uhl-Bien and Arena 2018; Vial 2019). However, recent research indicates that digital transformational leadership significantly influences DT (AlNuaimi et al. 2022).

The leadership role in DT may be associated with the function of recognizing the importance of executing DT and providing commitment and support to employees (Arkhipova and Vaia 2019; Imgrund et al. 2018; Porfírio et al. 2021). Following Ko et al. (2021), management commitment positively affects strategic goals as strong management commitment creates a coherent environment of ambitions and directions. For Hinings et al. (2018), top management supports new digital values and shifts the organizational belief system towards organizational change, fostering employee understanding of the digital strategy. In this vein, digitally mature organizations presumably have competent and digital-oriented leadership (Chirumalla 2021; Warner and Wäger 2019) that nourish the objective importance and is supportive and committed to employees' needs (Pirola et al. 2019; Stoianova et al. 2020) and, among other things, be able to deal with resistance to change and manage the tensions generated by change. Also, it is associated with the development and support of a mentality towards being capable of responding to the disruptions related to using digital technologies (Porfírio et al. 2021; Sousa and Rocha 2019) and a fundamental role in triggering disruptive technology absorptive capacity within SMEs (Scuotto et al. 2022). Regarding it, Korherr et al. (2022) identified six factors that play a critical role in fostering analytics and establishing analytics-based decision-making, such as management behavior, top management and strategy, analytics infrastructure, organization and governance, HR management and development, and culture.

However, although leadership has been connected with positive functions by the research mentioned earlier, recent results highlight a possible negative impact of top management. Elbanna and Newman (2022) bring to attention the possibility of top management overconfidence and excessive backing and support of systems implementation. Also, Weber et al. (2022, p 233) suggest that digital transformation-oriented behavior, characterized by a continuously "emphasizing the digital vision, showing the need for change, and staying abreast of new digital technologies, may intimidate employees who already have high levels of uncertainty due to an organization's DT". Hence, agreeing with Elbanna and Newman (2022), there is an interesting dialectic relationship between top management support's positive and negative sides, whose efforts, for instance, can create ambivalent change responses (Weber et al. 2022), promoting intimidation and increasing resistance to change instead of reducing it and fostering involvement.

# 3 Methods

This study employed mixed-methods research whose *developmental* purpose (following Venkatesh et al. 2016) was to explore the prevalence of cultural, organizational, and leadership factors in the DT process by developing and testing a conceptual model. Several researchers indicate the advantages of the simultaneous application of qualitative and quantitative research, as it could offer more accurate information, support interpretations, and indicate the direction of potential causalities (Mayring 2001). This study was undertaken using a sequential mixed methods design, specifically a *sequential exploratory research design*. It is characterized by an initial phase of qualitative data collection and analysis followed by a phase of quantitative data collection and analysis (Creswell and Plano Clark 2018). We choose this approach because it allows the discovery and testing of variables and dimensions that are unknown or still not established in theory and the possibility of generalizing the qualitative results of a small sample (Creswell et al. 2003; Morse 1991; Creswell and Plano Clark 2018).

Details will follow in explaining each phase, but it is necessary to indicate beforehand some characteristics related to the mixed-methods research design (Fig. 1). The sampling design strategy is a multi-level type, which involves using two sets of samples obtained from different levels of the study (Collins et al. 2007). Regarding the data collection strategy, according to Venkatesh, Brown, and Sullivan (2016), we used two techniques: a qualitative approach established on interviews with specialists; and a quantitative approach with data collected through a web-based instrument applied via an online survey. Concerning data analysis, we used a sequential qualitative–quantitative strategy, where qualitative data analysis is followed by quantitative data analysis. Thus, we used inductive theoretical reasoning in the first phase, defining emergent patterns from interview data (validated through design and analytical validity), and, after, we performed a data transformation practice, converting those concepts into numerical codes that could be examined quantitatively and described statistically (Teddlie and Tashakkori 2009). To avoid problems linked to multicollinearity, we ensured a sufficient sample size for accurate estimation and used available statistical tests such as variance inflation factors (VIF). Moreover, to provide rigor for quantitative procedures, we evaluated data using reliability and validity tests (e.g., internal validity, construct validity).

## 3.1 Qualitative phase

In the qualitative phase, we conducted exploratory qualitative research collecting data from interviews with field experts. First, we created a semi-structured script of
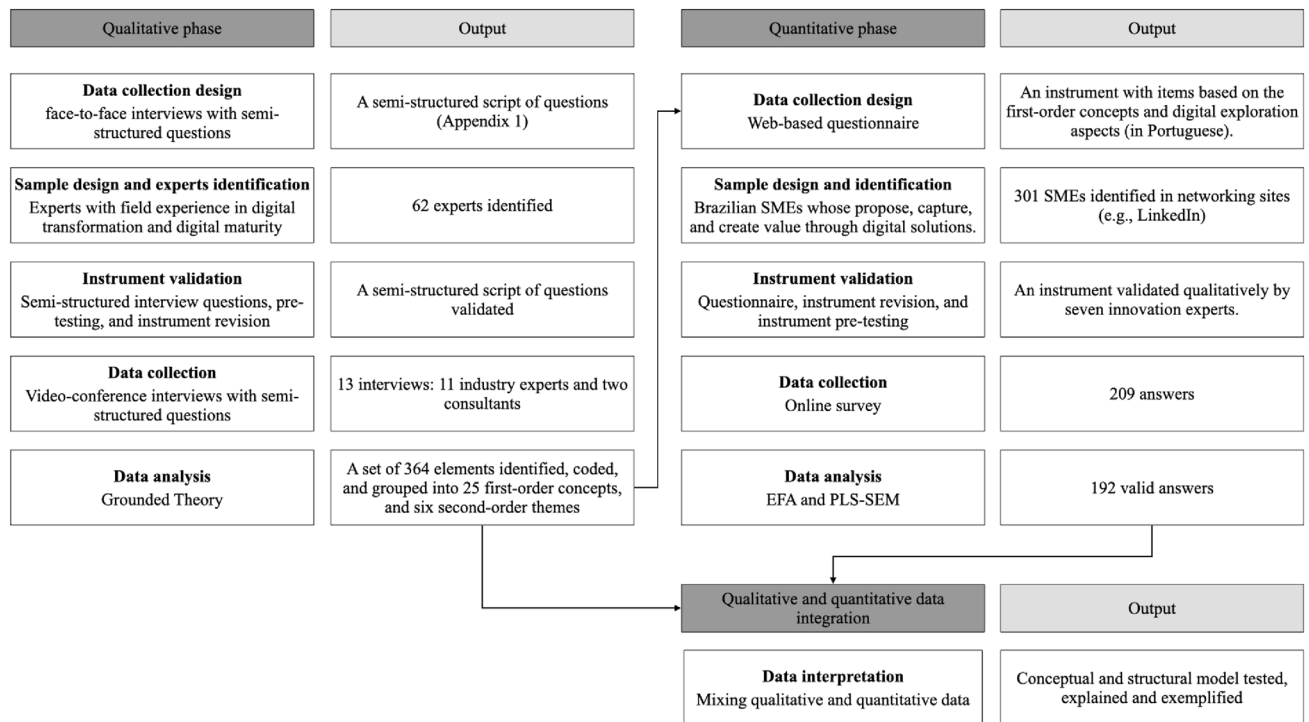
| Qualitative phase | Output | Quantitative phase | Output |
|---|---|---|---|
| **Data collection design**<br>face-to-face interviews with semi-structured questions | A semi-structured script of questions (Appendix 1) | **Data collection design**<br>Web-based questionnaire | An instrument with items based on the first-order concepts and digital exploration aspects (in Portuguese). |
| **Sample design and experts identification**<br>Experts with field experience in digital transformation and digital maturity | 62 experts identified | **Sample design and identification**<br>Brazilian SMEs whose propose, capture, and create value through digital solutions. | 301 SMEs identified in networking sites (e.g., LinkedIn) |
| **Instrument validation**<br>Semi-structured interview questions, pre-testing, and instrument revision | A semi-structured script of questions validated | **Instrument validation**<br>Questionnaire, instrument revision, and instrument pre-testing | An instrument validated qualitatively by seven innovation experts. |
| **Data collection**<br>Video-conference interviews with semi-structured questions | 13 interviews: 11 industry experts and two consultants | **Data collection**<br>Online survey | 209 answers |
| **Data analysis**<br>Grounded Theory | A set of 364 elements identified, coded, and grouped into 25 first-order concepts, and six second-order themes | **Data analysis**<br>EFA and PLS-SEM | 192 valid answers |

| Qualitative and quantitative data integration | Output |
|---|---|
| **Data interpretation**<br>Mixing qualitative and quantitative data | Conceptual and structural model tested, explained and exemplified |

**Fig. 1** Mixed method flow

**Table 1** DT strategic imperatives

| Area\phase | Digitization | Digitalization | Digital transformation |
|---|---|---|---|
| Digital resources | Digital assets | +Digital agility, Digital networking capability | +Big data analytics capability |
| Organizational structure | Standard top-down hierarchy | Separate, agile units | Separate units with flexible organizational forms, internalization of IT and analytical functional areas |
| Metrics | Traditional KPIs: Cost-to-serve, ROI, ROA | Traditional and Digital KPIs: User experience, Unique customers/users, active customers/users | Digital KPIs: Digital share, magnitude and momentum, co-creator sentiment |

Source: Verhoef et al. (2021)

questions (Appendix 1) and analytically validated it. After, we composed the sample, ensuring its design validity by providing accurate pieces of descriptive information (following Maxwell 1992) and ensuring credibility through a diverse sample selected with the following criteria. We screened experts who work on SMEs (up to 250 employees—European Commission 2003) digitally transformed, founded before 2010 (to ensure a background of organizations with experience and maturity enough to provide valuable inputs) and present certain digital maturity. To be aligned with our DTs' definition, we checked this latter point through a questionnaire based on the five strategic imperatives areas according to three phases of DT in Verhoef et al.'s (2021) model (Table 1). We interviewed eleven industry specialists

(Table 2) from Brazilian companies that represent the DT context, which present, at least, digitalization level in 'Organizational Structure' and have components at the DT level in Digital Resources and Metrics.

Four experts work on traditional real estate companies that digitalized their business models (RealB, RealE, RealG, and RealI). The real estate market is an attractive DT scenario because of the emergence of digital intermediaries (Gong and Ribiere 2020), whose exclusively digital activity has made renting and selling processes less bureaucratic and forced incumbents to react. Three other experts work in system development companies (SysC, SysJ, and SysK), a peculiar sector for DT due to its numerous changing organizations (Brown and Eisenhardt 1997) and because it

**Table 2** Interviewee's characteristics

| Expert | Position | Company size | Company foundation | Company area | Company capital | Professional education and resume |
|--------|----------|--------------|--------------------|--------------|-----------------|-----------------------------------|
| PubA | CEO/founder | 7 | 2008 | Publishing company | Between R$500,000 and R$1,000,000 | Journalist, MBA in management, and member of TEDx organization |
| RealB | CEO/founder | 10 | 2002 | Real Estate | Between R$100,000 and R$500,000 | Manager with 15 years of relevant professional experience in the field |
| SysC | CEO/founder | 13 | 2008 | Systems development | Up to R$ 100.000 | Computer scientist, Data Privacy Solutions Engineer, investor |
| RecD | CEO/founder | 16 | 2010 | Recruitment and selection | Between R$100,000 and R$500,000 | Civil engineer, MBA in economics and management, 13 years of relevant professional experience in the field |
| RealE | CEO/founder | 20 | 2003 | Real Estate | Above R$ 1,000,000 | Manager with 11 years of relevant professional experience in the field |
| EntF | CEO/founder | 35 | 2009 | Entertainment | Between R$100,000 and R$500,000 | Bachelor in advertising with a specialization in cultural marketing, 13 years of relevant professional experience in the field |
| RealG | CEO/founder | 40 | 2002 | Real Estate | Up to R$ 100.000 | Bachelor of Laws, entrepreneur, 19 years of relevant professional experience in the field |
| LingH | CEO/founder | 42 | 2003 | Linguistic consultancy | Up to R$ 100.000 | MsC, MBA, Bachelor of Arts, 19 years of relevant professional experience in the field |
| RealI | Commercial director | 60 | 1981 | Real Estate | Above R$ 1,000,000 | Manager with 11 years of relevant professional experience in the field |
| SysJ | CEO/founder | 100 | 1981 | Systems development | Above R$ 1,000,000 | Business Administration and Management, MsC |
| SysK | CEO/founder | 120 | 1997 | Systems development | Between R$500,000 and R$1,000,000 | MsC, Bachelor of Accountancy, 29 years of relevant professional experience in information technology |
| ConsL | NA | NA | 2014 | Service provider consultant | NA | MsC, 6 years of relevant professional experience in the field |
| ConsM | NA | NA | 2013 | Service provider consultant | NA | MsC, 7 years of relevant professional experience in the field |

Source: elaborated by the authors

is where agile methodologies were first introduced. About the other experts, two works in companies were winners of the National Innovation Award in Brazil in 2019: LingH in the linguistic consultancy and PubA in the publishing house. Given the DT initiated before the 2020 pandemic, both organizations maintained their staff and acted remotely, delivering their service digitally. Furthermore, one works in a recruitment firm (RecD), and the last one works in an entertainment company (EntF) with international performance that organizes itself internally to carry out the

events and recreate experiences in digital formats—a sector where resides a critical change because no one can attend to physical events during the COVID outbreak. In addition, we interviewed two innovation and service provider specialists in the DT context with field experience in SMEs—a significant role whose capabilities are crucial to helping organizations deliver digital value propositions (Mazumder and Garg 2021). Consultant ConsL has worked with small companies in Italy for more than six years, and consultant ConsM has a distinct role in the small real estate sector with more than seven years of experience in the systems development market.

Using video-conference meetings, we collected data through thirteen interviews that lasted one hour and twenty minutes (average). All the interviews followed the same script, and to ensure data reliability and credibility (Judd et al. 1991), questions were asked in the prescribed order. The interviews were recorded, transcribed, and validated by the respondents to avoid errors and misunderstandings (Gibbert et al. 2016), and after we analyzed the data corpus with the grounded theory method (Gioia et al. 2012). This examination method relies heavily on constant comparison of data collection and its analysis, allowing inductive theory development by coding, categorizing, and connecting data. In such a process, researchers looked for similarities and differences between the interview data and literature on organizational structure, culture, and leadership in the DT context (Timonen et al. 2018). This constant comparison included two processes: *open coding* and *axial coding*. In the former, data content was fragmented into key concepts or small sentences (*elements*); then, in the latter, they were grouped inductively based on their associations. This process permitted the creation of the initial concepts (*first-order concepts*) of the emerging conceptual model, and procedures were carried out by the three researchers independently, who routinely came together to compare their results. The main discrepancies were discussed to reach a consensual understanding and obtain reliability between coders (enhancing the theoretical validity and reliability). Through numerous iterations in fine-tuning the analytical structure and revisiting the data to seek confirmation and validation, the first-order concepts were further compared with each other to find out about any existing associations. Finally, they were arranged on *second-order themes* that compose the conceptual model, where interactional hypotheses paths were proposed based on the literature and interview data's content.

## 3.2 Quantitative phase

In the quantitative phase, we tested the structure of the conceptual model developed. Therefore, we assumed the second-order themes to be the model constructs and developed a questionnaire drawing on the insights generated from the qualitative phase. The questionnaire items were defined based on the qualitative first-order concepts to verify the respondent's level of agreement with affirmative sentences about the existence of each concept in the organization through a ten-point Likert scale (one equals "strongly disagree" and ten equals "strongly agree"). We chose this type of scale following the recommendation of Wittink and Bayer (2003): it offers a higher degree of the measurement precision of variance, can improve measurement reliability, and provides a better opportunity to detect changes. The questionnaire was developed to be completed anonymously by C-level positions and managers with sufficient knowledge of the firm's DT efforts. Following Solarino and Aguinis (2020), such elite informants retain the understanding of decision-making processes and organizational narratives, and it offers a chance to explore the micro-foundations of companies' strategies (Foss and Pedersen 2016).

To test the structure of the developed conceptual model, we organized a sample of mature digital organizations. We screened organizations that propose, capture, and create value through digital solutions due to their digital maturity, size, and declared service/product offer. We first searched online career networking sites (e.g., LinkedIn) for SMEs that offer their products or services through a digital solution or describe their activities considering the use of digital technology (a procedure carried out before and validated in recent studies such as Gong and Ribiere 2020; and Haarhaus and Liening 2020). We confirmed information on companies' websites and contacted managers to check their willingness to answer the questionnaire. To guarantee a sample adherent to the digital maturity research scope, we added a section in the questionnaire with four items that seek to ascertain some of the characteristics of strategic imperatives in the organization based on the Verhoef et al.'s (2021) model (Table 1). The indicators of digital resources, organizational structure, metrics, and goals were organized in multiple-choice questions, and the respondent should inform if they were present in the organization. Hence, to ensure that we objectively consider only organizations with a particular digital maturity level, the organizations should indicate mature strategic imperatives in digital resources and digital management (through metrics and goals), presenting at least a *digital transformation* level in one of them. After that, we also verified the respondent's perception of the DT performance by adding two ten-point Likert scale items. The first concerns (1) the perception of the extent the *firm employs digital technologies to develop a new digital business model that helps create and appropriate more value for the firm;* and the second (2) the perception of the organization's position compared to competitors. Data collection was done through a web-based questionnaire. We asked the sample previously set to answer the survey using several media (in particular email and direct message LinkedIn).

Following Couper (2017), the online channel is appropriate for collecting survey data.

The instrument's psychometric properties were assessed using a variety of techniques. Because scales were developed for this study, we applied robust procedures for instrument validation to avoid major concerns regarding the derived measurement model. First, a pre-study was conducted to evaluate the face and content validity. Researchers reviewed items several times, and a group of five academic specialists (PhD students linked to a university research group of technology and innovation) and two industry specialists (RealG and SysJ) tested the items' content regarding the context of the study and wording (literary editing and fluency of terms and words), the structure, and the scale (Rudner 2005). The scale validity was assessed using exploratory factor analysis (EFA). As almost everything measured in the social sciences is correlated to some degree (Meehl 1990), we performed the procedures most aligned and consistent with social science concerning factors extraction and rotation (Fabrigar and Wegener 2012, Kahn 2006, and Worthington and Whittaker 2006). We used Principal Axis Factoring (PAF) to perform factors extraction and chose oblique rotation to be applied to allow factor intercorrelations, performing Promax.

To ensure EFA was capable of factoring, we performed Kaiser–Meyer–Olkin (KMO)—considering excellent the values greater than 0.8 and 0.9 (Field 2005), Bartlett's tests of sphericity between items ($p < 0.05$), and verification of the diagonal in the anti-image matrix. As the proposed conceptual model is reflective (following Hair et al. 2017; Obonyo et al. 2017 Sarstedt et al. 2014), it was evaluated and validated by considering the internal consistency (composite reliability), factor reliability, convergent and discriminant validity (Hair et al. 2014). Composite reliability (CR) was analyzed based on the suggested level of 0.7 (Fornell and Larcker 1981), and items loadings were checked based on the cut-off value of 0.5 (Hair et al. 2009; Comrey and Lee 1992; Tabachnick and Fidell 2007) with no significant cross-loadings (Maskey et al. 2018). The reliability was assessed by Cronbach's alpha, considering 0.7 as acceptable (Hair et al. 2014, Park et al. 2014), the convergent validity was estimated by examining the average variance extracted (AVE), considering a cut-off value of 0.5 (Hair et al. 2019), and, finally, the discriminant validity was assessed through Heterotrait–Monotrait ratio (HTMT), considering the conservative cut-off value of 0.85 (Hair et al. 2019). As mentioned before, multicollinearity among the latent variables was checked by calculating the Variance Inflation Factors (VIF), considering the threshold value of 5.0. We also examined the outer loadings of the indicators—which should exceed 0.708 for satisfactory convergent validity (Henseler et al. 2009), but, in exploratory cases, this cut-off can be 0.6 (Garson 2016; Cordiglia and Van Belle 2017; Lazar et al. 2017).

Finally, to test the structural model and its hypotheses, we conducted a partial least squares structural equation modeling (PLS-SEM), an approach that employs ordinary least squares commonly utilized in information systems research (Hair et al. 2017). We choose PLS-SEM because it provides a proper statistical approach for testing hypotheses in a generalizable way for explorative research (Hair et al. 2017; Lowry and Gaskin 2014). Hence, the model's predictive power was assessed by the amount of variance attributed to the latent variables (i.e., R2), in which Hair et al. (2019) points out that the effect size for R2 of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, while Wetzels et al. (2009) suggest that in IT-related research the effect size for R2 of 0.36, 0.25, and 0.1 are considered large, medium, and small. The levels of significance were estimated using a bootstrap technique (5000 samples), following Hair (2014). For a significant relationship, we considered $t$ values should be at least 1.96 (Revythi and Tselios 2019). All data processes were conducted and analyzed using Statistical Package for Social Science software (SPSS) version 18 and Smart PLS software.

## 4 Results

The results are divided into two distinct parts: the development of the conceptual model and hypotheses paths, followed by the test of the structural model of the quantitative phase.

### 4.1 Development of conceptual model and hypotheses

Data content obtained from the thirteen interviews and analyzed with grounded theory generated 364 elements, coded and grouped into 25 first-order concepts and six second-order themes (Fig. 2 and Table 5). Below, we analyze the six second-order cultural, organizational, and leadership themes and propose hypotheses paths.

#### 4.1.1 Promoting an innovation culture (INN)

This theme with five first-order concepts points out how to conceive and maintain an organizational structure that generates business model innovations and grows digitally. We know from Verhoef et al. (2021) that, in fast-changing digital environments, it is required to cut aspects that decrease response speed and innovativeness. Agreeing with the authors, experts RealB, SysC, and SysK, reinforce that highly hierarchical structures and relations do not favor innovation or transformation; however, they are still a challenge to be modified because of their top-to-bottom nature. So, an innovation culture may impact the
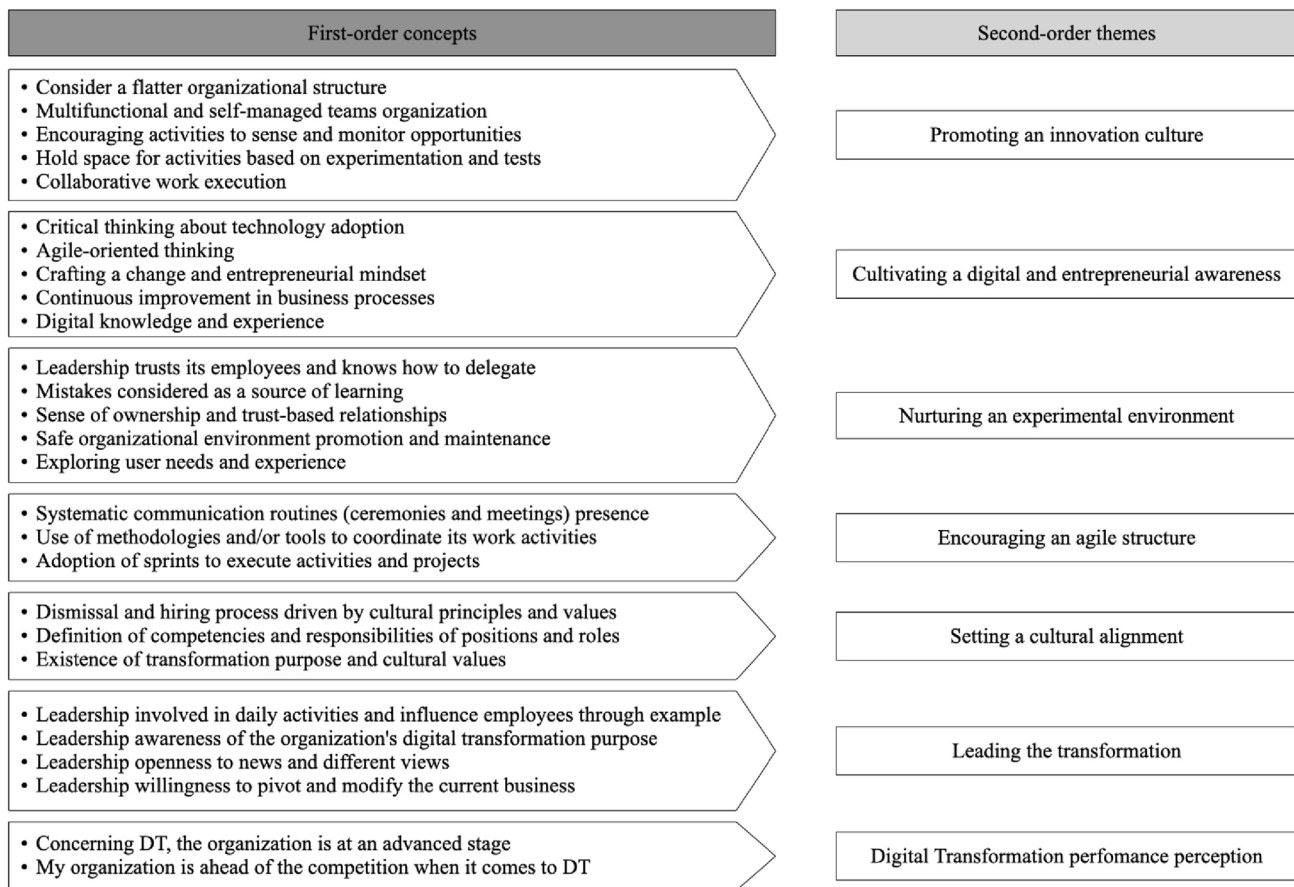
| First-order concepts | Second-order themes |
|---|---|
| • Consider a flatter organizational structure<br>• Multifunctional and self-managed teams organization<br>• Encouraging activities to sense and monitor opportunities<br>• Hold space for activities based on experimentation and tests<br>• Collaborative work execution | Promoting an innovation culture |
| • Critical thinking about technology adoption<br>• Agile-oriented thinking<br>• Crafting a change and entrepreneurial mindset<br>• Continuous improvement in business processes<br>• Digital knowledge and experience | Cultivating a digital and entrepreneurial awareness |
| • Leadership trusts its employees and knows how to delegate<br>• Mistakes considered as a source of learning<br>• Sense of ownership and trust-based relationships<br>• Safe organizational environment promotion and maintenance<br>• Exploring user needs and experience | Nurturing an experimental environment |
| • Systematic communication routines (ceremonies and meetings) presence<br>• Use of methodologies and/or tools to coordinate its work activities<br>• Adoption of sprints to execute activities and projects | Encouraging an agile structure |
| • Dismissal and hiring process driven by cultural principles and values<br>• Definition of competencies and responsibilities of positions and roles<br>• Existence of transformation purpose and cultural values | Setting a cultural alignment |
| • Leadership involved in daily activities and influence employees through example<br>• Leadership awareness of the organization's digital transformation purpose<br>• Leadership openness to news and different views<br>• Leadership willingness to pivot and modify the current business | Leading the transformation |
| • Concerning DT, the organization is at an advanced stage<br>• My organization is ahead of the competition when it comes to DT | Digital Transformation perfomance perception |

**Fig. 2** Results of qualitative phase

structure and make the organization 'c*onsider a flatter organizational structure*'. As mentioned by the expert RealB, it is best suited to companies that search for a scalable and expansion-oriented business model, which agrees with Kane (2019). Having horizontal and boundary-less structures tends to increase the company's shared vision (expert RealE), the organization's malleability, permeability, and adaptability, the collaboration among employees, and support for co-creating transformation. In this context, we also perceive an orientation to '*multifunctional and self-managed team organization*', which favors DT (following Matarazzo et al. 2021) and, according to Fregnan et al. (2022), promotes the integration of different kinds of knowledge which help to broaden perspectives and solutions. Likewise, *promoting an innovation culture* helps 'cut bureaucracies' (expert SysC) and ensure quality and agility in decision-making (experts EntF and SysJ). Finally, improving the communication (Roblek et al. 2021) and the organizational vision for employees (experts SysC, RecD, and SysK) also helps to get processes improved, technology adopted (experts EntF and SysJ), reduces resistance to change (expert RealI), and fosters employee

training and development (expert SysC). In such a context, in RealB, an organizational form known as *holacracy* has been implemented.

Besides, internal organizational collaboration and cooperation have been highlighted and explored as essential elements of DT (Fregnan et al. 2022; Roblek et al. 2021; Vial 2019; Li et al. 2021). In this respect, all experts indicated that '*collaborative work execution'* supports DT's success. It facilitates reaching a common purpose (experts SysC, RealI, SysJ, and EntF) and represents the possibility of increasing the effectiveness of performance: 'DT demands complex and intertwined activities, in which the activity of one depends on each other's, so, without collaboration, the development of new solutions and the necessary result is not achieved' (expert EntF).

Moreover, *par rapport* the development of valuable digital deliveries, Roblek et al. (2021) indicates the importance of ensuring that the natural curiosity of employees is maintained, and, in this sense, interviewees have widely cited that an innovation culture comprises and impact the fact of '*hold space for activities based on experimentation and tests*', like supporting activities of MVPs, tests, and adjustments.

Following Fregnan et al. (2022), it is crucial to be open to the introduction of something new and to promote activities of developing new solutions and functionalities experimentally, combining data and information, and comprehend that making the customer pay for a solution 'requires a lot of trial and error and observation of other primary sources of success' (expert SysK). Finally, we highlight that an innovation culture enhances the need to keep up with and get used to new technologies, creating room to maintain a structure that '*encourages activities to sense and monitor opportunities*' in the market and the ecosystem.

Based on the arguments above and inspired by the results of Scuotto et al. (2021), where innovation thus has a positive influence on SMEs' growth, we hypothesized that *promoting an experiment-driven culture.*

**H1**  *has a positive and significant effect on DT performance perception..*

### 4.1.2 Cultivating a digital and entrepreneurial awareness (DIGE)

This theme includes five first-order concepts and is directly linked to the DT process, highlighting the importance of promoting and maintaining a digital and changing awareness culture. It represents the organization's capacity to frame how technology will impact the business: for example, which technologies would suit better the company's' needs; which parts of the company are those that must be digitalized, and which would be better not to be digitalized or, perhaps, to be outsourced in partnerships (RealG). In such a sense, organizations generate a '*critical thinking about technology adoption*' (almost all interviewees corroborate this idea, which is also praised by Roblek et al. 2021) and an orientation to a '*continuous improvement in business processes*' (specialist consM; Yeow et al. 2018). Consequently, companies reduce technology adoption based on intuition and improve the criteria for it: technologies then may only be adopted according to improvement priorities and according to the possibility of innovating in performance and processes, facilitating communication, increasing collaboration, supporting decision-making (increasing employee autonomy), and delivering more value to the client. Furthermore, this theme involves the fundamental factor of '*digital knowledge and experience*'. Following Fregnan et al. (2022), it is essential to be familiar with technology to take advantage of the opportunities they offer, as there is no transformation without people who know how to deal with technologies (experts LingH and SysK). Although *digital knowledge* can be a particular limitation in SMEs (Machado et al. 2019), according to Scuotto et al. (2021), the ability of SMEs to innovate depends on employees with appropriate digital capabilities

to maximize the use of digital technologies. The availability of highly digitally skilled employees is positively related to their ability to absorb technology (Scuotto et al. 2022), so top management must comprehend that considerable benefits can derive from qualified employees, so they must be willing to acquire new knowledge (following Roblek et al. 2021).

'*Change and entrepreneurial mindset*', as mentioned in the reviewed literature (e.g., Roblek et al. 2021), was largely supported by interviewees as essential for DT, and it comprises the following characteristics: individual openness to novelty, curiosity, flexibility, appreciation for challenges, restlessness, and nonconformity. As put by the expert SysK, digital and entrepreneurial awareness relates 'to be open and embrace changes in an absolute way because conformed people do not promote changes' (agreeing with Roblek et al. 2021). Then, a way to fine-tune an organization's mentality for change is to increase employee autonomy (experts PubA and SysK), their ability to make decisions (expert SysJ), and the ability to 'learn how to learn', which tends to enhance collaboration among people (expert SysK). Besides, a change-oriented mentality is linked to '*agile-oriented thinking*' (alluding to a cognitive alignment with the agile manifesto principles inspired by software development practices), which according to experts SysC, SysJ, SysK, and ConsM, is decisive for DT. In accordance with Crittenden et al. (2019), and Vial (2019), experts argue such a mentality facilitates DT because it tends to foster a more automated and technological mentality, conceiving innovation through a lean thinking, small, incremental, and iterative changes in short cycles, and a continual value delivery.

From those elaborations and in line with previous works, such as Scuotto et al. (2021), whose results indicate that SME innovation depends on digitally skilled employees, we formulated that *cultivating a digital and entrepreneurial awareness.*

**H2A**  *has a positive and significant effect on DT performance perception;*

**H2B**  *has a positive and significant effect on promoting an innovation culture.*

### 4.1.3 Nurturing an experimental environment (EXP)

This theme comprises five first-order concepts that symbolize values and practices that provoke an experiment-driven atmosphere, leveraging the conditions to establish transformation routines (Warner and Wäger 2019) and, consequently, progress in the DT. SMEs usually come from hierarchical structures (Matarazzo et al. 2021) in which behaviors and routines are biased by a command-and-control logic

(as evidenced by experts RealG, RealI, and ConsM), where people in management/leadership positions are convinced that they can and must control everything (experts SysK and ConsL). This dynamic perpetuates a space of risk aversion that is difficult to disrupt, making the proposition of an experiment-driven atmosphere challenging. 'One of the things that I had the most difficulty in the transformation process was to create an environment in which people could suggest changes and talk about what was not going well' (expert SysC). So, to overcome it, organizations should nurture an experimental environment, which will '*promote and maintain a safe organizational environment'* that values a '*sense of ownership and trust-based relationships'*. The expert SysJ illustrates this point with the following quote: 'in a small business, it is essential to foment the feeling of being the 'owner of the organization' because it is a driving force: it makes the employee feel that his job is more than performing tasks and solving problems'. Another consequence is a feeling of being highly involved (Fregnan et al. 2022), which (1) allows employees to add something personal to each activity, and (2) represents a mechanism for generating psychological inclination in people facing changes and ensuring commitment (Leso et al. 2021; Leso and Cortimiglia 2021).

Moreover, this theme also values that '*mistakes are considered a source of learning*' and that the '*leadership trusts employees and knows how to delegate'*. Following Roblek et al. (2021), mistakes occur in developing and implementing disruptive innovations, and intolerance of errors is the biggest obstacle to disruptive innovation. So leaders must know that 'maturing in the DT is full of mistakes,' (SysK) and must nurture autonomy and decentralized work conditions, where employees know that making errors will not penalize them, and they can take risks without fear (founders of companies RecD RealE, and RealG). Furthermore, according to Vial (2019), a common theme points to the need for firms to cultivate a willingness to take risks and according to experts RecD, LingH, and SysK, companies that do not tolerate errors tend to struggle with DT. That resonates in the results of Roblek et al. (2021, p 12) about the propensity to take risks: 'risk-taking is evident in new technology projects and companies in which the culture discourages risk-taking become moribund'. Also, it is interesting to combine the results by Weber et al. (2022) and Roblek et al. (2021), where the former emphasizes that leaders nurture cognitive trust and that the latter indicates a positive relationship between trust and security. So it is straightforward to assume that the leader has a fundamental role in helping establish an experimental environment.

Finally, '*exploring user needs and experience*', found in previous literature (e.g., Mergel et al. 2019; North et al. 2019; Saarikko et al. 2020; Warner and Wäger 2019; Roblek et al. 2021), was widely mentioned in the interviews. A shared understanding of capturing the customer's perspective implies the capacity to innovate in a digital and changing market, fitting the customer's exigencies and needs through an attitude of more curiosity and less certainty to fine-tune the value proposition (RealG; Kane 2019). 'A culture of innovation and change begins when the company recognizes the importance of listening to the customer and stops assuming what he/she wants' (expert RealG), which is in line with Roblek et al. (2021), about the awareness of empathy and listening to the customers. According to consultant ConsM, this capacity helps differentiates the DT process from an action plan. Companies, especially SMEs, normally seek a step-by-step practical course instead of profoundly creating the capacity to evaluate innovations and whether they make sense for their customers. In such a way, it may trigger a necessary awareness to sustain an experimental environment with the search for more efficient processes, more valuable deliveries, and transformation (experts RealI, SysK) along with the customer needs at the center (Fregnan et al. 2022).

Based on the aforementioned arguments, we firmly believe that such concepts aid in constructing a more collaborative and innovative place where people can become digitally aware through their daily routine and activities. Therefore, we hypothesized that *nurturing an experimental environment.*

**H3A** *has a positive and significant effect on promoting an innovation culture;*

**H3B** *has a positive and significant effect on digital and entrepreneurial awareness.*

### 4.1.4 Encouraging an agile structure (AGL)

According to Fregnan et al. (2022), a new work culture implies flexibility, where it is essential to have the agility to react quickly. In this way, three first-order concepts compose this theme, and interviewees have cited agile approaches adoption as a way to help carry out a DT process. 'It is impossible to go through a DT without organization. If this organization comes from agile methodologies, this can surely help create the conditions for it' (expert RecD). However, a crucial point is to 'understand that *agile* is an approach and not just a method' (consultant ConsL). So, as the founder of company RealG pointed out, 'it provides pillars (e.g., inspection, adaptation, and transparency) that companies have to translate to their reality'. Once it is done, the organization enables an efficient arrangement that helps manage activities (e.g., deadline specifications, responsibility, prioritization), boost projects and activities execution, and anchor the importance of change.

In this context, by encouraging an agile structure, the company will promote '*the use of methodologies and/or tools to coordinate its work activities*' and '*the adoption of sprints to execute activities and projects*'—as reported in all interviews. For instance, KANBAN was widely cited as a method for organizing activity flow management. Monitoring activities and registering all tasks being developed 'ensures that the activities will continue to occur, even if the personnel changes within a team' (expert SysK). Beyond that, interviewees claimed that KANBAN is very useful, as it enables a complete vision of the whole and what is being performed by each collaborator (bringing predictability and shared knowledge). Similarly, encouraging the existence of *sprints* to execute activities and projects has been pointed out as crucial for DT. Interviewees, however, firmly believe there is no one-fit-all solution, and companies should try to adopt the logic to their reality. The adoption of SCRUM as an approach, for instance, can vary in (1) the development cycles realization and duration, (2) the team formation and role assignment (e.g., scrum master, product owner), and (3) ceremonies carried out (daily, planning, review, and weekly meetings). Results suggest that such adaptations and variations of agile methodologies are important in developing an agile-oriented culture. Interviewees claimed that 'it takes time for everything to work, and often the company is not prepared to work with an agile team, and there may be failures in the first sprints and frustration' (expert SysK). The practical advice is that 'firms must not rush when adapting and implementing agile methodologies' (expert RealG).

'S*ystematic communication routines (ceremonies and meetings)*' is a remarkably insightful result from the interviews. A significant consequence of an agile structure is its discipline which greatly benefits the DT journey. SMEs that were successfully transformed credit much of their success to creating a daily habit toward change. In this context, SCRUM ceremonies and meetings seem crucial to that disciplinary dynamic: planning meetings allow activities backlog definition and responsibilities assignment; review meeting enables continuous learning and improvements; daily meetings provoke tasks' execution; weekly meetings indicate what will be accomplished in the week and what was performed. Also, daily meetings are considered an evangelization mechanism by the interviewees. The expert RealG organized in his company daily half-hour meetings with all employees in which, before the start, he reminded everyone of DT's importance and the reason for its need.

Based on the above results and the fact that agility is deemed to allow organizations to successfully navigate the uncertainty and unpredictability of an environment dominated by digital disruptions (Troise et al. 2022; Roblek et al. 2021; Chan et al. 2019), we consider that an agile structure might promote a fine-tuning ambiance toward experimentation, with more narrowed practices of collaboration and dissemination of organizational matters. Then, we formulated the hypotheses that *encouraging an agile structure.*

**H4A** *has a positive and significant effect on nurturing an experimental environment;*

**H4B** *has a positive and significant effect on promoting an innovation culture;*

**H4C** *has a positive and significant effect on cultivating a digital and entrepreneurial awareness.*

### 4.1.5 Setting a cultural alignment (CULT)

This theme refers to practices and behaviors that allow organizations to internalize transformation purpose and cultural values. The lack of purpose and certainty about DT's potential gains and implications is prevalent in SMEs (Gruber 2019). However, having new values and a transformation goal is decisive for maturing in the DT, according to Levy et al. (2022), Mergel et al. (2019) and experts SysC, RecD, RealE, EntF, RealG, LingH, SysJ, and ConsL. Referencing Simon Sinek, expert ConsL said that any transformation must start with the *why* and only then goes on *how* to make the changes. Setting a cultural alignment implies first the '*existence of transformation purpose and cultural values*' towards DT. DT is very complex, so a clear vision and an elaborated strategy allow the organization to move on, as it gives a north, a common language, creating a sense of unity that contributes to decision-making, trust-building, and feeling of belonging (expert LingH; Stefanova and Kabakchieva, 2019). According to previous research, companies that internalize the need for reconsidering internal values tend to be more comfortable in achieving changes (Verdu-Jover et al. 2018), and strategic goals facilitate the implementation of new ideas (Ko et al. 2021). However, to Roblek et al. (2021), it is required to ensure that the natural curiosity of employees is preserved as a component of conceiving cultural values for developing an innovative company.

Furthermore, this theme promotes necessary efforts to translate and incorporate new values and purpose into the company's daily life. For instance, the '*definition of competencies and responsibilities of positions and roles*': a mechanism for alignment and implementing changes as it impacts several organizational aspects. For example, it permits (1) balancing team formations and (2) identifying necessary skills for a given position/function. Also, it favors competence-based employee promotion (experts PubA, RealB, and SysJ) and supports the development of change-oriented training programs, which involve collaborators in a continuous process of small changes to get used to and internalize the value of change (expert LingH). Furthermore, this

practice makes it possible to manage performance based on each employee's goals and responsibilities, which has two-fold consequences. First, it fosters internalizing purpose and cultural values and guidelines since they can be deployed as responsibilities and can be monitored. Second, it increases employee and team autonomy based on an explicit declaration of responsibilities—which resonates with Fregnan et al. (2022) concerning the awareness employees must have of their roles. For instance, experts PubA and LingH use OKRs' methodology to organize collaborators' and teams' goals.

Another cultural alignment practice identified involves the '*dismissal and hiring process driven by cultural principles and values*'. Lack of cultural alignment can result in resignations, resistance, boycotts of change efforts, and, as indicated in literature (e.g., Caputo et al. 2021; Chirumalla 2021; Vial 2019), inertia and resistance are the most significant barriers to DT. So '*dismissal and hiring process driven by cultural principles and values*' seem appropriate when employees struggle to align with a new digital culture. As the founder of company RealG puts it, 'if the organization is confident in its purpose and values, has given a chance to people to adapt, but people are resisting, the best thing to do is to dismiss them'. Companies RealB and LingH are two organizations where a new purpose and cultural values were proposed, deployed in people's competencies and responsibilities, and collaborators had time to adapt to it. In the consultancy LingH, seven employees had to be fired after 9 months. After 2 years of insisting on new rules and alternative ways for people to change, expert RealB decided to change the whole team. Otherwise, the hiring process ends up being facilitated because if organizations know what skills they are looking for, it is easier to hire people who share the same values (consultant ConsL).

Given the above arguments, we hypothesized that *setting a cultural alignment* through its values and mechanisms is a central pillar in DT and

**H5A** *has a positive and significant effect on nurturing an experimental environment;*

**H5B** *has a positive and significant effect on promoting an innovation culture;*

**H5C** *has a positive and significant effect on cultivating a digital and entrepreneurial awareness;*

**H5D** *has a positive and significant effect on encouraging an agile structure.*

### 4.1.6 Leading the transformation (LEAD)

DT is a journey that begins with the purpose, but it will only happen when top managers and leaders understand why the organization has to transform (experts RealB, RealG, and RealI, Imgrund et al. 2018; Arkhipova and Vaia 2019; and Singh et al. 2019). The results obtained set how leadership can stimulate a digital culture and how it can support the organization in DT (Singh et al. 2019; Uhl-Bien and Arena 2018; Vial 2019), pointing out, first, the leader's role to guide the organization in DT and sustain the change dynamically. So, in this vein, '*leadership awareness of the organization's DT purpose*' and '*willingness to pivot and modify the current business*' whenever necessary (experts PubA and RealG) are two expected behaviors of managers leading the DT.

Leading the transformation suggests being aware of what happens in the market (agreeing with Swift and Lange 2018), seeking knowledge to understand the transformation benefits, and bringing innovation into the company via new digital technologies. Then, it is essential to have the sensitivity to make changes (expert EntF) and know why it is happening because being aware of the significance of implementing DT is the basis for elaborating the direction and values that will guide the organization—highly in consonance with previous research (e.g., Porfírio et al. 2021; Swift and Lange 2018) in respect to determining the direction of the transformation. Following Ko et al. (2021), management commitment positively affects strategic goals as it develops an environment of ambitions and directions. Therefore, it may imply being open to evolution and '*open to change',* flexible to engage different people in discussions (Singh et al. 2019), and humble to accept different views (SysK) to make innovation happen. Roblek et al. (2021) claim that openness to change is one important internal factor contributing to disruptive innovations in a changing environment (Fig. 3).

Once leaders are aware of all this, they must be deeply committed to it, as it is a necessary anchor for DT's success concerning the process's long-term nature. Among the experts, it is undeniable that leadership must strongly embrace change and sponsor it by being committed not only to the *idea of change* but also *financially*—thinking of it as a long-term investment with no immediate payoff. Besides, interviewees argued that 'understanding and internalizing DT in culture takes time and energy' (experts RealG and SysK). Then, consistent with Ko et al. (2021), it is crucial to create a change-oriented culture by inspiring employees, sustaining energy, and remaining resilient during the process. However, one must be aware of the dual influence that leadership can have (Elbanna and Newman 2022; Weber et al. 2022). Inspired by the interviews and following Singh et al. (2019), a way to fine-tune supports actions and balance
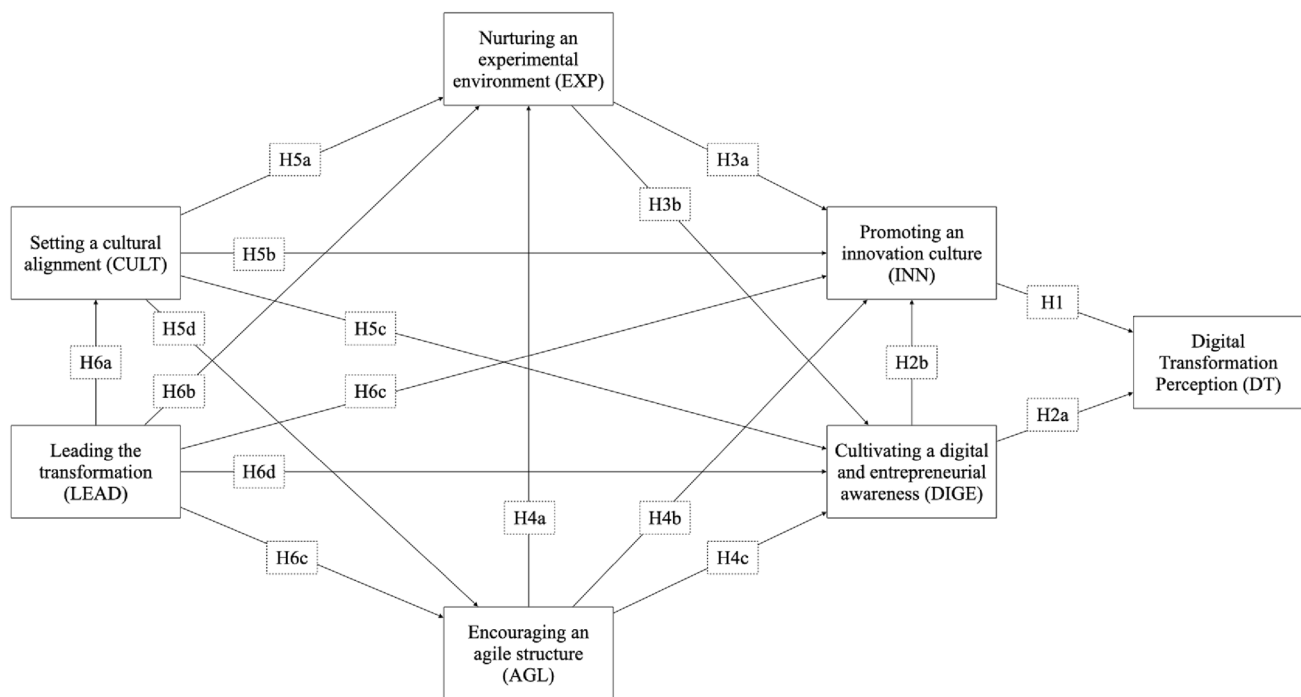
**Fig. 3** Conceptual model and hypothesis paths

the possible dialectic results can be done through the concept of '*leadership needs to be involved in daily activities and influence employees through example*'. Understanding and internalizing DT strategy in culture cannot depend only on the discourse. 'The transformation is not a cancer cell that proliferates in the company and changes the status quo' (expert RecD). The leader must 'walk the talk': disseminating it throughout the company, motivating employees, and integrating and coordinating the digital knowledge throughout the organization—which agrees with Matarazzo et al. (2021). Operational daily activities generate a force against any transformation because it consumes employee time, so the leader must be obstinate, evangelize the employees daily, and continuously communicate the reason for the transformation (experts EntF, RealG, and RealI). In Singh et al. (2019), we also note the use of webinars as an informal mechanism to inform and educate employees about current topics, while Weber et al. (2022) claim leader supports employees by supporting their skills development and providing individual feedback.

Then, based on the above assertions and inspired by previous results (e.g., Scuotto et al. (2022), whose findings support the role of CIOs in triggering disruptive technology abortive capacity within SMEs; AlNuaimi et al.'s (2022) association between digital transformational leadership and organizational agility; Ko et al. (2021) whose results point that management commitment has a positive effect on digital

innovation) we formulated the hypotheses that *leading the transformation.*

**H6A** *has a positive and significant on setting a cultural alignment;*

**H6B** *has a positive and significant on nurturing an experimental environment;*

**H6C** *has a positive and significant on promoting an innovation culture;*

**H6D** *has a positive and significant on cultivating a digital and entrepreneurial awareness;*

**H6E** *has a positive and significant on encouraging an agile structure.*

## 4.2 Measurement and structural model

To test the structural model, the instrument, based on the first-order concepts, was administrated through a web-based questionnaire sent to people in a management position of 301 Brazilian SMEs. We collected two hundred nine responses, of which 17 had to be discarded as they did not meet the digital maturity selection criteria. The final sample comprises 192 valid responses (64% of the companies contacted), and the respondents' profiles can be seen in Tables 3

**Table 3** Demographic characteristics

| Size | $n$ (192) | % | Position | $n$ (192) | % |
|---|---|---|---|---|---|
| 2 to 10 | 23 | 11.98 | General manager | 77 | 40.1 |
| 11 to 50 | 76 | 39.58 | Director | 51 | 26.15 |
| 51 to 249 | 93 | 48.44 | Manager/manager assistant | 39 | 20.31 |
| | | | Head | 25 | 13.02 |

Source: elaborated by the authors

and 4. Regarding the sample size, we took the perspective of building an adequate model, so as the maximum number of arrows pointing at a construct in the structural model is four, to detect a minimum R2 value of 0.10 in any of the constructs at a significance level of 1%, the smallest sample size required was 191 (Hair 2014). Since we obtained 192 usable responses, we met the sample size requirement.

Concerning EFA results, the KMO index test for each item was higher than 0.5 and an overall value of 0.901 for the whole questionnaire, indicating that the sample size and factorability were met for conducting EFA. Besides, Bartlett's test of sphericity was significant (approximate Chi-square = 2970.257; $p < 0.001$) and indicates an adequate amount of collinearity between items. The diagonal in the anti-image matrix was also inspected for values smaller than 0.5.

Table 5 summarizes the main results about items and constructs. Regarding item loadings and constructs, EFA pointed out that all items were over the cut-off value of 0.5 with no significant cross-loadings, except two items (*continuous improvement in business processes* and *digital knowledge and experience*) that presented loadings smaller than 0.5. However, we retained them because (1) of their theoretical importance (interviewees highlighted that only by knowing technologies is it possible to generate critical thinking about them and establish a trusting relationship with technology) and (2) the AVE for the construct was over 0.5. Regarding constructs reliability and validity, the model satisfied the criteria (Table 5). The AVE ratings are between 0.539 and 0.813, meaning that all indicators were

above the cut-off value of 0.5. All composite reliability values were also above the required cut-off value of 0.70, ranging between 0.854 and 0.911. Cronbach's alpha values for each factor were higher than 0.70, and discriminant validity values—assessed through HTMT, were all over 0.85. All VIF values are below 5.0, so multicollinearity is not an issue. Finally, outer loadings of the indicators were all above 0.708, except for the variable *considering a flatter organizational structure*, which presented 0.686—acceptable in exploratory cases.

Regarding the model's predictive power, $R^2$ values indicate that the full model explains 26% of the variance in DT performance perception, 47.8% in INN, 51.1% in DIGE, 62.0% in EXP, 33.5% in AGL, and 33.9% in CULT. Regarding Hair et al. (2019), all results (except DT) indicate moderate effect, while regarding Wetzels et al. (2009), results can be considered medium (INN, DIGE, and EXP) and large (AGL, CULT, and DT).

### 4.2.1 Hypothesis testing

Figure 4 and Table 6 show the results of the latent variable path model. Fourteen paths out of seventeen reached statistical significance. H1 is supported and proposes that INN is positively associated with DT (0.254, $p < 0.05$). Similarly, both H2a and H2b are statistically significant, supporting that DIGE positively influences DT and INN with effects of 0.321 ($p < 0.001$) and 0.188 ($p < 0.05$), respectively. Regarding nurturing an experimental environment (EXP) hypothesis, the analysis indicated that it has positive effects on INN (0.335, $p < 0.01$) and DIGE (0.357, $p < 0.001$). Also, the results confirmed that encouraging an agile structure (AGL) does have a positive effect on EXP (0.191, $p < 0.01$), INN (0.267, $p < 0.01$), and DIGE (0.196, $p < 0.01$). Although, the same is not true concerning the hypotheses about CULT. No statistical significance was observed for H5b and H5c, although CULT was positively related to EXP (0.391, $p < 0.001$) and to AGL (0.340, $p < 0.01$), supporting H5a and H5d.

Finally, the supporting role of leadership was confirmed in four out of the five hypotheses. The analysis suggested

**Table 4** Organizations industry

| Industry | $n$ (192) | % | Industry | $n$ (192) | % |
|---|---|---|---|---|---|
| IT and services | 72 | 37.50 | Farming | 7 | 3.65 |
| Financial services | 47 | 24.48 | Logistics and supply chain | 4 | 2.08 |
| Real estate | 19 | 9.90 | Staffing and recruiting | 4 | 2.08 |
| E-learning | 12 | 6.25 | Health care and wellness | 4 | 1.56 |
| Internet | 12 | 6.25 | Renewables and environment | 3 | 1.56 |
| Publishing, marketing and entertainment | 8 | 4.17 | | | |

Source: elaborated by the authors

**Table 5** Results descriptive statistics and EFA

| Construct and item | Mean | SD | Loading | Cr. Alpha | CR | AVE |
|---|---|---|---|---|---|---|
| *Promoting an innovation culture (INN)* | | | | 0.786 | 0.854 | 0.539 |
| Encouraging activities to sense and monitor opportunities | 8.4 | 1.569 | 0.627 | | | |
| Hold space for activities based on experimentation and tests | 8.72 | 1.477 | 0.537 | | | |
| Collaborative work execution | 8.86 | 1.405 | 0.608 | | | |
| Consider a flatter organizational structure | 7.92 | 1.76 | 0.559 | | | |
| Multifunctional and self-managed teams organization | 8.2 | 1.864 | 0.565 | | | |
| *Cultivating a digital and entrepreneurial awareness (DIGE)* | | | | 0.821 | 0.874 | 0.583 |
| Critical thinking about technology adoption | 8.32 | 1.698 | 0.735 | | | |
| Agile-oriented thinking | 8.39 | 1.558 | 0.631 | | | |
| Crafting a change and entrepreneurial mindset | 8.11 | 1.594 | 0.59 | | | |
| Continuous improvement in business processes | 8.57 | 1.598 | 0.469 | | | |
| Digital knowledge and experience | 8.77 | 1.405 | 0.315 | | | |
| *Nurturing an experimental environment (EXP)* | | | | 0.877 | 0.911 | 0.671 |
| Exploring user needs and experience | 8.62 | 1.557 | 0.792 | | | |
| Leadership trusts its employees and knows how to delegate | 8.64 | 1.35 | 0.684 | | | |
| Mistakes considered as a source of learning | 8.69 | 1.471 | 0.602 | | | |
| Sense of ownership and trust-based relationships | 8.78 | 1.351 | 0.611 | | | |
| Safe organizational environment promotion and maintenance | 8.93 | 1.485 | 0.56 | | | |
| *Encouraging an agile structure (AGL)* | | | | 0.789 | 0.877 | 0.704 |
| Systematic communication routines (ceremonies and meetings) presence | 8.46 | 1.746 | 0.69 | | | |
| Use of methodologies and/or tools to coordinate its work activities | 8.37 | 1.827 | 0.635 | | | |
| Adoption of sprints to execute activities and projects | 8.03 | 2.366 | 0.548 | | | |
| *Setting a cultural alignment (CULT)* | | | | 0.780 | 0.871 | 0.693 |
| Dismissal and hiring process driven by cultural principles and values | 8.64 | 1.606 | 0.772 | | | |
| Definition of competencies and responsibilities of positions and roles | 8.03 | 1.873 | 0.575 | | | |
| Existence of transformation purpose and cultural values | 8.77 | 1.596 | 0.531 | | | |
| *Leading the transformation (LEAD)* | | | | 0.856 | 0.903 | 0.700 |
| Leadership involved in daily activities and influence employees through example | 9.12 | 1.138 | 0.87 | | | |
| Leadership awareness of the organization's digital transformation purpose | 9.18 | 1.183 | 0.897 | | | |
| Leadership openness to news and different views | 8.92 | 1.404 | 0.585 | | | |
| Leadership willingness to pivot and modify the current business | 8.84 | 1.367 | 0.503 | | | |
| *Digital Transformation performance perception (DT)* | | | | 0.770 | 0.896 | 0.812 |
| Concerning DT, the organization is at an advanced stage | 8.37 | 1.49 | 0.867 | | | |
| Organization is ahead of competitors when it comes to DT | 8.14 | 1.79 | 0.737 | | | |

Mean scores are based on a ten-point Likert scale (1 = strongly disagree, 10 strongly agree)

Source: elaborated by the authors

that it has a positive effect on CULT (0.582, $p < 0.001$), EXP (0.351, $p < 0.001$), DIGE (0.152, $p < 0.05$), and AGL (0.311, $p < 0.001$), but it no statistically related to INN.

## 5 Discussion and conclusions

### 5.1 Discussion

First of all, we highlight that the development and validation of the conceptual framework were done by considering established and robust procedures. During the

qualitative phase, it comprised the selection of experts from a representative DT context—who represent companies that made efforts to transform their activities to offer services/products digitally, mainly by introducing platform-based offers (e.g., the case of the real estate companies) and new digital product and services development (e.g., the entertainment sector and recruitment). Then, data were analyzed with grounded theory to develop the conceptual themes. In the quantitative phase, we screened companies due to a digital maturity selection criteria, ensuring that, objectively, they were aligned with our definition of DT (Verhoef et al. 2021) and presented a
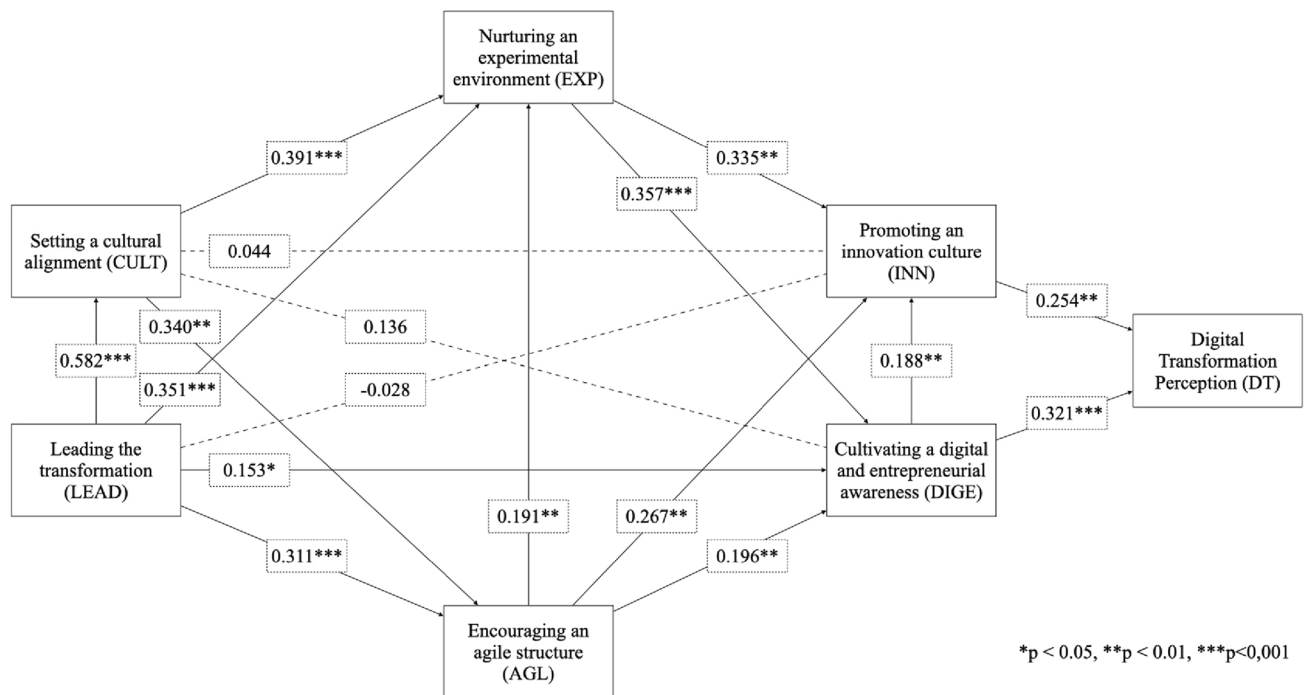
**Fig. 4** Conceptual model and hypotheses

**Table 6** Results descriptive statistics and EFA

| Hypothesis | Hypothesized path | T statistics | Effect | P values | Empirical evidence |
|---|---|---|---|---|---|
| H1 | INN-DT | 2.764 | 0.254 | 0.006** | Yes |
| H2a | DIGE-DT | 3.614 | 0.321 | 0.000*** | Yes |
| H2b | DIGE-INN | 2.282 | 0.188 | 0.023** | Yes |
| H3a | EXP-INN | 2.627 | 0.335 | 0.009** | Yes |
| H3b | EXP-DIGE | 3.485 | 0.357 | 0.000*** | Yes |
| H4a | AGL-EXP | 2.647 | 0.191 | 0.008** | Yes |
| H4b | AGL-INN | 2.919 | 0.267 | 0.004** | Yes |
| H4c | AGL-DIGE | 2.656 | 0.196 | 0.008** | Yes |
| H5a | CULT-EXP | 3.904 | 0.391 | 0.000*** | Yes |
| H5b | CULT-INN | 0.380 | 0.044 | 0.704 | No |
| H5c | CULT-DIGE | 1.492 | 0.136 | 0.136 | No |
| H5d | CULT-AGL | 3.034 | 0.340 | 0.002** | Yes |
| H6a | LEAD-CULT | 8.813 | 0.582 | 0.000*** | Yes |
| H6b | LEAD-EXP | 3.721 | 0.351 | 0.000*** | Yes |
| H6c | LEAD-INN | 0.288 | − 0.028 | 0.773 | No |
| H6d | LEAD-DIGE | 2.256 | 0.153 | 0.024* | Yes |
| H6e | LEAD-AGL | 3.465 | 0.311 | 0.001*** | Yes |

Source: elaborated by the authors (*$p < 0.05$, **$p < 0.01$, ***$p < 0,001$)

minimum level of digital maturity. Finally, we carried out robust procedures to validate the instrument and analyze the data (e.g., EFA with PAF to perform factors extraction and Promax oblique rotation; reliability and validity tests with conservative cut-off values) with a proper data sample.

This article describes DT following Verhoef et al.'s (2021) perspective (a sociocultural process that employs digital technologies to create and appropriate more value

for the firm), and it also uses the author's framework as a prerequisite to explore how organizational culture, structure, and leadership factors contribute to SME's DT process. Our results ensure that this perspective is valid and that such factors represent an intertwined and holistic way to support organizational changes, being significant and essential for DT. Statistically, model constructs help explain 26% of the variance in DT performance perception, a significant result since we address human behavior modeling (which has a high inherent variability), and it is considered a moderate result following Wetzels et al. (2009). Next, we discuss the constructs and their associations.

We first highlight the direct and positive effect of *promoting an innovation culture* (INN) and *cultivating a digital and entrepreneurial awareness* (DIGE) on explaining 26% of the variance in DT performance perception. The positive results on *promoting an innovation culture* support previous research in respect, for instance, to the fact that innovation thus has a positive influence on SMEs' growth (Scuotto et al. 2021) or that organizations that encourage innovative culture and new ways of thinking are most likely to succeed in executing DT plans and initiatives (Alshehab et al. 2022). It also stands as a powerful argument for SMEs to believe and invest more in innovation culture to scale digital business models. Following Roblek et al. (2021), approximately only 1–3% of company staff dedicates SME time to innovation, which may be due a posture to minimize risks of the numerous challenges SMEs face in DT (Verhoef et al. 2021; Müller et al. 2018; Scuotto et al. 2021). However, it also seems too risky not to adapt to the possibilities that digital brings (Carcary, Doherty, and Conway 2016), besides the fact that an innovative culture reduces the rate of cultural resistance. In this vein, it is worth diving deeper and exploring such a result concerning the five first-order concepts. In relation to the question proposed by Verhoef et al. (2021) about if digital transforming firms should adopt self-organizing teams instilled with autonomy and flexibility, our results directly contribute to it (and to the literature associated with it, e.g., according to Fregnan et al. 2022) by stressing the significance of some organizational factors for *promoting an innovation culture* as, for example, multifunctional teams arrangement with less hierarchical organizations, and activities of experimentation and sensing. Another important point is that internal organizational collaboration and cooperation between people are essential elements of DT (Fregnan et al. 2022; Roblek et al. 2021; Vial 2019). Although it can be challenging for SMEs—whose organizational structure is often not flexible enough (Rafael et al. 2020), a collaborative and innovative approach benefits transformation by establishing a change-oriented environment identified with a constant search for better customer

deliveries, less bureaucratic practices, quick decision-making, and employees more committed to deliveries. After all, it enables, for example, operations to run without depending on physical spaces.

Besides it, the results strongly supported change-oriented values and principles regarding digital and entrepreneurial awareness (DIGE). From literature, we know that a particular mentality could be perceived in digitalized organizations (Colli et al. 2019), but from interviews and the structural model, we captured how much this can be related to DT (0.321, $p < 0.001$) and an innovative structure (0.188, $p < 0.05$). Improving the understanding of what a 'digital culture looks like' (Kane et al. 2016), we echo Korherr et al. (2022) and Levy et al. (2022), arguing that a company that transforms is one that, among several things, has a culture that transited to data collection, analysis, and evidence-based decision making, despite making decisions based on intuition (about what customers want and or which technology is best)—a widespread behavior in SMEs. Besides resonating with the results of previous works as Fregnan et al. (2022) and Roblek et al. (2021), it is an organization connected to what is happening, and that cultivates critical thinking about technology, knowing how to choose and use the most appropriate technology that may improve its value proposition. In this line, according to interviewees, a way to fine-tune it is by promoting incremental change circumstances through continuous training and development, confirming that learning is crucial for DT in SMEs (Matarazzo et al. 2021). As expert SysK says, 'new technologies will be launched continuously, and one cannot stop learning nor dealing with technology'. Furthermore, the results also confirm that the ability to innovate depends on appropriate digital capabilities to maximize the use of digital technologies (Scuotto et al. 2021). The people who understand digital technologies are the ones who make the changes; therefore, there is no transformation without such knowledge and capability to deal with technologies (experts LingH and SysK). To enhance employee learning experience and performance, recent literature point to gamification (Adhiatma et al. 2021), and experts SysC, EntF, and RealI indicate that a way to increase digital experience is to invest in young and digital native professionals and mix them with people who might represent different generational and technological paradigms. Although Roblek et al. (2021) point out a potential difference among cultural values, following the interviewees, it permits merging specialized technological expertise with management experience while disseminating a digital culture and training *old* employees.

Moreover, we found exciting results regarding *nurturing an experimental environment* (EXP) and *encouraging an agile structure* (AGL). First, they are both significantly and positively related to INN and DIGE, so we can imply they indirectly support the DT journey by helping craft

and structure the organization. According to Vial (2019), a common theme across DT studies points to firms' need to cultivate a willingness to take risks and experiment. In this line, our results confirm that nurturing an experimental environment is crucial to developing a change-oriented attitude and enhancing innovations (agreeing with Alshehab et al. (2022), whose results show that a risk-taking culture also encourages new ways of thinking and solutions from diverse perspectives). From the experience of expert RealG, 'no meeting or transformation will run if people do not talk and participate. However, if they feel in a safe and trustworthy environment, they start talking and helping each other more.' Following experts LingH and RealI, celebration routines can help create such a safe space, making people feel involved (as indicated by Fregnan et al. 2022) and breaking their potential resistance.

Concerning *agile structure* (AGL), Tronvoll et al. (2020) argued that agility facilitates DT, but how this relationship takes place was not very well defined. So, a significant contribution of this study is the comprehension that agility enables companies to establish an organizational dynamic focused on discipline, a success factor in DT because it allows companies to acquire malleability, organized activities, and improve communication. Also, inspired by Verhoef et al. (2021), we know that stimulating digital agility requires flexible organization forms that allow fast responses to constant digital change. However, while it was not tested in the developed model, we can infer implications the other way around. Agility significantly increases a digital *innovation culture* (e.g., to detect and exploit market opportunities and have a flatter organizational structure with collaborative work execution), a crafted *digital and entrepreneurial awareness*, and a safe *experimental environment*. Hence, combined results may suggest that those relations can be mutually reinforcing. Another important result is that SMEs must understand that agility has a philosophical basis and that its pillars can be translated into countless realities. So, if companies manage to adapt them, the agile approach can benefit work progress and problem resolution and help anchor changes. In RealG, for example, the founder organized the SCRUM daily meeting as a half-hour encounter with all employees in which, before the start, he reminded everyone of DT's importance and the reason for it. The case of RealI is also interesting in this sense. SCRUM daily meetings were used to overcome a real estate company's usual problem in the proper use of CRM: not entering data. At the meetings, everyone had to talk about their sales funnel registered in CRM, and people who did not use the system began to feel uncomfortable as they did not have anything to manifest, and this was the ignite to use the system. So, from the structural model, SMEs that manage to reconcile agile with a horizontal and collaborative structure tends to

create greater autonomy and, consequently, greater agility in decision making and in proposing more valuable deliveries.

Hypotheses that linked *setting a cultural alignment* (CULT) to INN and DIGE were not supported. This interesting result suggests at least two important considerations with practical implications. First, *setting a cultural alignment* alone does not guarantee an *innovation culture* or *digital and entrepreneurial awareness*. From the proposed model, the construct CULT has a guiding quality that needs a structure that "embodies" its orientation—which happens through the enhancement of a *safe and experimental environment* (EXP) and a functional and rhythmic structural approach (in this case an *agile structure*—AGL). The second consideration supports the importance of contemplating the model holistically and intricately. The attempt to model cultural and organizational factors involved in DT involves a high level of complexity, and the fact that these hypotheses have not been supported extols the complex nature of mediation and indirect effects of the other constructs (e.g., EXP and AGL). This strengthens the understanding that DT takes place through a set of different factors intertwined in a complex manner. In a practical way, this is a significant result because it points out that once the company has its values and uses them to craft roles and functions, the organization can be on track to the DT process. Furthermore, the positive link between CULT and EXP confirms that cultural values that aim to develop an innovative company have to ensure that employees' natural curiosity is maintained (Roblek et al. 2021).

Finally, about the theme *leading the transformation,* our results confirm that leadership plays an essential role in DT in many ways. As Singh et al. (2019) reported, a cultural shift can be particularly challenging, and leaders need to make people be willing to take the risk and embrace digital topics and DT. In relation to it, our results point out that leadership directly affects CULT, EXP, AGL, and DIGE, and so our results confirm AlNuaimi et al. (2022), Ko et al. (2021), and Alshehab et al. (2022) concerning that leadership significant in defining strategic DT goals and influencing DT. Equally, through its capacity to propose and live the company's purpose and values (confirming Porfírio et al. 2021), its presence help to create the conditions for a safe and experimental environment and reduces resistance to change (e.g., fear of losing the job), inspires behaviors, and convince employees.

Nevertheless, it is necessary to indicate that the direct relationship with INN (H6d) was not supported, which is a counterintuitive though significant result. As aforementioned, recent literature discussed a possible dual influence leadership might hold while supporting DT. In this context, Weber et al. (2022) suggest that a digital transformation–oriented behavior may intimidate employees who already have high levels of uncertainty due to an organization's DT, which

could reflect in resistance to change. Our results confirm (and extrapolate) it. Despite the negative result between LEAD and INN, we notice that leadership plays a significant and positive role in helping promote and maintain EXP, CULT, AGL, and DIGE factors that, afterward, will help promote a culture of innovation. From that, we first suggest that it plays a role mediated to INN, which might not result in resistance to change. However, when analyzed alone, it has a negative influence on INN, and that may be due to a negative side linked to the behavior of overconfidence and excessive backing and support (Elbanna and Newman 2022) or characterized by emphasizing the digital vision, showing the need for change, and staying abreast of new digital technologies (Weber et al. (2022). In any case, we confirm Elbanna and Newman (2022) regarding a dialectic relationship between the positive and negative sides of top management support in DT. In this vein, expert Sysk has stated an interesting practical implication: "*leaders must be aware that employees are specialist workers that usually know more about their work than leadership does, so it is better not interfere*".

## 5.2 Conceptual model and dynamic capabilities

Another source of discussion relates to the potential association among the model developed *par rapport* the ability for firms to design and maintain high-order mechanisms (dynamic capabilities) that enable repeatable, continuous adaptation in a dynamic environment as the DTs—a question pointed out by Vial (2019) and in line with similar works that investigate dynamic capabilities, such as Daronco et al. (2022). So, by analyzing recent literature that explores the interface between DT and dynamic capabilities, we suggest how the factors that compose the model may serve as a basis (antecedents) for firms to design and maintain high-order mechanisms of sensing, seizing, and reconfiguring (following Teece 2007). Table 7 summarizes the potential associations among the model factors and micro-foundation of dynamic capabilities mechanisms.

According to Teece (2007), sensing refers to identifying and shaping opportunities and threats through new information about, for example, customer needs and the market. In DT, sensing capabilities may involve detecting digital evolution, users' emerging behaviors (Warner and Wäger 2019; Nylén and Holmström 2015), and competitor-based trends. In Matarazzo et al. (2021), sensing was perceived as the most important driver of SME firm's competitiveness and DT, while Soluk and Kammerlander (2021) proposed that sensing is essential for technological opportunity identification and development at the initial DT stage in SMEs. From that, we notice a great connection with the model factors in mainly two orientations. One considers digital scanning and trends monitoring efforts, which can be greatly influenced

by first-order concepts of INN (e.g., *encouraging activities to sense and monitor opportunities)*, DIGE (e.g., *critical thinking about technology adoption)*, EXP (e.g., *exploring user needs and experience)*, and LEAD (e.g., *leadership openness to news and different views)*. We claim this is an interesting point because it can orient SMES to deal with challenges and threats related to market and societal and value-chain inertia, as pointed out by Brunetti et al. (2020) and Saarikko et al. (2020). The second orientation is linked to digital scenario planning, what will be affected by CULT (e.g., the *existence of transformation purpose and cultural values)* and LEAD (e.g., *leadership awareness of the organization's digital transformation purpose)*, which may assist companies in avoiding a possible inconsistent understanding of transformation scope and substance (e.g., absence of clear vision or strategy, inaccurate outcome measurement) as suggested elsewhere (e.g., Chirumalla 2021; Saarikko et al. 2020).

Seizing refers to an organization's ability to take advantage of resources and skills to develop opportunities (Teece 2007). Regarding DT, we witness an orientation to the development of digital solutions (e.g., Warner and Wäger 2019; Cao et al. 2019), which may be enabled and strengthened by some of the model constructs. For example, we highlight the presence of INN (e.g., *hold space for activities based on experimentation and tests),* DIGE (e.g., *change and entrepreneurial mindset*, and *digital knowledge and experience)*, EXP as a whole, AGL (*use of methodologies to coordinate its work activities,* and *adoption of sprints*) and LEAD (*leadership willingness to pivot and modify the current business*).

Finally, reconfiguring is the capacity to carry out transformations, e.g., improving competitiveness through the reconfiguration of organizational assets (Teece 2007). In the DT context, management processes such as continuous redesigning and combining resources and acquiring and integrating knowledge are deemed critical. In this respect, DC micro-foundations are somehow influenced and supported by all the model factors. For instance, we indicate a significant link between redesign efforts (Warner and Wäger 2019; Soluk and Kammerlander 2021; Chirumalla 2021) and INN (via *considering a flatter organizational structure*). Also, DIGE (through *agile-oriented thinking*) and EXP (through *safe organizational environment promotion and maintenance*) help to set the company for a continuous digital improvement strategy (Chirumalla 2021). AGL's three first-order concepts enable balancing digital portfolios (Warner and Wäger 2019), while we notice a high supportive connection between CULT aligning function with improving digital maturing (Warner and Wäger 2019) and the process of hiring new human resources (Matarazzo et al. 2021) that may help to overcome potential path dependence inertia and cognitive inertia, a huge challenge indicated by literature (e.g., Margiono 2020; Caputo et al. 2021; Chirumalla 2021;

**Table 7** Relations among factors and DC mechanisms

| Factor | Sensing | Seizing | Reconfiguring |
|---|---|---|---|
| Promoting an innovative culture (INN) | Use of marketing analytics (Cao et al. 2019); Digital scouting (Warner and Wäger 2019); Trend Monitoring (Soluk and Kammerlander 2021; Matarazzo et al. 2021; Tortora et al. 2021); Internal sensing (Torres et al. 2018); | Product development management (Cao et al. 2019); Recognising, assimilating, and commercialising new information (Soluk and Kammerlander 2021); Rapid prototyping (Warner and Wäger 2019); Agile cross-functional teams (Chirumalla 2021); | Redesigning internal structures (Warner and Wäger 2019); Reorganisation of routines (Soluk and Kammerlander 2021); Integration of process and IT know-how (Chirumalla 2021); |
| Cultivating a digital and entrepreneurial awareness (DIGE) | Use of marketing analytics (Cao et al. 2019); Digital scouting (Warner and Wäger 2019); Trend Monitoring (Soluk and Kammerlander 2021; Matarazzo et al. 2021; Tortora et al. 2021); Internal sensing (Torres et al. 2018); | Product development management (Cao et al. 2019); Recognising, assimilating, and commercialising new information (Soluk and Kammerlander 2021); Rapid prototyping (Warner and Wäger 2019); Knowledge generation, Knowledge acquisition (Tortora et al. 2021); Agile cross-functional teams (Chirumalla 2021); | Continuous digital improvement strategy (Chirumalla 2021); |
| Nurturing an experimental environment (EXP) | Use of marketing analytics (Cao et al. 2019); Internal sensing (Torres et al. 2018); | Product development management (Cao et al. 2019); Recognising, assimilating, and commercialising new information (Soluk and Kammerlander 2021); Rapid prototyping (Warner and Wäger 2019); Engaging in strategic partnerships (Soluk and Kammerlander 2021); Agile cross-functional teams (Chirumalla 2021); | Continuous digital improvement strategy (Chirumalla 2021); |
| Encouraging an agile structure (AGL) | | Product development management (Cao et al. 2019); Recognising, assimilating, and commercialising new information (Soluk and Kammerlander 2021); Rapid prototyping (Warner and Wäger 2019); Agile cross-functional teams (Chirumalla 2021); | Balancing digital portfolios (Warner and Wäger 2019); Management vision and a giraffe's view (Chirumalla 2021) |
| Setting a cultural alignment (CULT) | Digital scenario planning (Warner and Wäger 2019); Support scenario-planning practices (Chirumalla 2021) | | Improving digital maturing (Warner and Wäger 2019); Quick learning by employees (Soluk and Kammerlander 2021); Process of hiring new human resources (Matarazzo et al. 2021) |
| Leading to transformation (LEAD) | Use of marketing analytics (Cao et al. 2019); Use of marketing analytics (Cao et al. 2019); Digital scouting (Warner and Wäger 2019); Trend Monitoring (Soluk and Kammerlander 2021; Matarazzo et al. 2021; Tortora et al. 2021); Internal sensing (Torres et al. 2018); Digital scenario planning (Warner and Wäger 2019); Support scenario-planning practices (Chirumalla 2021) | Product development management (Cao et al. 2019); Recognising, assimilating, and commercialising new information (Soluk and Kammerlander 2021); Rapid prototyping (Warner and Wäger 2019); Knowledge generation, Knowledge acquisition (Tortora et al. 2021); Engaging in strategic partnerships (Soluk and Kammerlander 2021); Agile cross-functional teams (Chirumalla 2021); | Continuous digital improvement strategy (Chirumalla 2021); Balancing digital portfolios (Warner and Wäger 2019); Management vision and a giraffe's view (Chirumalla 2021); Redesigning internal structures (Warner and Wäger 2019); Reorganisation of routines (Soluk and Kammerlander 2021); Integration of process and IT know-how (Chirumalla 2021); |

Source: elaborated by the authors

Saarikko et al. 2020). Finally, LEAD is arguably characterized as an antecedent of such reconfiguring mechanisms.

### 5.3 Theoretical contributions

Research on DT is growing in numbers (Vaska et al. 2021; Verhoef et al. 2021), and there is a strong call for more research on the different aspects of DT in SMEs. Our findings contribute to the scarce literature on companies transitioning to digitalized business models (Matarazzo et al. 2021; Seetharaman 2020), helping to structure the foundation for further exploration—a need highlighted by Kadir and Broberg (2020). The conceptual model developed and tested in this study represents original research, in which we adopted a mixed-method approach and carried rigorous analysis (grounded theory, EFA, and PLS-SEM) on the data collected to ensure substantial implications. Thus, we present a number of theoretical and scientific implications of this study.

The main contribution is the proposition and test of a conceptual model, including the relation between (1) promoting an innovation culture, (2) cultivating a digital and entrepreneurial awareness, (3) nurturing an experimental environment, (4) encouraging an agile structure, (5) setting a cultural alignment, and (6) leading the transformation the DT context. First, the 364 elements inductively grouped in 25 first-order concepts and six second-order themes in the qualitative phase are, per se, an intense and condensed corpus of knowledge based on literature and practical instance that future research can take into consideration. Then, by testing the model, we provide statistical extrapolation of how they relate to each other, and it represents a significant contribution because it reveals the magnitude of their effects and their significance in relation to each other. Therefore, such a result confirmed our qualitative and quantitative choices for the analysis to answer the research question, dealing with the complexity it entails and the significant data volume.

Second, it contributes to the scarce research on DT by framing and exploring a scientific demand for an in-depth discussion about cultural, organizational, and leadership factors in this context. DT is an emerging topic (Caputo et al. 2021; Vaska et al. 2021) with a great interest in capturing the capabilities and the challenges of dealing with the DT (Chirumalla 2021; Warner and Wäger 2019), but few studies have approached how such antecedents relate to each other and DT. The present research contributes to advancing discussions, for example, of Vial's (2019) DT framework about how structural changes affect how organizations change their value proposition.

Third, this study helps establish and advance knowledge of the interface between technology, work, and people in SMEs. For instance, it becomes possible to understand how and how much organizations can generate and ensure the

development of necessary cognitive aspects suggested by the literature (such as tolerance to failures, trust, the propensity to take risks, openness to change—Roblek et al. 2021), to respond to modern digital technology through the understanding of the constructs digital and entrepreneurial awareness and nurturing an experimental environment. Equally, the model contributes to understanding the impact of agile structures and the dual influence of leaders in managing and supporting the creation of an innovation culture to advance DT. Finally, this study confirms the dialectic relationship between the positive and negative sides of top management support in DT.

Four, the relations inferred with respect to DC contribute to crafting the ability to design and maintain high-order mechanisms that enable repeatable, continuous adaptation in DTs. Although we did not conduct any test in this matter, we firmly believe this is a significant theoretical contribution as it sets the link between our results with a compelling and timely theory.

### 5.4 Managerial implications

The managerial implications mainly concern how SMEs can employ their efforts to deal with DT, and this study can contribute to practice in three ways. First, using the developed model, managers can comprehend the big picture of the factors they should be aware of when deciding how to manage DT. Second, given the usual scarce resources (companies' time and effort) and lack of flexibility in SMEs, managers have the knowledge to guide their decisions about where to look first, how they should focus their energy, and what to expect as a result. Third, this study also provides information to create favorable conditions for the growth of SMEs by supporting, for instance, governmental actions. According to OECD (2017), SMEs are lagging behind in the digital transition, and, for instance, following Cazeri et al. (2021), a large number of Brazilian companies do not even know the basic definition of "Digital revolution". So those contributions can be associated with a potential economic contribution (Keen and Williams 2013), as SMEs constitute an essential part of the economy in most countries (Gruber 2019).

### 5.5 Limitations and future research

Any conclusions drawn from this study should be considered in light of limitations, which provide avenues for future research. Firstly, the present study focused on understanding DT's cultural, organizational, and leadership factors, and it was done through interviews with industry and consultant experts. Thus, it probably does not capture all the key factors that may exist, and, as a limitation, the present study could have benefited from more interviews drawn from varied industries, which would allow richer data and an opportunity

for more details for the first-order concepts and second-order themes. Future works could (1) include additional variables to test further the validity and usefulness of this research model and (2) test potential relations with DC mechanisms.

Second, we used a prerequisite to have an adherent sample on both qualitative and quantitative methods, based on Verhoef et al.'s (2021) model (Table 1). From that, we objectively consider organizations with a specific digital maturity, and we captured the performance of DT based on respondents' perception, which can be biased, although we tried to control it through rigorous analysis and such a prerequisite exam. Future works can work on better ways to understand DT performance and further modify the proposed model.

## 5.6 Conclusion

Through a six constructs model, this study explored, presented, and discussed how cultural, organizational, and leadership contribute to the DT process in SMEs. This study answered a theoretical call (Matarazzo et al. 2021; Scuotto et al. 2021; Seetharaman 2020; Soluk and Kammerlander 2021; Vaska et al. 2021) and represents a timely and robust orientation to SMEs' efforts in the DT context. Also, it helps advance the practice and theory by discussing essential aspects of the organizational behavior and information technology fields, such as the development of an innovative culture and the role of leadership in supporting DT.

## Appendix 1

1. How do you relate organizational culture and the DT process?
2. What cultural aspects are relevant to the success of the DT process?
3. What makes up an environment where change happens (change-oriented environment)?
4. Which organizational structures are most effective for the DT process?
5. Does your company employ/promote agile aspects in its organizational structure? Which are?
6. From this, how does the agile organization relate to the DT process?
7. Specifically, about the process of diluting the decision-making power in teams/collaborators, how does it relate to the DT process?
8. What can be said about the collaboration between people? How does this relate to DT? How to create a collaborative culture to foster DT?

## Declarations

**Conflict of interest** The authors declare that they have no competing interests.

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