UNIVERSIDAD DE MURCIA

ESCUELA INTERNACIONAL DE DOCTORADO

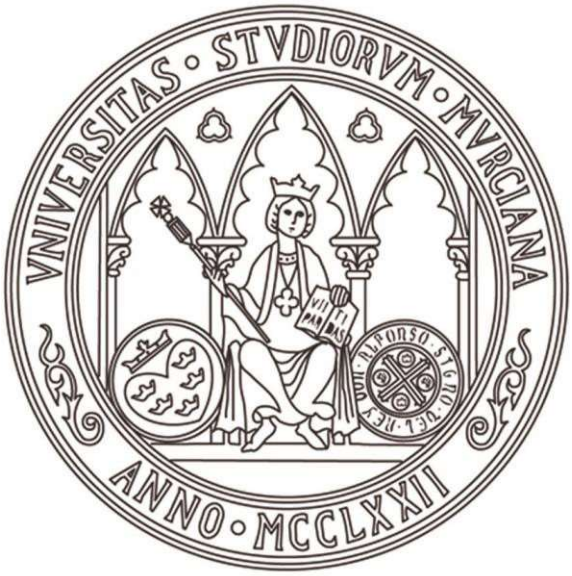
TESIS DOCTORAL

Managing dynamic capabilities and competencies for digital transformation

La gestión de capacidades dinámicas y competencias para la transformación digital

D. Álvaro Nicolás Agustín

2024



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Managing dynamic capabilities and competencies for digital transformation

La gestión de capacidades dinámicas y competencias para la transformación digital

Presentada por: **D. Álvaro Nicolás Agustín**

Dirigida por:

Dr. D. Francisco Maeso Fernández

Dr. D. Daniel Jiménez Jiménez

2024

UNIVERSIDAD DE MURCIA

DECLARACIÓN DE AUTORÍA Y ORIGINALIDAD DE LA TESIS PRESENTADA EN MODALIDAD DE COMPENDIO O ARTÍCULOS PARA OBTENER EL TÍTULO DE DOCTOR

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D./Dña. Álvaro Nicolás Agustín

doctorando del Programa de Doctorado en

Sociedad, Desarrollo y Relaciones Laborales

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A Dios, a mi familia y a mis tutores

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RESUMEN DE LA TESIS DOCTORAL

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ABSTRACT

In the so-called “era of Industry 4.0.”, digital transformation is reshaping all areas of society and, as it could not be otherwise, also that of companies. Without a doubt, it is one of the research topics that is arousing the greatest interest in the literature on business management due to the shared concern that current business models might not work in the new scenario, and it is necessary to undertake profound changes in the way business is managed by current companies. Likewise, it has become clear in both the academic and professional worlds that this organizational change would have a very direct impact on the performance of organizations.

Therefore, the main objective of this doctoral thesis is to study the management of certain dynamic capabilities of companies and the capabilities of employees that facilitate the creation of the knowledge necessary to implement digital transformation processes in the company.

Our work is based on the need that exists in a company to adapt its processes and products to the new scenario, characterized by the inclusion of greater technology, automation and innovation, and in which the common variable continues to be the creation of new organizational knowledge for value creation.

Although the importance of knowledge creation has been widely defended by previous literature during these last two decades, the demands derived from digital transformation processes are going to be even greater, introducing a greater expiry date and depth of useful knowledge and increasing the need to update essential organizational knowledge. Although ordinary capabilities will continue to be essential for the daily functioning of operations, the company will require new and different skills, processes, procedures, organizational structures, even decision rules and disciplines, that allow the detection and capture of any opportunities that arise. They emerge in new, more dynamic environments. That is, digital transformation will require new dynamic capabilities that facilitate the creation of new knowledge and behaviours in employees to transform their processes.

To respond to the stated objective, this work presents three empirical studies that analyze the impact of the said dynamic capabilities and employee behaviours on digital

transformation and its results, based on a survey carried out with 184 companies in the industrial sector located in the Region of Murcia.

The main results derived from the study reveal, first of all, the importance of certain dynamic capabilities on digital transformation: information capacity, organizational agility and absorption. These three capabilities will allow those companies that transform their businesses to be able to introduce changes in their business models and improve their results.

In addition to these dynamic capabilities, the work also delves into the need to have employees whose conduct behaviour is aligned with the objectives required by digital transformation. The second study shows that the alignment of human resources practices and staff attitudes are essential to implement the changes in production processes required by the new paradigm. These results suggest that investment in more knowledge-intensive processes requires a workforce that is more committed to change and adopts more innovative conduct.

Going deeper into this thesis, the third study empirically analyzes the impact that providing their employees with training in new information and communication technologies has for companies. In particular, it studies whether human capital and organizational commitment can mediate the relationship between training in new information and communication technologies, and digital transformation. The results not only corroborate these ideas, but also highlight the effect that this type of training has on the company's results.

The doctoral thesis culminates by showing the main contributions that complete the existing academic framework, as well as more practical implications for the business world. These encourage company leaders to implement a series of dynamic capabilities based on knowledge and to promote innovative and efficient behaviours. committed to face the changes required by digital transformation.

RESUMEN

En la llamada “era de la Industria 4.0.”, la transformación digital está cambiando todos los ámbitos de la sociedad y, como no podía ser de otra forma, también el de las empresas. Sin duda, es uno de los temas de investigación que mayor interés está despertando en la literatura sobre gestión empresarial por la preocupación compartida de que los modelos actuales de negocio no puedan funcionar en el nuevo escenario y sea necesario acometer cambios profundos en la forma de gestionar la empresa actual. Asimismo, se ha puesto de manifiesto tanto en el mundo académico como en el profesional que este cambio organizacional impactaría de una forma muy directa en el desempeño de las organizaciones.

Enfrentar estos desafíos implica que las empresas deben entender el comportamiento de varios factores internos que influyen en la capacidad de una organización para abordar la transformación digital y su impacto en el rendimiento empresarial. Un aspecto clave que subraya estas ideas es la suposición de que el conocimiento adquirido por la empresa, inmerso en estructuras y prácticas organizacionales, no permite a la empresa adaptarse a los cambios que exige la transformación digital, ya que la forma de generar valor es completamente diferente. Para adaptarse exitosamente, las empresas deben ser capaces de introducir constantemente nuevos conocimientos externos y adaptarlos a su realidad específica. Esta tarea no es sencilla sin cambiar la manera en que el personal realiza sus tareas y sin enfrentar los problemas de un entorno altamente demandante y cambiante, lo que a su vez requiere una nueva forma de gestionar los recursos humanos de la empresa.

Las proposiciones mencionadas nos ayudan a entender que, en los próximos años, debido a que la transformación digital es inminente, los recursos y capacidades actuales de las empresas pueden devaluarse. Si la presión competitiva sobre las empresas ya es alta, la amenaza (y oportunidad) de la era digital incrementará la presión para la intensificación tecnológica y la digitalización de las empresas, lo que causará mayor inestabilidad e incertidumbre en el entorno, poniendo a prueba los cimientos sobre los que se sostienen las empresas.

Por ello, el objetivo principal de esta tesis doctoral consiste *en estudiar la gestión de determinadas capacidades dinámicas de las empresas y las capacidades de los empleados que facilitan la creación del conocimiento necesario para implantar los*

procesos de transformación digital en la empresa. Nuestro trabajo parte de la necesidad que existe en la empresa por adaptar sus procesos y productos al nuevo escenario, caracterizado por la inclusión de una mayor tecnología, automatización e innovación, y en el que la variable común sigue siendo la creación de un nuevo conocimiento organizativo para la creación de valor.

Si bien la importancia de la creación del conocimiento ha sido ampliamente defendida por la literatura precedente durante estas dos últimas décadas, las exigencias derivadas de los procesos de transformación digital van a ser aún mayores, introduciendo una mayor caducidad y profundidad del conocimiento útil y aumentando la necesidad de actualizar el conocimiento organizativo esencial. Aunque las capacidades ordinarias continuarán siendo imprescindibles para el funcionamiento cotidiano de las operaciones, la empresa requerirá de nuevas y diferentes habilidades, procesos, procedimientos, estructuras organizativas, incluso de reglas de decisión y disciplinas, que permitan la detección y captura de las oportunidades que surgen en los nuevos entornos más dinámicos. Esto es, la transformación digital requerirá nuevas capacidades dinámicas que faciliten la creación de nuevos conocimientos y comportamientos en los empleados para la transformación de sus procesos.

La revisión teórica ha destacado que la empresa necesita ser capaz de actualizar sus capacidades constantemente. Por eso, se ha utilizado un enfoque de Capacidades Dinámicas como marco conceptual general. Esto no implica que cada estudio no haya sido complementado por otros enfoques teóricos más en línea con sus problemas específicos. La perspectiva de Capacidades Dinámicas asume esta necesidad de cambio y se compromete a integrar, reconfigurar, obtener y desechar recursos para ajustarse a los cambios del mercado o incluso para generarlos. En nuestro campo de estudio, esta teoría argumentaría que la adaptación digital es esencial para la supervivencia en el mercado actual. Sin embargo, esta adaptación digital requiere la generación de nuevos conocimientos y aprendizaje.

Asimismo, la revisión centrada en las Capacidades Dinámicas señala que algunas capacidades, como la capacidad de información, de absorción o la agilidad organizacional, son esenciales para que las empresas se adapten con éxito a la transformación digital. Además, la revisión muestra que las competencias de los empleados también juegan un papel importante en esta implementación. No es

sorprendente que el cambio de actividades intensivas en mano de obra hacia actividades en las que las máquinas juegan un papel mayor en el proceso de producción requiera nuevos conocimientos, actitudes y comportamientos. Obviamente, también requiere una forma diferente de gestionar estos recursos humanos.

Para dar respuesta al objetivo planteado, en este trabajo se presentan tres estudios empíricos que analizan el impacto de dichas capacidades dinámicas y comportamientos de los empleados sobre la transformación digital y sus resultados, sobre la base de una encuesta realizada a 184 empresas del sector industrial localizadas en la Región de Murcia. Los principales resultados que se derivan del estudio ponen de manifiesto, en primer lugar, la importancia sobre la transformación digital de determinadas capacidades dinámicas: capacidad de información, agilidad organizativa y absorción. Estas tres capacidades permitirán que aquellas empresas que transformen sus negocios sean capaces de introducir cambios en sus modelos de negocio y mejorar sus resultados.

Como hemos señalado, el trabajo también profundiza en la necesidad de contar con unos empleados cuyo comportamiento esté alineado con los objetivos exigidos por la transformación digital. En el segundo estudio se constata que la alineación de las prácticas de recursos humanos y comportamientos del personal son imprescindibles para implantar los cambios en los procesos productivos que exige el nuevo paradigma. Estos resultados sugieren que la inversión en procesos más intensivos en conocimiento requiere de una mano de obra más comprometida con el cambio y que adopte un comportamiento más innovador.

Profundizando en esta tesis, el tercer estudio analiza empíricamente el impacto que tiene para las empresas dotar a sus empleados de formación en nuevas tecnologías de la información y la comunicación. En particular, estudia si el capital humano y el compromiso organizacional pueden mediar en la relación entre la formación en nuevas tecnologías de la información y la comunicación y la transformación digital. Los resultados no solo corroboran estas ideas, sino que destacan el efecto que tiene este tipo de formación en los resultados de la empresa.

El estudio culmina mostrando las principales contribuciones que completan el marco académico existente, así como las implicaciones más prácticas hacia el mundo empresarial y que animan a los dirigentes de las empresas a implantar una serie de

capacidades dinámicas basadas en el conocimiento y a fomentar comportamientos innovadores y de compromiso para afrontar los cambios exigidos por la transformación digital.

Sin duda, la Industria 4.0 representa una nueva fase en la organización y control de la cadena de valor a lo largo del ciclo de vida de los productos. Esta fase está impulsada por la digitalización, la automatización y otras tecnologías avanzadas. Las empresas en esta era deben ser capaces de adaptarse rápidamente a los cambios del mercado y las nuevas tecnologías para mantenerse competitivas. La transformación digital no solo implica la adopción de nuevas tecnologías, sino también un cambio profundo en la cultura empresarial, los procesos de negocio y las estrategias de gestión. Las empresas deben ser capaces de generar, compartir y aplicar conocimiento de manera más eficiente y efectiva. Esto requiere una reevaluación de las capacidades existentes y la adquisición de nuevas habilidades y competencias.

Además, los empleados juegan un papel crucial en la transformación digital. Su comportamiento y sus habilidades pueden facilitar o dificultar la implementación de nuevas tecnologías y procesos. La alineación de las prácticas de recursos humanos con los objetivos de la transformación digital es esencial para lograr un cambio efectivo. En este sentido, las políticas y prácticas de recursos humanos deben estar alineadas con los objetivos de la transformación digital. Esto incluye la contratación de personal con las habilidades necesarias, la formación y el desarrollo continuo de los empleados, y la creación de un ambiente de trabajo que fomente la innovación y el compromiso. También los empleados deben estar dispuestos a adoptar nuevas tecnologías y procesos, y a proponer y probar nuevas ideas. En este sentido, un comportamiento innovador es fundamental para la implementación exitosa de la transformación digital, así como el compromiso de los empleados con la organización y sus objetivos es esencial para el éxito de la transformación digital. Los empleados comprometidos están más dispuestos a adoptar cambios y a contribuir al éxito de la organización.

Por su parte, la formación en nuevas tecnologías de la información y la comunicación (TIC) es fundamental para dotar a los empleados de las habilidades necesarias para la transformación digital. La formación debe ser continua y adaptarse a las necesidades cambiantes del mercado y de la organización. La inversión en formación aumenta el capital humano de la organización, lo que se traduce en una mayor capacidad para

adaptarse a los cambios y para innovar, así como también puede aumentar el compromiso organizacional, ya que los empleados se sienten más valorados y preparados para enfrentar los desafíos de la transformación digital. Además, la formación en nuevas tecnologías tiene un impacto positivo en los resultados de la empresa, ya que mejora la eficiencia, la productividad y la capacidad de innovación.

Por tanto, la transformación digital es un proceso complejo que requiere cambios significativos en la estructura organizativa, los procesos de negocio y la cultura empresarial. Las empresas deben desarrollar nuevas capacidades dinámicas y fomentar un comportamiento innovador y comprometido entre sus empleados para aprovechar las oportunidades que ofrece la era digital. Las empresas deben invertir en el desarrollo de capacidades dinámicas como la capacidad de información, la agilidad organizativa y la capacidad de absorción para adaptarse a los cambios del entorno digital y las prácticas de recursos humanos deben estar alineadas con los objetivos de la transformación digital para fomentar un comportamiento innovador y comprometido entre los empleados. Por su parte, la formación continua en nuevas tecnologías de la información y la comunicación es esencial para dotar a los empleados de las habilidades necesarias para la transformación digital.

Los resultados de este trabajo también sugieren que, para fomentar la transformación digital, los gerentes necesitan prestar atención a las capacidades organizacionales y las competencias de sus empleados. Por un lado, las empresas involucradas en el proceso de transformación digital deben tener capacidades dinámicas que estimulen la captura y uso del conocimiento esencial para la gestión empresarial. Nuestro estudio respalda la promoción de capacidades de información, agilidad organizacional y habilidades de absorción. Aunque cada competencia promueve aspectos específicos relacionados con el conocimiento, todas comparten la capacidad de gestionar el conocimiento necesario para una empresa digital. No obstante, fomentar estas capacidades no es ni simple ni rápido, los gerentes de la empresa deben tratar de comprometerse firmemente con ellas, ya que no solo proporcionan el conocimiento necesario para la implementación inicial de la transformación digital, sino que también garantizan la renovación constante del conocimiento y, por lo tanto, de los recursos y capacidades de la empresa, lo que la hace competitiva.

Por otro lado, la gestión de la empresa debe empoderar al personal de la compañía. Este estudio ha demostrado la importancia de las competencias de los empleados, ya sean sus conocimientos, habilidades, comportamientos o incluso su compromiso, como esenciales para el éxito de los procesos de transformación digital. Estas competencias pueden mejorarse mediante prácticas adecuadas de gestión de recursos humanos, como la formación en tecnologías de la información y la comunicación, que ayudan a crear el capital humano necesario para abordar la digitalización. Por lo tanto, es crucial que las empresas adopten prácticas de gestión de recursos humanos que respalden la estrategia organizacional y promuevan un entorno que fomente la innovación y la adaptación, asegurando así una transformación digital exitosa y sostenible.

En definitiva, la transformación digital es una oportunidad para que las empresas mejoren su eficiencia, aumenten su capacidad de innovación y se adapten rápidamente a los cambios del mercado.

INTRODUCTION

INTRODUCTION

I.1 Introduction to the research topic of the doctoral thesis

The 4.0 Industry represents a new revolution that combines advanced production and operations techniques with intelligent technologies that will be integrated into organisations, persons and assets (Felsberger et al., 2022).

The last years have seen new technologies like Big Data or the use of robots in the production process revolutionise how companies do business (Verhoef et al., 2021). These technologies are improving operational efficiency of companies, optimising their process management and improving their market orientation (Zhai et al., 2022). Indeed, changes are taking place in the way companies create value and interact with their clients. These new technologies and the behaviour of digital clients via online shopping are external digital transformation drivers for companies.

Nevertheless, despite the opportunities that this environment offers, innovation in products and services make it difficult to reconcile this new paradigm with traditional business models and organisation structures. This underlines the importance of developing digital transformation plans.

Digital transformation leads a company towards a new business model by allowing for the implementation of new ways for creating value and profit. Its scope covers processes that are central to the business, as well as operations, its capacities and business strategy (Hess et al., 2016; Matt et al., 2015). There is currently an urgent need to face up to the introduction of new technologies so as to be able to adapt to the current environment, to be more productive and competitive. Therefore digital transformation demands the introduction of new digital resources and adaptations to structures, strategies and objectives, all for making companies more effective (Verhoef et al., 2021).

Perhaps the most important role falls to the so-called dynamic capabilities as they are thought to be essential in the digital transformation process (Troise et al., 2022). Furthermore, a company's organisational capabilities ought to be converted into a series of key behaviours in the company staff who directly participate in digital transformation processes (Salvato & Vassolo, 2018). It is human resources who have to adapt and then participate in a new production process that is more dynamic, technologically more intense and is better able to manage new knowledge (Blanka et al., 2022). It should come

as no surprise that not only should a company be able to manage a series of capabilities that allow for the creation of new knowledge, but it should also succeed in managing that very human capital by means of a series of human resource practices. These will aid in generating new behaviours amongst employees and so foster digital transformation (Weber et al., 2022).

Having reached this moment, it is no wonder that the role of these dynamic capabilities and of human resources in digital transformation should awaken so much interest both in the professional and academic worlds (Ellström et al., 2021; R. Fenech et al., 2019; Trenerry et al., 2021).

The emerging state of the issue and the aforementioned interest call for new studies which address in depth, firstly, what type of organisational capabilities ought to be adopted and, secondly, what employee competences are in terms of successful implementation of the digital transformation processes. Additionally, given the relevance of staff and their behaviour, it would be necessary to understand human resource management, and, especially those human resource practices linked to the generation of new knowledge in information technology (IT) that might contribute to a company's successful implementation of digital transformation.

I.2. Rationale and research objectives

The doctoral thesis proposal addresses an issue of vital importance to the current situation. It focuses on the management of dynamic capabilities and organisational behaviours in the context of digital transformation, specifically in the industrial sector of the Region of Murcia. The rationale is based on the absolute necessity that companies have to adapt themselves to the '4.0 industry era', where technology, automation and innovation are key elements (Bag, Yadav, et al., 2021). Thus digital transformation represents a revolution that integrates advanced production techniques and operations with intelligent technologies in organisations, persons and assets (Felsberger et al., 2022).

It is widely known that the use of new digital technologies is transforming the way companies operate. It improves their efficiency, optimises process management and makes them more market-oriented (Verhoef et al., 2021). Despite the opportunities offered by this environment, the aforementioned changes often clash with traditional business models and organisational structures and, most importantly, invalidate traditional value creation processes. Digital transformation boosts a new business model

which allows for the creation of value and profits through central processes, operations and commercial strategies. This, in turn effects improved productivity and competitiveness for the business (Hess et al., 2016; Matt et al., 2015). These highlighted results provide a tempting incentive for businesses to embark on costly and uncertain processes of investment in technology which break with a more traditional way of producing goods and services. This is for both a desire and a need to improve the finances of those entities which commit to digital transformation (Ferreira et al., 2019).

As already mentioned, these changes in the way of creating value demand that businesses prevail upon certain organisational capabilities that facilitate the creation of new knowledge and also on external technology (Ellström et al., 2021). There is, furthermore, a need for staff who are committed to using the aforesaid technology to implement and boost digital transformation in their business (Blanka et al., 2022). This requires an understanding of the role played by dynamic capabilities and human resources in this process.

The main objective of the thesis is to study how the dynamic capabilities of companies and the behaviours of human resources might facilitate the creation of the knowledge needed to implement the process of digital transformation. This focus is crucial, given that, despite the extensive literature that supports the importance of knowledge creation in the last decades (Cepeda‐Carrion et al., 2012; Ferraris et al., 2021; Ferraris et al., 2019; Ferraris et al., 2017; Kianto et al., 2017), digital transformation introduces new demands and challenges. These require distinct skills and focuses.

Hence this thesis attempts to *study the management of specific dynamic capabilities of businesses and the competences of staff who facilitate the creation of the knowledge necessary for the implementation of digital transformation processes in the company*. The objective is to analyse the effect that specific dynamic capabilities, human resources practices and employee behaviours have on digital transformation as a means to achieve a competitive advantage in the current dynamic context.

The main objective of this research can be subdivided into various sub-objectives through which the achievement of the main objective and the structure become easily reachable. In short, the objectives addressed can be summarised in the following points:

(a) Understanding the role of dynamic capabilities in the digital transformation process of companies.

(b) Understanding the relationship between the digital transformation of a business and an improvement in its results. Reviewing the existent literature can help to understand how companies decide to invest in technology in order to improve their production processes.

(c) Based on the literature review, proposing which human resource practices are most suitable for companies in terms of their objective towards successful digital transformation.

(d) Analysing whether capabilities and behaviours of employees could be suitable for a company that is undergoing a digital transformation process in search of better organisational performance.

(e) Contrasting empirically whether specific dynamic capabilities, capabilities and behaviours of employees could foster digital transformation in companies and, in so doing, improve results.

(f) Identifying whether companies that invest in information technology and communication training can stimulate those capabilities and favourable behaviours in the processes of digital transformation.

(g) Understanding the possible effects of aligning company management with its information technology departments and its results.

(h) Assessing whether dynamic capabilities and digital transformation of companies allow for innovation in business models in the search for better performance in organisations.

(i) Making empirically justified recommendations to be taken on by companies involved in the process of digital transformation. These conclusions will follow on from empirical testing of the different hypotheses included in this doctoral thesis.

I.3. Methodology

In order to meet the above objectives, it was necessary to carry out an empirical study, after an appropriate literature review, which suggests variable relationships related to digital transformation.

As previously mentioned, this study includes three independent empirical studies which deal with specific issues regarding phenomena related to digital transformation. However, the empirical part was developed under the same comprehensive project that studied specific principles and results in the digital transformation of companies in the Region of Murcia.

Most of the companies that participated in the questionnaire used in this thesis are from that region. Some are situated on the border of Alicante because of its close relationship with the institutions and markets of the Region. The region, which is in the southeast of Spain, is characterised by a solid and diversified business base. Its companies cover a wide range of sectors, from agricultural and fishing to manufacturing, tourism and services (de Bobadilla, 2003).

Firstly, agriculture plays a crucial role in the economy of the Region of Murcia. It is characterised by its fruit and vegetable production, especially citrus fruit, lettuce, tomatoes and peppers, among others (Briones Peñalver et al., 2018). Agricultural companies in the region have excelled at their ability to make the most of available resources. These include the efficient use of water as well as adopting sustainable practices that minimise their environmental impact and promote the conservation of natural resources (Martinez-Conesa et al., 2017).

Another important sector is tourism, which includes hotels, restaurants, travel agencies and tour operators. The region attracts millions of tourists every year thanks to its beautiful beaches, rich history and delicious cuisine (Martínez et al., 2020). Over the last years the region has experienced an increase in rural and nature tourism, which has led to the emergence of companies which specialise in eco-tourism and adventure tourism (Báez & Perea, 2020).

On the industrial side, it is home to manufacturing companies that produce a wide range of products, from processed food and beverages to chemicals, plastics and metal products.

These companies have shown that they can compete at both national and international levels thanks to their commitment to innovation, quality and efficiency (Aragón Sánchez & Rubio Bañón, 2019). Many of these companies are also focused on internationalisation, seeking business opportunities in foreign markets and setting up strategic partnerships with companies in other countries (Piñera Salmeron & Sanz Valle, 2021).

The last few decades have seen how businesses in the Region of Murcia have incorporated technological advances into their productive processes and business models (Colino Sueiras et al., 2010). They have invested in their human capital to improve skills and knowledge. They have also strengthened internationalisation strategies, gaining access to new markets and diversifying their sources of income(Piñera Salmeron & Sanz Valle, 2021). Furthermore, they have shown commitment to sustainable development and contributed to the community (Martinez-Conesa et al., 2017). In short, companies in the Region of Murcia stand out for their diversity and capacity to adapt which have contributed to improving the sound base and dynamism of their business structure. This puts them in a position to undertake the changes required by digital transformation.

The objectives of this doctoral thesis, which are vital for the competitive survival of companies of the region have not gone unnoticed by the main organisations of the territory. That is why they decided to get involved in putting this project into practice. Thus, the executives of the main business associations promoted data collection amongst their partners. These are: The Regional Federation of Metal Companies of the Region of Murcia (FREMM), The Regional Confederation of Business Organisations of the Region of Murcia (ADIMUR) and the Association of Young Business People of the Region of Murcia (AJE).

As a result of this collaboration and using the regional database of companies with more than ten employees (SABI: Sistema Ibérico de Análisis de Balances), the study population was profiled, and a questionnaire was designed with information that covered the objectives set out. The final sample used in the three studies that are presented in this thesis cover 184 valid questionnaires which are representative of the group.

Once the information had been collected, and in order to test the hypotheses, the methodology of structural equation modelling was used. This technique has been shown to be of enormous use in identifying different simultaneous relationships amongst diverse

areas or organisation processes. This is because they behave as latent variables that interact with one another. This technique can be studied using covariance-based structural equation modelling (CB-SEM) or using variance-based Partial Least Squares (PLS-SEM). Whereas CB-SEM operates with common factor models and aims to minimise the difference between the theoretical and empirical covariance matrix, PLS-SEM has a different objective. It aims to maximise the explained variance of the dependent variables. In this sense, the PLS-SEM methodology, while maintaining academic rigour, is easier to apply in complex models or where there is little prior knowledge of the relationships in the research models. However, the MBC-SEM approach requires that the researcher has extensive knowledge of the method in order to establish the model and its relationships.

Having checked the particular characteristics of each technique, and by virtue of those of the models proposed, the PLS-SEM analysis is the best fit. One must take into account that the theory supporting digital transformation is not sufficiently established and the information available is limited (Gerlach et al., 1979). One ought not to be surprised that some authors, like Mehmetoglu and Venturini (2021), have debated the advantages and disadvantages of both approaches, and have validated the choice of the PLS-SEM methodology. Nor in the case of Richter et al. (2022) who found that the use of the PLS technique by *management* researchers worldwide has grown exponentially in the last decade in various indices or in the last five years in published journal articles Web of Science (WoS) (Ciavolino et al., 2022).

However, the fundamental reason for using this technique is because the measurement models used in this doctoral thesis on the observed variables are based on composites (Henseler, 2017). While behaviour-related constructs are usually modelled as common factor models (reflective measurement models) or with causal-formative measurement models (if causal or formative indicators are available), composites are used when working with design constructs or artefacts that are the result of theoretical thinking (Henseler, 2017), created with a theoretical justification and as a mixture of elements. When analysing the model of this study, it is understandable why the choice was made to use composites, This is because digital transformation, dynamic capabilities, HR practices or business outcomes are more aligned with composite modelling (Henseler, Ringle, et al., 2016b).

Although this technique can, according to Henseler (2018), be used for different research purposes: confirmatory, explanatory, exploratory, descriptive and predictive, this thesis has a more exploratory orientation due to the limited previous research on the proposed relationships. This does not, however, mean that the predictive and explanatory orientation offered by these models is not taken into account.

In any case, this methodology which is common to the three studies presented in the central chapters of this doctoral thesis, will facilitate the contrast of the theoretical model that responds to the previous objectives and to the research hypotheses that will be developed thence.

I.4. Structure of the doctoral thesis

In order to respond to the objectives set out in the study and considering the breadth of the topics addressed, this doctoral thesis is structured in four chapters to which are added this introduction and a chapter devoted to the final conclusions of the study.

The introduction provides an overview of the research topic, setting out the key objectives, as well as the main lines of methodology which are common to the three proposed studies.

The first chapter is theoretical and provides the basis for the approach underlying the thesis. Although it is not a complete theoretical review of the relationships between the concepts (discussed in greater depth in the following chapters), the study attempts to address, from the perspective of Dynamic Capabilities, how companies should attempt to have a series of organisational competences that facilitate the creation of new knowledge in order to drive digital transformation processes. Throughout this chapter, the main ideas of this perspective will be reviewed, concepts will be differentiated, and the general vision studied in the rest of the chapters will be set out.

The second chapter explores the relationship between dynamic capabilities, digital transformation and organisational performance. It includes a structured summary, introduction, theoretical framework, methodology, results and discussions with implications and conclusions. The key objective of the chapter is to understand how information capability, organisational agility and absorptive capacity facilitate digital transformation in companies. Furthermore, this article looks at how digital transformation can improve company performance by driving business model innovation.

The third chapter focuses on general human resources practices that support employee behaviour which enables digital transformation. The structure of the chapter conforms to the requirements of a journal article. This chapter discusses how digital transformation in companies also requires a workforce to drive it forward. The theoretical review in this chapter demonstrates that to achieve innovative employee behaviour, companies have to decide which HR strategies and practices to implement. Companies strategically aligned to digital transformation seek to foster those human resource management practices that achieve these goals.

The fourth chapter aims to explore more deeply that one human resources practice so necessary to foster the knowledge needed in digitally advanced companies, i.e. training in information and communication technologies (ICT). Following the same basic structure as the previous two chapters, the study delves into how these human resources practice supports digital transformation and business results. Not only are direct relationships established, but there is also an analysis of how ICT training influences transformation through the mediating role of organisational commitment and human capital.

The thesis concludes with overall conclusions that summarise the key findings of each chapter. The individual conclusions of the central chapters are presented, highlighting the main theoretical contributions, practical implications, limitations and suggestions for future research. Finally, the thesis concludes by acknowledging its limitations and suggesting future research directions.

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CHAPTER 1:
GENERAL THEORETICAL FRAMEWORK

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The current competitive situation, the constant changes in the environment or the impact of technology have an influence on the decision-making process of business negotiations (Ancillai et al., 2023). The capacity of the companies to adapt to new changes will determine their chances of survival. It is not surprising that there is a great concern in the academic and business world about the impact of the company's digital transformation and, fundamentally, how it can be confronted.

The object of this chapter is to analyze the general framework which will guide the development of the doctoral thesis in the next chapters. Specifically, the Dynamic Capabilities approach will be addressed as a perspective that helps to understand why companies continually need to renew their resources and capabilities if they wish to continue competing in highly dynamic and complex environments. Making use of the Resources-based View, this chapter seeks to understand why the company must have a set of resources, mainly new knowledge, and capabilities to manage this knowledge, which help the company to introduce the changes required by digital transformation. If we also take into account the essential part played by company employees in this process, and that their competences, whether behaviour, attitudes or knowledge, are another element to be managed by the company's leaders, we begin to understand the need for a joint approach to these factors in order to undertake the digital transformation processes with guarantees of success.

The structure proposed throughout this chapter follows a set pattern. Firstly, the general framework of the study is established, focusing on the need of the business to know how to undertake the implementation of digital transformation processes under conditions of considerable competitive pressure and uncertainty in the environments. This section will show how digital transformation requires new knowledge, attitudes and behaviours that differ greatly from traditional competences. This reflection forces companies to be constantly searching for, incorporating, and applying new knowledge, thus requiring them to renew the company's resources and capabilities.

Secondly, the Dynamic Capabilities approach is addressed. Dynamic capabilities are a firm's ability to integrate, build, and reset both internal and external resources/competences so as to address and mould quick-changing business

environments (Teece et al., 1997). Starting from the most classical approaches and going deeper into the Resources based View, this section establishes the theoretical foundations of this theory, trying to determine and differentiate the foremost dynamic capabilities acknowledged by the specialised literature.

Once the conceptual framework has been established, the third section focuses on establishing the theoretical bases on which to analyse the influence that dynamic capabilities exert on the processes of implementing digital transformation in a company. In this case, in general terms, we review the role played by the main capabilities and competences in organisations to enable (a) companies to acquire new knowledge; (b) employees to adopt appropriate behaviours; (c) processes of value generation to introduce the necessary changes; (d) companies to become more competitive. This section summarises the overall theoretical model and indicates how it will be addressed more specifically in each of the proposed studies.

Finally, the bibliography used in the review of this theoretical chapter that underpins the rest of the doctoral thesis is included.

1.1. Digital Transformation

1.1.1. Concept and importance

Digital transformation is considered to be a comprehensive process through which organizations redefine their business models, operations and strategies through the integration of digital technologies (Hess et al., 2016; Matt et al., 2015). This change is not limited only to the implementation of technological tools, but encompasses a profound re-evaluation of organizational culture, the adoption of new functioning forms and the creation of value through technological innovation (Leal-Rodríguez et al., 2023).

In addition, digital transformation entails strategically using emerging technologies such as data analysis or robotic automation to improve the efficiency, agility and adaptability of an organization in an increasingly digitalized business environment (Verhoef et al., 2021; Vial, 2019). In fact, it is linked to the improvement of operational efficiency, cost reduction and the creation of new business models (Ferreira et al., 2019; Melo et al., 2023). Those organizations that do not address digital transformation risk being left behind, as digitalization has become critical to long-term survival and growth (Schneider

et al., 2023). Digital transformation allows companies to optimize their in-house processes by automating and digitizing routine tasks (Verhoef et al., 2021; Wang et al., 2022). The implementation of advanced technologies e.g. robotic automation streamlines operations, reduces errors and frees up time and resources that can be allocated to more strategic activities (Schlegel & Kraus, 2023).

Digitalization not only implies the improvement of existing processes, but also the creation of new business models and the constant generation of innovative value propositions (Ancillai et al., 2023; Favoretto et al., 2021). Companies that digitally transform are better positioned to identify emerging opportunities, develop innovative products and services, and proactively react to variations in customer expectations (Zhai et al., 2022). Furthermore, in a dynamic business environment, the ability to adapt is essential. Digital transformation gives companies the ability to quickly tailor their strategies and operations in response to changes in competition, regulations or consumer preferences (Troise et al., 2022). Besides, it allows companies to offer more personalized and efficient customer experiences. From implementing e-commerce platforms to using data analytics to better understand customer preferences, organizations can improve customer satisfaction and build stronger relationships (Ferreira et al., 2019; Matarazzo et al., 2021).

Although the initial investment in digital technologies can be significant, digital transformation often leads to sustainable long-term cost reduction (Zhai et al., 2022). Process automation, efficient resource management and data-driven decision making contribute to a more profitable operation and improved profit margins (Verhoef et al., 2021). Therefore, by adopting digital transformation companies can expand their reach and explore new markets (Ferreira et al., 2019; Songkajorn et al., 2022). It also facilitates collaboration between companies through digital connectivity, the creation of business ecosystems and participation in collaborative platforms (Riquelme-Medina et al., 2022).

1.1.2. Determining factors

Digital transformation is a complex process, which is altering the current business models and, yet seems to have been insufficiently studied in academia to date (Vial, 2019). From the review of the literature, the successful implementation of digital transformation is clearly conditioned by external and internal factors (Verhoef et al., 2021).

From an *external overview*, the technological landscape is in constant flux, with innovations such as artificial intelligence and cloud computing transforming the ways businesses operate (Schallmo et al., 2017). Companies can easily become overwhelmed by the sheer number of options, potentially leading to haphazard technology adoption and underutilization of resources. A holistic approach is required, wherein emerging technologies are thoroughly evaluated in light of an organization's strategic goals (Hess et al., 2016). Collaboration with technology experts facilitates informed decision-making and effective implementation. Within today's globalized and digital marketplace, the pressure to innovate is constant and integrating emerging technologies strategically can provide a critical competitive edge (Schallmo et al., 2017).

Those organizations that fail to adapt may be left behind, losing market share and being overtaken by more agile and technologically advanced competitors (Ancillai et al., 2023). The response to this competitive pressure involves a proactive mindset toward innovation. Companies must be willing to experiment, learn from failures, and adapt quickly to changing market dynamics. Thus, business agility and the ability to anticipate emerging trends are crucial to excel in a competitive environment (Gong & Ribiere, 2023). In addition, uncertainty and instability are characteristics of the current business environment. Geopolitical changes, economic fluctuations and unexpected crises are also external factors that can significantly influence the implementation of digital transformation (Teng et al., 2022). A company's ability to navigate through these turbulences depends on its resilience and adaptive ability. Additionally, permutation management becomes a critical component. Organizations must develop a culture that fosters resilience and responsiveness through continuous training, effective communication, and anticipation of possible scenarios (Leal-Rodríguez et al., 2023). Flexibility in strategic planning and diversification of sources and suppliers are also key strategies to mitigate the risks associated with environmental instability.

Among the *internal factors* of the company that can determine the successful deployment of digital transformation processes are culture or leadership. Leaders must go beyond simply supporting digitalization and they must communicate a clear vision that inspires employees and other stakeholders. The ability to lead change, make bold decisions and adapt to technological evolution is essential (Porfírio et al., 2021). These types of leaders also foster an organizational culture that values innovation, experimentation, and continuous learning. A culture that embraces innovation, collaboration and agility

facilitates the implementation of disruptive changes (Leal-Rodríguez et al., 2023). Resistance to change is common, but a culture that encourages curiosity, adaptability, and acceptance of new technologies helps overcome these obstacles.

Another important determinant of internal digital transformation is structural organizational flexibility, which allows one to meet the challenges that arise from an increasingly digital environment (García-Sánchez et al., 2018; Vial, 2019). Furthermore, for companies to digitally transform, leaders must first think about a digitalization strategy and create objectives that can be measured and met (Matt et al., 2015). In fact, for the company to manage to successfully undertake a digital transformation process, it is necessary for the general management to be in line with the information technology department because both must agree on how the digital transformation strategy is going to be executed (Gerow et al., 2014). In addition, the choice and implementation of emerging technologies are critical factors. This is not simply about adopting technology for the sake of it, but rather selecting those solutions that best align with business objectives and strategic vision (Teng et al., 2022; Verhoef et al., 2021). The ability to integrate these technologies coherently into existing infrastructure is important for ensuring effectiveness.

Another important factor is knowing and adopting people management practices that adapt to current times and that promote appropriate employee behaviours to ensure that the digital transformation process concludes successfully (Chowhan, 2016). For example, training and skills development are key elements to ensure employees are equipped to embrace transformation (Trenerry et al., 2021). Additionally, continuous training and digital skills development are elementary if digital transformation is to be successfully adopted(Falck et al., 2016). Employees must gain the required skills to use new technologies and actively contribute to the transformation process. This involves not only technical training, but also the development of soft skills e.g. problem solving, creativity and collaboration (Ruiz, 2020). Having employees committed to the organization's objectives is key to being able to face a transformation process of this magnitude (Battistelli et al., 2019; Montani et al., 2020). Thanks to certain human resources practices that the company adopts to adapt to the digital environment, employees can become more committed (Bos-Nehles & Veenendaal, 2019; Yang et al., 2019). Therefore, it is easier for them to adopt innovative work behaviours to seek better performance for their organizations (Kwon & Kim, 2020).

Finally, although all the mentioned factors are essential, managing dynamic capabilities is what mainly determines the success of digital transformation. Acquiring these allow companies to adapt effectively to these changes, quickly adjusting their strategies, processes and structures to remain competitive (Teece, 2018). Dynamic capabilities foster continuous innovation by enabling companies to identify emerging opportunities and adopt new technologies in an agile manner (Mele et al., 2023). Within this frame of reference, being able to innovate quickly or change business models can make the difference between success and stagnation (Heubeck, 2023; Parameswara et al., 2023). Dynamic capabilities give companies the flexibility to adjust to changing market demands and react to opportunities and threats in a timely manner (Felsberger et al., 2022). In a digital world, where a wide range of options is accessible to consumers , the ability to understand and meet changing customer needs is crucial (Matarazzo et al., 2021). Dynamic capabilities enable businesses to effectively collect and analyse data, which in turn facilitates the personalization of products, services, and customer experiences (Ellström et al., 2021). In fact, digital transformation often involves greater collaboration and connectivity, both internal and external (Weritz et al., 2020). Thus, dynamic capabilities facilitate collaboration between different functions and teams within the organization, as well as integration with external partners and the adoption of collaborative technological solutions and promote continuous learning in the organization (Warner & Wäger, 2019). This involves the ability to learn from experience, adapt as necessary, and apply acquired knowledge in the future. Organizational learning capacity allows continuous improvement and adaptability in a digital environment (Mele et al., 2023).

Despite the existence of important external factors that are demanding a commitment to digitalisation processes, it seems to be clear from the previous paragraphs that the successful digital transformation implementation is based on the company's resources and capabilities. Its ability to foster the necessary capabilities at all times, which allow it to make the most of external technological knowledge to apply it in the digitisation processes, will be key.

Based on these ideas, the following sections explore the general theoretical approaches that underpin the foundations of this study.

1.2. Main theoretical framework

In previous sections, the importance of dynamic capabilities in the adaptability and competitiveness of organizations was highlighted. In this section, a brief review of the theoretical foundations that support these capabilities will be carried out, exploring concepts such as resource and capabilities theory or knowledge management, to better understand how organizations can develop and leverage these capabilities in search of competitive advantages. In addition, we will review what behaviours are necessary so that employees can carry out the digital transformation of the company.

1.2.1. Resources-Based View

One of the perspectives that has had a major impact on the literature of the last decades in terms of strategic and organisational management has been the Resource-Based View (RBV) (Barney, 1991), which emerged as a response to the limitations of previous approaches focused on the position and structure of companies. This theory was notable for shifting attention from external factors, such as the industrial environment, to the internal resources and specific capabilities of organizations.

The RBV, which was consolidated in the 1980s (Wernerfelt, 1984), argues that to achieve sustainable success, resources and capabilities must meet four criteria: they must be valuable to the company, rare in the market, difficult for competitors to imitate, and not substitutable by other resources or capabilities. The combination of these elements creates a sustainable competitive advantage. Resources are defined as tangible or intangible assets controlled by the company, which can be used to improve its efficiency and effectiveness (Teece et al., 1997). Resources may include financial, technological, human, or other assets that the company owns. A company's capabilities are about the effective integration, development and deployment of its resources. They involve the organization's ability to perform complex tasks and coordinate different resources to achieve strategic objectives (Zahra & George, 2002). However, as the discipline advanced, the limitations of this approach became apparent. The dynamics of constant change in business environments, characterized by the evolution of technology, globalization and rapid obsolescence, caused this theory to be perceived as insufficient to fully explain the success or failure of companies in an increasingly volatile business world (Hansen & Wernerfelt, 1989).

Regarding digital transformation, the RBV recognizes that business environments are turbulent and that technological changes can alter the nature of valuable resources and capabilities (Teece et al., 1997). What is valuable today may become obsolete tomorrow due to rapid technological evolution and changes in market preferences (Ancillai et al., 2023). Faced with the dynamics of the environment, this framework leads to the introduction of the theory of dynamic capabilities. This theory suggests that not only do organizations need to identify and exploit their current resources and capabilities, but also develop the ability to continually adapt and renew themselves as they react to changes in the environment (Teece et al., 1997). Agility, the ability to learn and constant innovation are fundamental to this approach. In the context of digital transformation, dynamic capabilities become crucial to ensure the company's adaptability and long-term survival (Parameswara et al., 2023).

Thus, it was in this context that the Dynamic Capabilities Perspective (Teece et al., 1997) began to take shape. Although the RBV highlighted the importance of static resources and capabilities, it broadened the perspective by recognizing that, on the one hand, organizations need to be able to exploit their existing resources, and on the other, to adapt and renew themselves (Zahra & George, 2002).

1.2.2. Dynamic Capabilities Perspective

The Dynamic Capabilities Perspective directs itself towards dynamic capabilities, which are about how an organization manages to integrate, build and reconfigure its resources and capabilities in real time, allowing it to adapt and thrive in a milieu of change(Teece et al., 1997). The notion of dynamic capabilities implies the ability of organizations to identify opportunities and threats, and to internally reorganize their resources and capabilities efficiently and effectively (Barreto, 2010). This approach not only focuses on the exploitation of current competitive advantages, but also on the ability to learn, innovate and evolve over time (Teece, 2018). Thus, this perspective represents a natural evolution of the RBV, providing a more comprehensive framework for understanding how organizations can maintain their competitive edge in a dynamic and changing business environment.

Dynamic capabilities focus on how a company manages to adapt and change in response to variations in the competitive environment. This involves not only the ability to make

the most of emerging opportunities, but also managing to reconfigure existing resources and skills to meet new challenges (see table 1).

Table 1.1. The main contributions to the dynamic capabilities' perspective

Authors	**Contribution to dynamic capabilities**
Teece (1997)	Introduced the concept of dynamic capabilities, highlighting the importance of adaptability and the constant renewal of resources and capabilities
Pisano and Shuen (1997)	They proposed that dynamic capabilities are critical for innovation and continuous adaptation
Winter (2003)	He emphasized the idea that dynamic capabilities include both the ability to learn and to reconfigure resources in response to change
Helfat and Peteraf (2003)	They contributed to the development of the theoretical framework by incorporating elements of knowledge absorption and transformation.
Aguilera and Montgomery (1998)	They highlighted the importance of organizational flexibility and strategic decision making in building dynamic capabilities

Source: Own elaboration

Two key categories in this context are ordinary capabilities and dynamic capabilities, each with its own distinctive characteristics. The *ordinary* ones focus on present operation, while the *dynamic* ones focus on strategic change and reshaping resources to develop competitive advantages over time (Teece, 2016). Although some authors, such as Helfat and Winter (2011), raise the difficulty of clearly separating dynamic capabilities from operational ones, the importance of this distinction is maintained. Teece (2014) highlights the need to act on dynamic capabilities through a specific set of these, minimizing the fragmentation of the analysis. Regarding the macro and micro vision, these authors discuss the interpretation of dynamic capabilities as higher-level organizational routines or decision-making actions that depend on the skills of managers. The relevance of both approaches to understanding how companies adapt and generate change is recognized.

Thus, ordinary capabilities allude to the routine skills and processes that an organization uses to carry out its daily operations (Rumelt, 2012; Teece et al., 1997). These include the efficient capacity of an organization to allocate and use its resources, such as human, financial, and technological capital. Developing this capability ensures that the organization can operate profitably and competitively in the short term. In addition, the design and implementation of efficient operational processes to maximize productivity and minimize costs are elementary. Developing this capacity contributes to the consistent quality of products and services, as well as efficiency in the value chain. On the other hand, the constant identification of areas of improvement and the implementation of gradual changes to increase effectiveness and efficiency fosters adaptability and helps maintain relevance in a changing business environment. Finally, the tacit knowledge refers to accumulated experience and practical skills that cannot always be easily documented but are essential for the efficient execution of daily tasks for making quick and effective decisions, as well as addressing complex problems.

For their part, dynamic capabilities focus on how an organization manages to adapt and evolve in a changing milieu (Mele et al., 2023). These capabilities are essential for innovation, strategic adaptation, and the pursuit of new opportunities because they allow an organization to reconfigure its resources and processes to address emerging challenges and capitalize on new market trends (Cheng et al., 2023). Thus, this thesis highlights the evolution of the concept of dynamic capabilities over time, pointing out the contribution of various authors in its definition and classification. It is based on the distinction proposed by Collis (1994) between operational and dynamic capabilities, and delves into the hierarchy of these capabilities. Winter (2003) expands the classification of capabilities by proposing different hierarchical levels. In his work, he identifies zero-level or operational capabilities, which are critical for short-term survival. Furthermore, he introduces first-level capabilities, dynamic in the function of modifying the company's resource base, and higher-level capabilities, which operate on first-level capabilities.

For their part, Ambrosini et al. (2009) and Zahra et al. (2006) propose three levels of dynamic capabilities related to managers' perception of the dynamism of the environment. This approach distinguishes between incremental, renewal and regenerative capacities, addressing different degrees of adaptation to environmental change. In addition, Wang and Ahmed (2007) establish a hierarchical order for the company's resources and capabilities, explicitly relating it to competitive advantage. They refer to resources as

"zero order," first-order capabilities linked to performance, and strategic core capabilities essential for competitive advantage. As experts in the field point out, dynamic capabilities, being a particular type of business capabilities, are defined as the ability to carry out activities, being latent until they are used (Helfat et al., 2009). Teece et al. (1997), Teece (2007), and the review of Barreto (2010) highlight three key dimensions of dynamic capabilities: sensing, integration, and reconfiguration. These dimensions are essential for organizational adaptation, and the central tenet of dynamic capabilities is to explain how organizations can adjust their routines and resources to gain a competitive edge (Teece et al., 1997).

Teece (2007) expands the analysis of dynamic capabilities and proposes specific mechanisms to analytically break them down into the ability to uncover and mould opportunities and threats, exploit these opportunities, and maintain competitiveness by improving, joining, protecting and reshaping the company's assets. These capabilities are critical in adapting to technological and customer opportunities, as well as designing and implementing viable business models. This typology of dynamic capabilities proposed by Teece (2007) and Teece (2014) is widely cited in the literature (Ellonen et al., 2011; Gebauer et al., 2011; Katkalo et al., 2010; Wilden et al., 2009). Other academics, such as Pavlou and El Sawy (2011), have presented similar proposals to operationalize the variable, focusing on detection, learning, integration and coordination. Wang and Ahmed (2007) have also theorized about the main factors of dynamic capabilities, breaking them down into adaptation, absorption and innovation.

Teece (2007) proposes a three-step process for dynamic capabilities: detection, capture, and reconfiguration. Sensing involves the company's ability to recognize opportunities and threats in the market environment, which requires active exploration and search in markets and technologies. Authors like Ellonen et al. (2009) define it as activities to scan, search, identify and explore new opportunities, which involves analysing the external environment and anticipating market developments. Once opportunities are detected, the next step is capture, which refers to the organization's ability to effectively to make the most of those opportunities. This involves making strategic decisions, investments and building up new products, processes, or business models. Leveraging relates to addressing opportunities through timely investments that enable the establishment and capitalisation of competitive advantages.

Reconfiguration is the component that ensures sustainable profitable growth in dynamic markets. It represents the company's ability to organize its asset base, transform resources and processes, and develop new capabilities through learning. Teece (2007) highlights that reconfiguration involves recombining and reconfiguring assets and organizational structures as the company expands and markets vary. In unveiling a broader spectrum of dynamic capabilities, we delve into organizational learning as a cornerstone. This entails the organization's proficiency in swiftly acquiring, assimilating, and applying new knowledge and skills, fostering adaptability to environmental shifts and fuelling innovation. This adeptness in organizational learning is intricately intertwined with strategic flexibility—a pivotal capability enabling the organization to alter strategies and reconfigure resources adeptly, seizing emerging opportunities and mitigating potential threats in the ever-evolving business landscape.

Nonetheless, in the current business environment, dynamic knowledge-based capabilities have become increasingly important for the adaptability and sustainable success of organizations. These capabilities not only reflect a capacity for information acquisition and assimilation, but also the ability to transform that knowledge into strategic actions that drive innovation and competitiveness. These imply the organization's ability to handle its expertise effectively, integrating and applying knowledge in decision-making and the execution of activities (Mele et al., 2023) as well as the ability to continually learn, unlearn and relearn to maintain relevance and effectiveness in a changing business environment. In this context, resources include tangible and intangible assets that the firm possesses. These resources can be financial, physical, human or technological (Permatasari et al., 2023). In addition, knowledge is an important intangible resource and it refers to the understanding, information and experience that the organization has accumulated over time. It can be codified (documented) or tacit (knowledge that is not documented or difficult to express verbally) (Khaksar et al., 2023). The ability to integrate knowledge involves the combination of knowledge dispersed throughout the organization (Hernández-Linares et al., 2023). This may include connecting information from various sources and creating new insights or solutions (Robertson et al., 2023). Another aspect of these dynamic knowledge-based capabilities is resource reconfiguration as the organization's ability to modify and reorganize its existing resources in response to changes in the environment. This could involve redistributing tasks, forming interdisciplinary teams, or adopting new technologies (Songkajorn et al., 2022).

In addition, capability renewal is an essential element of these capabilities as the organization's ability to build up new skills as new opportunities or challenges arise. This implies a process of continuous innovation and adjustment to changes in the market or technology (Kaur, 2022). All of this leads to the creation of a sustainable competitive edge through the effective application of dynamic knowledge-based capabilities which can lead to the generation and maintenance of a sustainable competitive advantage. This means that the organization can maintain its abiding market position thanks to its adaptive and evolutive faculty.

At their core, dynamic capabilities encapsulate the essence of adaptability and resilience. Faced with changing environmental conditions, an organization equipped with dynamic capabilities is ready to alter, improve or even completely renew its existing resources and competencies (Horng et al., 2022). However, it goes beyond mere adaptation; It extends to the field of knowledge management. The ability to take advantage and effectively apply knowledge becomes a key piece in decision-making and the execution of activities. This is not a static process; rather, it involves a perpetual cycle of learning, unlearning, and relearning (Mele et al., 2023). The organization must not only accumulate knowledge, but also integrate it across various facets, forging connections between various sources of information to generate innovative ideas and solutions (Songkajorn et al., 2022).

Although research on knowledge-based dynamic capabilities in the digital transformation of companies is in its early stages, the existing literature offers a solid foundation for future studies (Khaksar et al., 2023; Mele et al., 2023; Permatasari et al., 2023). More empirical research is needed that explores how companies develop and implement these capabilities for obtaining successful digital transformation (Hernández-Linares et al., 2023; Khaksar et al., 2023). In this context, it is imperative to delve into the study of knowledge-based dynamic capabilities, such as organizational agility (Gong & Ribiere, 2023), absorptive capacity and information capability (Cepeda-Carrion et al., 2012). These capabilities not only form the foundation upon which an organization can evolve in a changing environment but are also critical in the creation and effective application of knowledge. Detailed insight into these dynamic capabilities is revealed as a key aspect to driving resilience, innovation and organizational conduct. This thesis explores the essence of these capabilities and their strategic influence in today's business world.

1.2.3. The behavioural perspective

As mentioned above, organizational capabilities and knowledge are essential in implementing the changes necessary for digital transformation. However, effective management of this knowledge requires a holistic approach that considers the behaviour of employees within the organization. This section aims to show that in order to manage this knowledge it is necessary to have employees willing to disseminate it and use it in the company. We are now going to point out the behavioural significance of an organization's employees.

1.2.3.1. Concept and importance

As regards digital transformation, the alignment of employee behaviours with the company's strategic objectives becomes a determining factor for success (Weber et al., 2022). Behaviours, understood as the actions, attitudes and approaches adopted by individuals within the organization, play an elementary role in knowledge management (Levallet & Chan, 2019).

Behaviours in the work environment range from the willingness to share information and continually learn to the ability to mould oneself to new technologies and work methods. They include an attitude towards collaboration, a willingness to take calculated risks or the ability to work flexibly in a dynamic environment (Cherian et al., 2021). In terms of digital transformation, behaviours also imply a proactive mindset towards the adoption of technological changes and actively contributing to constant upskilling. Additionally, aligning employee behaviours with the company's digital transformation goals is essential to ensure that each individual action adds to the general vision of the organization (Bartsch et al., 2020). Aligned behaviours imply that employees share and apply knowledge in a manner consistent with the digital strategy, thus promoting agility or operational efficiency (Trenerry et al., 2021). These behaviours directly influence knowledge management by determining employees' willingness to share valuable information, engage in joint learning processes, and adapt to the variable exaction of the digital environment (Weber et al., 2022). Creating an organizational culture that encourages aligned behaviours enhances the company's ability to capitalize on its collective knowledge and develop the dynamic capabilities necessary for digital transformation (Cetindamar Kozanoglu & Abedin, 2021).

1.2.3.2. Theoretical perspective

There are various theories that study employee behaviours and their effects on organizations. However, in this thesis we will focus only on three. Firstly, Social Exchange Theory is based on the premise that social interactions are guided by the principle of reciprocal exchange (Cropanzano & Mitchell, 2005). According to this theory, people evaluate relationships in terms of costs and benefits, and tend to engage in those interactions that maximize their gains and minimize their losses. In the work context, employees evaluate how they relate to the organization based on what they contribute and receive. Secondly, Human Capital Theory argues that investment in employee's education, training, and building up their skills contributes significantly to the value they bring to an organization (Sweetland, 1996). This theory highlights that workers are assets who possess knowledge, skills and experiences that can increase their productivity and add to the success of the company. In the context of digital transformation, constant updating of human capital skills becomes crucial.

Finally, Contingency Theory has important implications for human resource management and business results (Woodward, 1958). From an HR management point of view, the theory highlights the importance of aligning HR practices with the company's specific technology and organizational structure. This involves selecting, training and developing employees according to the contingent needs of the organization (Delery & Doty, 1996). This theory also affects adaptability: since organizational effectiveness depends on contingent factors, the ability to adapt becomes essential. Human resource management must be flexible to adjust to changes in technology and the environment, allowing the company to maintain its performance. Regarding business performance, theory suggests that by properly aligning the organizational structure and human resource management with technological contingents, business performance can be improved (Woodward, 1958). Effective human resource management contributes to efficiency and effectiveness in the operation of the chosen technology and organizational structure.

During digital transformation, employees may perceive changes in their roles and responsibilities (Blanka et al., 2022). Effective management of this process involves a social exchange where the organization must provide a favourable work environment and benefits, while employees contribute with their commitment and adaptability (Montani et al., 2020). Additionally, digital transformation often involves the adoption of new

technologies and skills (Trenerry et al., 2021). Thus, Human Capital Theory highlights the importance of investing in training and skills development so that employees are equipped to address digital challenges and contribute to organizational success (Schlegel & Kraus, 2023). Since digital transformation is a dynamic and context-dependent process, Contingency Theory suggests that implementation strategies should adapt according to changing conditions (Woodward, 1958). Flexibility in management and decision making is essential to effectively manage digital transformation.

Together, these theoretical perspectives highlight the need to understand and manage social interactions, invest in fostering human capital, and adapt strategies to the specific contingencies of the digital transformation process. Success in this process depends largely on how these interrelated dynamics are managed.

1.2.3.3. Employee behaviours in dynamic environments

In dynamic environments oriented toward digital transformation, employees who exhibit appropriate behaviours are those who show flexibility, adaptability, and a willingness to constantly learn (Weber et al., 2022). The teamwork ability and collaboration on interdisciplinary projects are also essential (Leal-Rodríguez et al., 2014). However, one of the most notable behaviours in this context is an innovative attitude (Guinan et al., 2019). Employees who constantly look for new ways to address challenges, propose creative solutions, and are open to experimentation contribute significantly to success in environments of change and technological evolution (Trenerry et al., 2021). Thus, innovative work behaviour refers to employee competence in generating, developing and putting into practice new ideas and solutions that add value to the organization. It involves creativity, initiative and willingness to take risks in the search for improvements and advancements (West & Farr, 1989).

Innovative employees not only generate ideas, but also actively participate in implementing changes that lead to continuous improvement (Utomo et al., 2023). However, there are different behaviours that employees who are capable of innovating in the company usually adopt and this is something that companies usually take into account when designing their policies and carrying out their human resources practices (Sanz-Valle & Jiménez-Jiménez, 2018). The capacity to anticipate and respond effectively to variations in the business environment is essential to the long-term success of any

organization. In this context, innovative employees become crucial strategic assets (Utomo et al., 2023). The contribution of innovative employees manifests itself in various forms, from the development of improved products and services to the optimization of internal processes (Montani et al., 2020). In the constant search for innovative solutions, these employees become drivers of change, promoting a mindset of continuous improvement throughout the organization (Battistelli et al., 2019). This orientation towards innovation not only allows the company to keep up with changing market demands, but also puts it in an advantageous position against the competition.

Creative problem solving is another key dimension of innovative employee behaviour. Rather than simply addressing challenges conventionally, innovative employees look for novel and creative approaches (Bos-Nehles & Veenendaal, 2019). This ability to think outside the box can lead to more effective and efficient solutions, providing the company with a distinctive competitive advantage. Operational efficiency also benefits significantly from innovation. Innovative employees often identify opportunities to simplify processes, reduce costs, and improve quality (Scott & Bruce, 1994). These operational improvements not only increase profitability, but also strengthen the company's position in the market by offering products or services more efficiently and effectively. Furthermore, the ability to anticipate market needs is a distinctive characteristic of innovation-driven organizations. Innovative employees, by being in tune with emerging trends and changing customer expectations, allow the company to stay ahead of the competition by offering solutions that solve problems before they become apparent to the broader market (Prieto & Pérez-Santana, 2014).

There are, however, some antecedents to these behaviours in organizations. On the one hand, for example, company-provided new technology training plays a crucial role in engendering employees' ingenious work behaviour. By equipping workers with up-to-date skills, the company facilitates the adoption and application of new technologies in their daily tasks, thereby promoting innovation in the workplace (Trenerry et al., 2021). In addition, remote-working can provide a more flexible environment conducive to individual reflection and creativity (Caparrós Ruiz, 2022), while teamwork encourages collaboration and the exchange of ideas, driving collective innovation (Hoegl & Parboteeah, 2007). Furthermore, an objective performance appraisal encourages employees to constantly seek improvement and adopt more innovative approaches to their job responsibilities and leaders who strive for a participative leadership style and support

autonomy also contribute to it (Goswami & Upadhyay, 2019). On the other hand, in terms of the effects on companies, the adoption of this innovative behaviour by employees can result in significant improvements. Improving information capabilities allows the company to stay abreast of the latest trends and technologies (Cepeda-Carrion et al., 2012). Organizational absorption facilitates the successful assimilation of new practices and technologies, while organizational agility enables rapid adaptation to changes in the business environment (Gong & Ribiere, 2023; Si-Meng et al., 2021). Thus, digital transformation is driven by employees with innovative work behaviour, as these individuals are more inclined to propose and adopt advanced technological solutions (Weber et al., 2022).

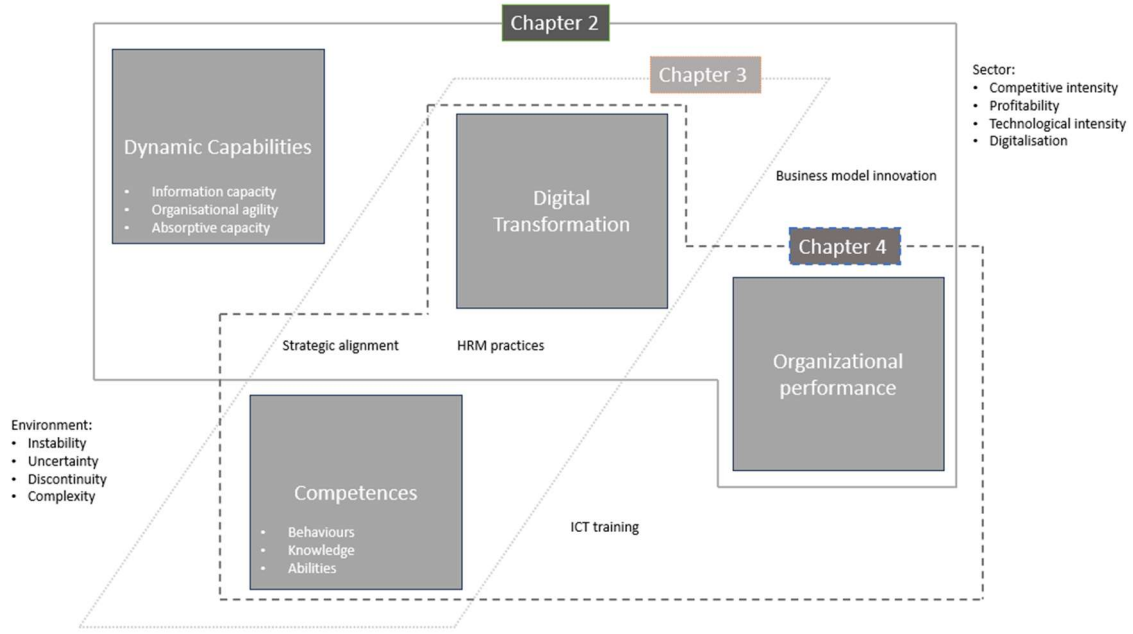
The need to study these antecedents and effects of innovative work behaviour is fundamental to understanding how human resources practices influence a company's ability to innovate and adjust to a constantly changing business environment. Research in this area provides a solid foundation for strategic decision-making in human resource management and allows companies to build up effectual strategies to promote innovation and digital transformation. In addition, it contributes to the creation of more dynamic and continuously viable work environments, improving the competitiveness and ability of companies to face emerging challenges.

1.3. Thesis theoretical model

The theoretical review carried out throughout this chapter has suggested that digital transformation is becoming a fundamental element for companies to survive in the environments described above. However, as a summary, the literature also points out the need for certain dynamic capabilities that must be implemented to launch digitalization processes, among which are organizational agility, information, and absorptive capacity. This analysis would be partially addressed if the human is not taken into account in the motivation and capacity to implement the necessary changes that the application of said digital competencies in digitalization processes entails. It is necessary to bear in mind that companies must develop a series of human resource management practices that indicate and promote the behaviours, knowledge and skills necessary for the new digital framework in which companies operate, acquiring training in new technologies and let the application of the said digital competencies in digitalization processes. This entire theoretical framework is collected in Figure 1.1, which sums up the general model of the

doctoral thesis, which will be addressed through different empirical studies based on more parsimonious models that facilitate and delve into more specific relationships.

Figure 1.1: General theoretical model



The first part of the model corresponds to chapter 2, where it is argued that three dynamic knowledge-based capabilities are key determinants of digital transformation. Absorptive capacity, organizational agility, and information capacity are proposed as critical for companies to not only adopt digital technologies but also use them effectively to innovate and adapt to changing environments. The first one allows companies to assimilate new knowledge and technologies from the external environment, while organizational agility allows them to reconfigure their internal resources to take advantage of these new opportunities. On the other hand, information capacity allows them to efficiently manage and use data for strategic decision making. These capabilities are essential to ensure that companies can remain relevant and competitive over the long term in an ever-evolving business environment. Thus, the choice to focus on dynamic knowledge-based capabilities to study the digital transformation of companies is based on their strategic importance, their flexibility and adaptability, and their focus on the organization's internal knowledge. There is a strong theoretical foundation supporting the role of these capabilities in digital transformation, and understanding how they influence a company's ability to digitally transform is critical to success in today's business environment.

Chapters 3 and 4 refer to the fact that the promotion of employee competencies, knowledge and skills is a crucial aspect to promote the digital transformation process in

companies and improve their organizational performance. To this end, this model suggests that a close collaboration between company management and information technology (IT) departments is essential to ensure that digital transformation is carried out effectively and aligned with business objectives. Furthermore, this model proposes that in the digital age, HR practices must adapt to foster a work environment that promotes innovation, collaboration and employee engagement. This includes implementing training and development programs that help employees acquire the digital skills necessary to adapt to new technologies and work processes. In addition, practices such as teleworking, certain types of leadership that encourage autonomy and creativity, and performance evaluation based on merit and objectives, can improve employee commitment and their willingness to adopt innovative work behaviors. In addition, the model add training provided to employees in relation to new technologies as essential to improve their digital skills and, therefore, their human capital. This allows them to be better prepared to adapt to technological changes, effectively use digital tools in their daily work and contribute more significantly to the company's digital transformation.

By promoting employee competencies and skills and strategically aligning company leadership with IT departments and digital-friendly HR practices, companies can create an environment conducive to digital transformation. This not only improves organizational performance by increasing operational efficiency and innovation, but also strengthens employee engagement and their ability to adapt and contribute to the company's long-term success in an increasingly digitalized and competitive business environment.

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CHAPTER 2:
DYNAMIC CAPABILITIES, DIGITAL TRANSFORMATION AND ORGANIZATIONAL PERFORMANCE

CHAPTER 2: DYNAMIC CAPABILITIES, DIGITAL TRANSFORMATION AND ORGANIZATIONAL PERFORMANCE

2.1. Structured abstract

Purpose: The purpose of this research is to empirically test the relationship between some dynamic capabilities, digital transformation, and company performance, including business model innovation as a mediator.

Design/Methodology/Approach: Surveys were completed by the CEOs of 184 Spanish companies, and their responses were analysed with PLS-SEM methodology.

Findings: Our results highlight that information capability, organizational agility and absorption capability have a direct relationship with digital transformation and that business model innovation partially mediates the link between digital transformation and company performance.

Originality/Value: This study fills an existing gap in the literature by combining some dynamic capabilities, digital transformation, business model innovation and their effects on performance. This results in a unique model and highlights the importance of acquiring knowledge of the environment so that companies can digitally transform and thus obtain excellent results.

Practical Implications: Managers can better understand some organizational routines that allow the company to successfully face a digital transformation process and, in this way, improve company performance.

Keywords: Dynamic capabilities, digital transformation, business model innovation, company performance

2.2. Introduction

The new digital technologies that are currently emerging can make the implementation of digital transformation in companies more difficult because they can make their capabilities and resources obsolete. Thus, in the management of the digital transformation process, it is necessary for a company to pay special attention to the development of

certain capabilities that will allow it to advance in the process, so called dynamic capabilities (Ellström et al., 2021; Matarazzo et al., 2021).

Dynamic capabilities will allow the organization to adapt continuously to changes in the environment, to capture the information that surrounds it, and to recognize new knowledge to apply it to commercial ends (Cohen & Levinthal, 1990). They have been defined as "the ability of an organization and its management to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997), and consist of an array of several skills, processes and routines that allow an organization to orientate corporate strategy to identify new opportunities, capture them and therefore transform the organization (Borcan, 2021).

Some studies (Ellström et al., 2021; Troise et al., 2022) have expressed the importance of dynamic capabilities for companies to achieve digital transformation, however, we have identified a lack of empirical studies on this matter. Digital transformation is a complex and multicausal phenomenon (Hess et al., 2016), which needs special study and understanding at the present time (Kraus et al., 2021; Reis et al., 2018), due to its transversality and current relevance. Most companies have not achieved their transformation goals (Ellström et al., 2021; Ghosh et al., 2022) and we do not know what conditions are necessary for a digital transformation to take place that contributes to the transformation of the company's business model from a perspective that accompanies the dynamism of the environment. Moreover, literature covering digital transformation and innovation management is still scarce and lacks a unified perspective (Appio et al., 2021).

The topic of digital transformation is in an early stage and there are numerous theoretical and qualitative studies, but there are still few quantitative studies (Ellström et al., 2021). Organizations need to know how to develop dynamic capabilities, and for this reason empirical studies are necessary. In this sense, there is a lack of empirical studies on dynamic capabilities and digital transformation, where only conceptual works can be observed (Felsberger et al., 2022; Konopik et al., 2022; Mele et al., 2023) as well as case and qualitative studies (Ellström et al., 2021; Ghosh et al., 2022).

On the other hand, the main goal of digital transformation is the increase in value creation and therefore in performance. The mechanisms under which the companies transform their strategies thanks to dynamic capabilities remain largely unexplored, and more research is needed when analysing changes in business model innovation experimentation

(Bouwman et al., 2019). This problem is of concern because companies want to exploit the full potential and opportunities of digital transformation and do not know what mechanisms to implement so that technology investments translate into better business decisions that deliver value and benefits (Warner & Wäger, 2019). Thus, how companies build dynamic capabilities for digital transformation is a priority strategic issue that still needs to be understood by academics and practitioners (Ellström et al., 2021; Ghosh et al., 2022; Konopik et al., 2022; Mele et al., 2023).

The course of action to address this concern entails studying the micro foundations of digital transformation from a dynamic capabilities perspective that can be translated into practical recommendations for organizations that need to transform themselves (Sousa-Zomer et al., 2020). In this sense, this study contributes to covering the research gaps indicated by Demeter et al. (2021), who note that it is necessary to know more background information on digital transformation, as well as those pointed out by Ghosh et al. (2022) and Ellström et al. (2021), who highlight that it is important to know why companies may be failing in their digital transformation goals. In addition, these authors stress the lack of empirical studies that address the relationship between dynamic capabilities and the digital transformation of companies, to which this work contributes. In the same way, we also provide for the need expressed by Bouwman et al. (2019) regarding how to know the organizational changes which are necessary for the transformation of the business model.

The methodology used is PLS-SEM, which has been employed in other studies about agility, business model innovation and digital transformation, including organizational performance variables (Cegarra-Navarro et al., 2016). In addition, this study follows the research of Teece (2018), which focuses on some aspects of dynamic capabilities as illuminating factors for business model innovation but does not test the effects of this relationship on performance. After the introduction, this chapter continues with a review of the literature which relates and allows us to develop our research model. The following section explains the PLS-SEM methodology and presents a description of the main empirical results and conclusions. The chapter ends with a description of its main limitations and future lines of research.

2.3. Theoretical framework

2.3.1. Dynamic capabilities perspective in digital transformation

The theory of Dynamic Capabilities has its origin in the theory of resources and capabilities (Barney, 1991). Thus, to compete in the market, organizational resources must be valuable, scarce, difficult to imitate and irreplaceable. In a technological context, the way resources are worked and operated is as important as their own value (Borcan, 2021; Ellström et al., 2021), as the possession of technology and resources does not guarantee success today.

For this reason, the dynamic capabilities framework is considered nowadays to be the leading perspective in strategic management (Barreto, 2010). Its main goal is to shed light on the level of heterogeneity among firms that explains differentials in organizational behaviour and performance depending on their ability to identify opportunities, deal with threats, orchestrate resources and effectuate transformations (Teece, 2017b). It goes one step further than the resource-based view theory (Barney, 1991) by extending its static character and emphasizing the need of firms to be able to renew themselves and create new value-oriented strategies (Schreyögg & Kliesch-Eberl, 2007).

The dynamic capabilities theory is especially relevant when talking about innovation and technology (Chirico & Salvato, 2008). Building these capabilities is a 'journey to coherence' that may endure for years, according Leinwand and Mainardi (2010) (p. 91), and ensure that a firm's ordinary capabilities modify themselves over time (Rindova & Kotha, 2001), reconfiguring them according to environment requirements. Dynamic capabilities are broken down in three primary clusters of operations and activities (Teece, 2017a):

- Sensing: activities dealing the identification and assessment of opportunities that match customer needs. It is about handling uncertainty and new opportunities.

- Seizing: mobilization of organizational resources addressing such opportunities to capture value. It consists of identifying relevant gaps and critical missing capabilities to create them.

- Reconfiguring: continuous organizational development and strategy update to integrate new routines and activities for the business model to increase value for customers.

Only in a few cases has the dynamic capabilities framework been used to explain the mechanisms that make an organization take full advantage of digital transformation (Appio et al., 2021; Sousa-Zomer et al., 2020; Vial, 2019) and most previous studies address the impact of digital transformation on dynamic capabilities and not the other way around. However, as Mele et al. (2023) point out, the theoretical foundations of research on dynamic capabilities need to be reviewed because while resolving dynamic capabilities issues after you have digitally transformed your business may make sense in some cases, it is preferable that dynamic capabilities be adopted prior to digital transformation. Especially when today's changing environment could endanger the value of their abilities to compete. Therefore, it is necessary to identify organizational routines that specifically allow digital transformation (Ellström et al., 2021; Ghosh et al., 2022). In fact, dynamic capabilities by themselves do not ensure the competitiveness of the company, so it is necessary to adapt to the environment through a digital transformation process (Ghosh et al., 2022).

Some antecedents and consequences of digital transformation are explained in the academic literature by a series of research hypotheses that we will develop in this section, considering the variables used for our study. Firstly, we will relate how dynamic capabilities such as information capability, organizational agility and absorption capability have an effect in digital transformation. Then, we will explain the mediating role of business model innovation in the relationship between digital transformation and company performance.

2.3.2. Information capability and digital transformation

As stated in the resources and capabilities approach (Barney, 1991), an organization’s competitive advantage lies in managing the capabilities that lead to success and combine the resources needed to create value. This theory is the basis on which the theory of dynamic capabilities explained in the previous section is then built. It is therefore important to talk first about information capability, which plays a key role in fostering other capabilities, such as in this case, digital transformation (Vial, 2019).

Marchand et al. (2000) were the first to propose the concept of information capability, as the ability to deploy information resources, plan and integrate them in the organization framework with the aim of improving business performance (Anandhi S Bharadwaj, 2000). In the model of Marchand et al. (2000), they classify information practices in three groups: information management, information technologies and information culture, where behaviours such as collaboration and open communication play a key role.

Information capabilities are needed to manage business processes, analyse data, and foster communication and collaboration inside and outside the organization (Li et al., 2021). Thus, these dynamic capabilities are facilitators of change, which is why it is thought that they can favour digital transformation, although much focus has been placed in the literature on their impact on company performance (Ghosh et al., 2022). Organizations can transform digitally by creating digital internal and external documentation, through the creation of digital channels of communication with their suppliers, customers, or employees, or by using surveys and metrics to learn about customer satisfaction through increased information capacity. This can be increased using information technologies to streamline business processes or by collecting and analysing business data for better decision making. If companies use information technologies for efficient communication with external business partners or for coordination between departments, they can create WhatsApp groups or an employee portal, a customer relationship software or use digital order forms.

Studies such as Lee and Lee (2004) discuss the importance of information capability for the implementation of technology such as ERP systems. In the context of digital transformation, Park and Mithas (2020) mentioned the great importance of information analytics capability, especially in our current times, where companies need these skills to handle all the data (Vial, 2019). In this sense, dynamic knowledge-based capabilities help companies cope with change and overcome organizational barriers to digital transformation by leveraging digital knowledge within companies (Mele et al., 2023). Nwankpa and Roumani (2016), for their part, stated that a positive relationship between information capabilities and digital transformation can be detected by taking advantage of digital opportunities. Organizations can create digital transformation by redesigning and rethinking existing business processes and transforming products and services if they have the capabilities to support it. This leads us to establish our first research hypothesis:

H_1: *Information capability* is positively associated with *digital transformation.*

2.3.3. Organizational agility and digital transformation

In today's changing technological environment, organizations need to modify their traditional processes, structures and management towards more agile management processes and practices. Flexibility is defined as the ability of a system to meet rapidly changing needs and other external stimuli in a cost-effective manner without compromising the quality of products and services. It allows companies to reconfigure processes, applying new resources and procedures and this is essential for designing new organizational structures (AlNuaimi et al., 2022).

As a result of this, organizational agility appears today as a critical issue for the success and survival of companies (Felipe et al., 2016; Gong & Ribiere, 2023). It is defined as the ability of a company to identify unexpected changes in the environment and respond quickly and efficiently by using and reconfiguring internal resources, thus obtaining a competitive advantage in the process (AlNuaimi et al., 2022).

Organizational agility is one of the key skills in competition today due to the ability that is generated to detect both threats and opportunities and anticipate them by responding with the necessary changes and actions to be taken (Felipe et al., 2020), playing a key role in enabling organizations to respond to the challenges of an increasingly dynamic and unpredictable environment (Borcan, 2021). Moreover, organizational agility is key for the sensing process detailed before in the dynamic capabilities' framework. Agility also enables the development of innovation capabilities (Altay et al., 2018), and is composed of the process of sensing or scanning the environment, plus the process of responding or mobilizing resources to transform organizational capabilities. The flexibility required to compete in the context of digital transformation is far superior to that of traditional organizations. The same applies to speed and agility, as companies need to be open to change, to transformations in the market and in customer needs, and to use new technologies in an agile way (Weritz et al., 2020).

The digital transformation process is very demanding in terms of the capacity of an organization to adapt to the new situation, to have success, it requires its members to be able to generate and share new ideas and to be willing to take risks and experiment. Agility in an organization's workforce, operations, and network produces this behaviour and it also enables the necessary internal changes in both the formal and informal

procedures to allow organizations to transform more effectively with a greater likelihood of achieving their intended transformation objectives (Gong & Ribiere, 2023).

Thus, one of the goals of a company is to innovate in the form of new products, services or businesses and organizational agility contributes by providing swift and flexible responses to changes and through rapid execution or implementation of operations. These capabilities-driven outcomes (e.g., business model innovation, radical changes in offerings, competitive advantages, etc.) are at the core of digital transformation. Companies are continually looking for change as an opportunity to be more profitable, they implement decisions to react to market changes and anticipate the needs of customers, suppliers and employees in an agile way and this leads them to create their own tools for the digital transformation, such as the use of dashboards with the results of the company or digital metrics that allow them to measure customer satisfaction.

Agility has already been identified by information systems literature as a crucial antecedent for digital transformation (Tallon et al., 2019; Vial, 2019), because it will provide a firm with the ability to rapidly detect and make use of new opportunities to achieve a degree in which a company could be considered somehow digital-based (Gerster et al., 2020; Tallon et al., 2019). In addition, Mele et al. (2023) have also pointed out that dynamic capabilities are necessary to successfully implement the changes that characterize digital transformation and generate new insights for digital transformation and, in this sense, organizational agility enhances big data analytics, which is also highly valuable for identification of opportunities and threats (AlNuaimi et al., 2022; Barlette & Baillette, 2022).

Therefore, we pose the second research hypothesis:

H_2: *Organizational agility* is positively associated with *digital transformation.*

2.3.4. Absorptive capacity and digital transformation

There are continuous opportunities both in the environment and within the organization itself, such as intangible resources or new technologies, which if they are absorbed or acquired by companies can constitute a competitive advantage.

In this sense, companies develop an absorptive capacity that is part of dynamic capabilities (Božič & Dimovski, 2019). This was defined by Cohen and Levinthal (1990)

(p. 128) as "the ability of recognizing new external knowledge, assimilating and applying it to commercial ends". In addition, Zahra and George (2002) raised the *PACAP-RACAP model*, which joins together the potential absorption capacity (knowledge acquisition and assimilation) and the realized absorption capacity which implies knowledge transformation and exploitation (Leal-Rodríguez et al., 2014).

Likewise, absorption capability is a set of dynamic organizational routines and processes which play a key role in organizational learning (Zahra & George, 2002). It is in the field of knowledge management where the concept emerges as the ability of a firm to acquire insights from its external environment (Cohen & Levinthal, 1990). For this reason, it represents an important part of a firm's competences to create new expertise, which enables better business performance by incorporating new knowledge into existing prior know-how (Lane & Lubatkin, 1998). Some of the attributes that influence an organization's dynamic absorptive capacity are the intensity, speed, and direction of learning acquisition routines (Zahra & George, 2002).

Moreover, knowledge is a key intangible asset in any process of evolution and growth, and even more so in the process of digital transformation. However, some findings show that it influences digital transformation trough the early detection of new opportunities (Weritz et al., 2020), but the literature has not empirically addressed how the absorptive capacity influences digital transformation. The latter implies a configuration of resources that includes organizational knowledge (Mele et al., 2023), therefore, the absorption capacity of companies influences their ability to transform digitally (Ferreira et al., 2019). For example, companies seek and are constantly acquiring new knowledge and skills in the market, which allows them to have people prepared to introduce new technological elements into their products or services offered to customers. They also search for and are constantly acquiring technologies, to employ them in their production process, as well as register and store the newly acquired knowledge in the market for future use.

Although to our knowledge there is a lack of empirical studies that explain how absorption capacity allows the digital transformation of companies, there are studies with similar concepts that can guide us. For example, García-Sánchez et al. (2018) point out that potential absorptive capacity influences realized absorptive capacity, which affects organizational innovation and organizational performance. The empirical results of the study carried out Khan and Tao (2022) reveal a positive relationship between the knowledge absorption capacity, agility and innovation performance of companies

mediated by big data analysis and digital platform capability. Finally, the study of Müller et al. (2021) indicates that the acquisition, assimilation, transformation and exploitation of environmental knowledge allows companies to participate in both exploratory and exploitative innovation strategies, that enable the design of new business models adapted to Industry 4.0.

In light of the above, we derive the third research hypothesis:

H_3: *Absorption capability* is positively associated with *digital transformation.*

2.3.5. Digital transformation, business model innovation and company performance

Business model innovation is defined by Zott and Amit (2010) (p.2) as the "way of designing a new or modifying the firm's extant activity system". It is considered by several authors as an ongoing learning process (Sosna et al., 2010) and a 'trial-and-error-based process' rather than an analytical approach (McGrath, 2010). It is also recognized as a dynamic process where companies try to maintain their competitive advantage by modifying activities and functions within their business models.

The exploration of new opportunities is the first stage when talking about business model innovation, that consists of analysing challenges and evaluating new sources of competitive advantage in the environment. Then comes their exploitation by creating value. Finally, the effects measurement is key to evaluating and readapting the strategy. This approach complements the dynamic capabilities theory by addressing the question of how to explore and exploit opportunities. Therefore, in combination they create a strong theoretical framework where business model innovation could be studied and explained (Schneider & Spieth, 2014). Companies are changing the way they distribute their products or services through the creation of new online channels. Their cost mechanisms change thanks to an organizational structure that allows them to transform digitally, as well as their income mechanisms, the logic of how income is generated, and their offer of products or services change thanks to the introduction of digital technology in the product or service offered. Thus, the market position of companies is changing due to elements of digital transformation.

Business model innovation has become one of the main key points to increase performance in organizations. In this sense, emerging technologies have a great impact on business model innovation (Ghosh et al., 2022) and companies, by innovating their

business models, firms can also gain competitive advantage, as business models are hard to replicate and might result in a firm's sustainable profitability (Bouwman et al., 2019). In fact, many companies have increased their market share by improving cost and revenue mechanisms or by introducing digital components into the products or services offered to customers. In addition, they have entered new markets thanks to changes in the distribution channels or by introducing digital components into their products or services, the quality of which has been improved thanks to the modification of the architecture of value creation. There are also companies that have been improving their brand image or reputation in recent years because the positioning of products and services in the market has changed, as well as being able to offer more products and services thanks to a better understanding of customer needs, through surveys, digital customer satisfaction metrics or the use of technologies such as Big Data.

On the other hand, it has been stated in the literature that one of the most desired effects of digital transformation is to be able to compete in the market and get an increase in performance (Hess et al., 2016; Tallon et al., 2019; Weritz et al., 2020). Thus, when companies choose to adopt a digital transformation strategy, it has to be based on their needs and objectives. By doing so, organizations can improve their results and make their processes more efficient (Ukko et al., 2019; Zhai et al., 2022). Therefore, considering digital transformation as a long-term investment can improve companies' performance (Teng et al., 2022; Zhai et al., 2022). Thus, dynamic capabilities provide a consistent approach to study digital transformation, due to the impact that digital technology has on the performance of companies (Ellström et al., 2021). In fact, it has been noted that digital transformation improves companies' communication and saves costs (Teng et al., 2022; Zhai et al., 2022), for example, through the implementation of Enterprise Resource Planning (Guo & Xu, 2021). In fact, digital transformation is associated with improvements in several measures of company performance, such as innovation, financial performance, growth, reputation or competitive advantage (Vial, 2019). Wang et al. (2022) focus on the impact of Big Data, artificial intelligence and blockchain and point out that they improve cost savings, operational efficiency, innovation and performance. Furthermore, Guo and Xu (2021) affirm that new product development is sped up by using 3D printing, one of the latest evolutions produced by digital transformation. Thus, Wang et al. (2022) and Zhai et al. (2022) conclude that digitally transformed companies perform better than those that have not started the process yet.

As said before, digital transformation is what allows companies to create new business models, which are enabled and transformed by technological progress and digital technologies (Kutzner et al., 2018; Teece, 2018). However, the digital transformation itself is sometimes not enough to make an effective impact on company performance (Teng et al., 2022; Vogelsang et al., 2018). In addition, business model changes are a core capability for digital transformation being effective in performance results, according to diverse qualitative and quantitative studies (Ellström et al., 2021; Ghosh et al., 2022). Therefore, business model innovation mediates this relationship and increases the impact of digital transformation, fulfilling expectations for enhanced performance.

From the academic literature exposed above, we state the last research hypothesis:

H_4: *Business model innovation* mediates the relationship between *digital transformation* and *company performance.*

2.4. Methodology

2.4.1. Data collection and sample

We started the process of data collection through the managers of several entrepreneurs' organizations that provided feedback about the best wording of the questionnaire and the most appropriate order of the questions. They also informed their members about the project. An electronic survey was carried out in February 2020, an email was sent to 947 firms affiliated to the principal business associations in the area and with more than ten employees in Spain. These companies were selected following the Spanish Classification of Economic Activities (CNAE), we included firms from the code C "Manufacturing industry", but also from other codes (particularly code A, "Agriculture", due to the wide diffusion of export food-processing companies in the area).

The SABI ("Sistema de Análisis de Balances Ibéricos") database was used to ensure that the final sample properly represented the population regarding their business, dimension, and geographical location. The questionnaire was aimed at CEOs, as the constructs considered in the model require a broad vision of a firm. Study purpose, data acquisition procedure and privacy statement were explained through a cover letter. In the end, we obtained 184 valid responses, with a 19% response rate.

2.4.2. Measures

Seven-point Likert scales have been used for all measurements. All the scales used were translated into Spanish to send the questionnaires to the CEOs and then back translated into English. The questionnaire included the following scales:

Information capability is measured with four items generated based on previous works on information technology capability (Chen et al., 2009; Wu et al., 2006). One of the items used in the executive survey was: "The use of information technology is useful for collecting and analysing business data for better decision making".

This study measures *organizational agility* using items adapted from Lu and Ramamurthy (2011). One of the items used in the executive survey was "We have the ability to respond quickly to customer needs".

Regarding *absorption capability*, the scale is based on existing items of Szulanski (1996) and Jaworski and Kohli (1993). One of the items used in the executive survey was "We are proficient in integrating newly acquired knowledge into current ways of doing things".

Digital transformation is measured using a practical adaptation of the work of Verhoef et al. (2021). One of the items used in the executive survey was "My company uses digital components in the product or service offered to customers". After the filtering process, two items were erased.

This study measures *business model innovation* with the Spieth and Schneider (2016) measure. One of the items used in the executive survey was "In the last three years our company has changed the internal value creation activities". After the filtering process, one item was erased.

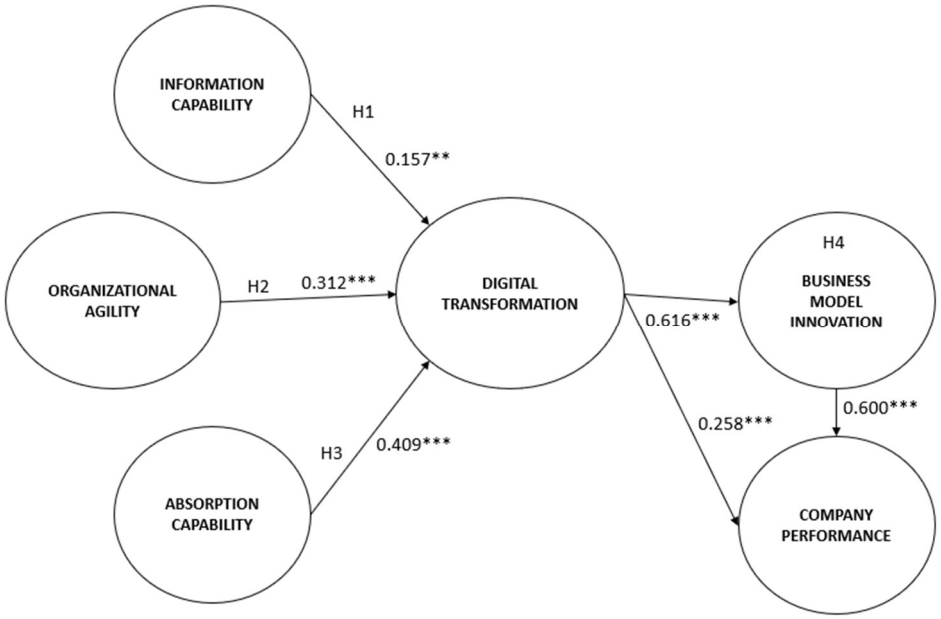
Company performance is measured with Ferreira et al. (2019). One of the items used in the executive survey was "In the last three years our company has increased the market share".

All variables are design constructs, resulting from theoretical thinking, therefore they are studied as Mode A composites (Henseler, 2017; Henseler, Ringle, et al., 2016a). This implies the indicators of a given construct share a common source and they should be strongly correlated.

2.4.3. Data analysis

We tested the structural equation model (SEM) outlined in Figure 1 using the partial least squares (PLS) technique (Henseler, Ringle, et al., 2016a) implemented in SmartPLS 4.0.9.2. Due to the novelty of the model, we used PLS as an exploratory approach, which is on the five types of research for which PLS can be used, according to (Henseler, 2018). One of the advantages of this method is that it is robust in terms of deviation from normality. However, it is advisable to avoid using indicators with severe deviations from normality. Therefore, both excess kurtosis and skewness were computed for the forty-seven indicators. Only in three cases was the standard limit of 2.0 (in absolute terms) surpassed. Therefore, we opted for not excluding anyone in the next step.

Figure 2.1: Results of the structural model



Note: *p < 0.05; **p < 0.01; ***p < 0.001

Based on the nature of composite constructs we should expect each indicator to be strongly correlated with its construct with values equal or higher than 0.707, as this value implies that the correlation of the indicator with the construct is higher than the value explained by the error (the square of 0.707 is 0.500). Because the constructs are reflective, dropping a few indicators does not alter the meaning and validity of a construct. Two items were removed from the digital transformation construct, as they had very low

individual indicator reliability (0.345 and 0.626); another one was removed from the business model innovation construct (0.631). The final items used, after confirmatory factor analysis, are presented in Table 2.1.

Table 2.1 shows the results of the tests applied to assess the reliability and validity of the composites. All the individual indicator reliability values were higher than 0.7 (Wynne W Chin, 1998), but one in the BMI construct (0.688); however, we opted for maintaining it as it was close to the threshold and did not interfere in the others results. All composite reliability (SCR) values were higher than 0.7 (Bagozzi & Yi, 1988), similarly in the case of Cronbach's Alpha values (Roldán & Sánchez-Franco, 2012) and ρ_α (Dijkstra & Henseler, 2015), which is a consistent reliability measure. The Average Variance Extracted index (AVE) (Fornell & Larcker, 1981), for convergent validity, provides values for all the constructs above the 0.5 threshold (Bagozzi & Yi, 1988). All these results were confirmed when using the t-statistics obtained after applying bootstrapping.

Table 2.2 shows two tests for discriminant validity. The aim is to show that the indicators of one construct are more closely linked to their theoretical construct than to the others. In bold on the diagonal, the square root for each AVE is displayed and the values exceed the correlation with any other latent variable (values under the diagonal), confirming that discriminant validity holds (Fornell & Larcker, 1981). The heterotrait-monotrait (HTMT) criterion requires that the diagonal values should be lower than 0.85 (Henseler et al., 2015), the values above the main diagonal fulfilled this threshold. As before, similar conclusions are obtained when using bootstrapping. Thus, all the constructs are reliable.

Table 2.1 also shows the R^2 for the three dependent variables and the prediction power of the model, Q^2. Both are general indicators of the explicative power of the model using the sample, but they do not provide information about the validity of the model when applied to a different sample. We follow Danks and Ray (2018) and Shmueli et al. (2019) to assess the predictive power of our model. The procedure implies using a training sample to estimate the parameters of the model and a holdout sample, not used. The parameters estimated with the training sample are then applied to the out of sample data in order to generate predictions of the dependent constructs. If the difference ($Q^2_{predict}$) between the real values of the holdout sample and the estimated ones is small, then the model has a good predictive power.

Table 2.1: Measurement and factor loading

Constructs	Measures	Loadings	Standard deviation	T-values	Reliability and model adjustment [a]
Information Capability	Indicate the degree to which the use of information technology is useful for (1 = Strongly disagree; 7 = Strongly agree)				
	1. Streamline business processes	0.905	0.020	44.665	Cronbach α = 0.919
	2. Collect and analyze business data for better decision making	0.899	0.027	32.818	ρ_α = 0.924
	3. For efficient communication with your external business partners.	0.913	0.018	49.648	SCR = 0.943
	4. For coordination between departments.	0.872	0.029	29.775	AVE= 0.805
Organizational Agility	In our company (1 = Strongly disagree; 7 = Strongly agree)				
	1. We have the ability to respond quickly to customer needs.	0.825	0.030	27.301	
	2 We have the ability to quickly adapt production to changes in dema	0.809	0.044	18.375	
	3 We have the ability to quickly deal with supplier issues.	0.855	0.027	31.852	Cronbach α = 0.941
	4 We quickly implement decisions to react to market changes	0.920	0.012	74.261	ρ_α = 0.947
	5. We continually look for ways to reinvent or redesign our company	0.878	0.018	47.598	SCR = 0.952
	6. We see market changes as opportunities to improve the profitability of the company.	0.885	0.017	52.502	AVE= 0.737
	7. We have a flexible organizational structure that allows us to face the changes derived from digital transformation	0.835	0.025	33.564	
Absorption Capability	In our company (1 = Strongly disagree; 7 = Strongly agree)				
	1. We often seek new knowledge and skills outside of the company (for example, through courses, attending events, etc.).	0.867	0.024	35.498	Cronbach α = 0.946
	2. We record and store newly acquired knowledge for future use (for example: information acquired at events, courses, etc.)	0.881	0.024	36.871	ρ_α = 0.949
	3. We analyze the usefulness of the new external knowledge for our existing knowledge.	0.943	0.010	96.900	SCR = 0.959
	4. We are proficient in integrating newly acquired knowledge into current ways of doing things.	0.932	0.012	78.199	AVE= 0.824
	5. We constantly consider how to exploit newly acquired knowledge, skills and technologies.	0.912	0.015	62.138	
Digital Transformation	Our company uses: (1 = Little use; 7 = Much use)				
	1. The business strategy has been designed taking into account digital technology	0.716	0.046	15.725	Cronbach α = 0.930
	2. Digital components in the product or service offered to customers	0.744	0.038	19.371	ρ_α = 0.934
	3. Digital channels of communication with employees: employee portal, email or whatsapp groups, digital newsletter,etc.	0.779	0.034	22.704	SRC = 0.940
	4. Communication channels with suppliers.	0.800	0.030	26.256	AVE= 0.588
	5. Digital order forms	0.750	0.044	17.167	R^2= 0.565
	6. Digital applications for internal financial statements or Blockchain	0.715	0.039	18.171	Q^2= 0.546
	7. Internal and external digital documentation	0.846	0.023	37.349	
	8. Big Data analysis of information	0.737	0.039	19.112	
	9. Digital surveys to measure customer satisfaction	0.737	0.041	17.828	
	10. Digital metrics to measure customer satisfaction: Visits to the web, visits to digital channels, interactions on social networks, etc.	0.791	0.032	24.503	
	11. Dashboard on company results	0.810	0.028	29.402	
Business Model Innovation	In your company, during the last 3 years, they have changed: (1 = Strongly disagree; 7 = Strongly agree)				
	1. The offer of products and services	0.774	0.031	24.660	Cronbach α = 0.943
	2. Its position in the market	0.819	0.028	28.839	ρ_α = 0.950
	3. The main competencies and resources	0.831	0.031	27.022	SRC = 0.951
	4. Internal value creation activities	0.793	0.046	17.144	AVE= 0.638
	5. The role and participation of suppliers and customers in value creat	0.751	0.037	20.016	R^2= 0.380
	6. Distribution	0.688	0.055	12.453	Q^2= 0.416
	7. Income mechanisms	0.794	0.034	23.137	
	8. Cost mechanisms	0.775	0.036	21.451	
	9. The value proposition towards customers	0.879	0.018	49.805	
	10. The value creation architecture	0.873	0.018	49.794	
	11. The logic of how income is generated	0.790	0.033	23.592	
Company Performance	In your company, during the last 3 years: (1 = Strongly disagree; 7 = Strongly agree)				
	1.Has increased market share	0.817	0.036	22.501	Cronbach α = 0.897
	2. You have entered new markets	0.817	0.038	21.519	ρ_α = 0.905
	3. The brand image or reputation has improved	0.886	0.028	31.506	SRC = 0.924
	4. The quality of the service or product has increased	0.909	0.016	57.138	AVE= 0.710
	5. The range of products or services offered has increased	0.776	0.046	17.031	R^2= 0.616
					Q^2= 0.440

[a]: ρ_α (Dijkstra and Henseler, 2015). SCR: Scale composite reliability. AVE: Average variance extracted. Model adjustment: R^2 for the three dependent variables; Q^2 is the prediction power of the model.

Table 2.2: Correlations matrix and reliability

Constructs	*Correlations*					
	1	*2*	*3*	*4*	*5*	*6*
1. Information capability	**0.897**	0.298	0.372	0.41	0.295	0.276
2. Organization agility	0.277	**0.859**	0.841	0.715	0.721	0.771
3. Absortion capability	0.346	0.806	**0.907**	0.751	0.669	0.714
4. Digital transformation	0.384	0.684	0.714	**0.767**	0.645	0.674
5. Business model innovation	0.282	0.692	0.642	0.616	**0.799**	0.811
6. Company performance	0.252	0.722	0.664	0.627	0.758	**0.843**

Notes: Diagonal elements (bold figures) are the square root of the variance shared between the constructs and their measures. Below diagonal elements are the correlations between constructs. Above diagonal elements are the Heterotrait-Monotrait Ratio (HTMT) values.

The minimum size of the holdout sample is 30, therefore we divided the sample in 5 folds; four folds are used for the training part and the fifth constituted the holdout sample. The process is repeated 10 times. For each indicator, we should expect a $Q^2_{predict}$ negative. We follow Shmueli et al. (2019) to choose how to measure the prediction error depending on the skewness of the prediction error of an indicator. There are twenty-seven indicators in the dependent constructs, only two of them are not symmetrically distributed (indicators three and four of Company Performance). At the indicator lever, the $Q^2_{predict}$ is computed as $Q^2_{predict}$ = 1- (Error measure of the PLS model/Mean value of error measures when using the training sample), therefore a positive value indicates the PLS model's prediction error is smaller than the benchmark. A second more complex approach implies using a Linear Model (LM) using all the exogenous indicators to predict each indicator of the endogenous construct; then, the error prediction of the PLS model is compared against the one obtained by the LM, if $PLS_{error} < LM_{error}$, then for that indicator the out-of-sample predictive power is good.

Table 2.3 shows the prediction summary for the indicators of digital transformation, business model innovation and CP. All $Q^2_{predict}$ are positive (third column). The next step is to compare the error prediction of the PLS model against the error prediction of the LM. We observe that for digital transformation all differences are negative; for business model innovation, 73% of the indicators have a good predictive power and for corporate performance 60%. Therefore, following Shmueli et al. (2019), the model has a high predictive power for digital transformation and a medium predictive power for business model innovation and corporate performance. This implies that the model is not dependent of the specific data used and can be used in other setups.

Table 2.3: Predictive power at the indicator level.

	Skewness	Q^2 predict	$PLS\text{-}SEM_{error}$ minus LM_{error}
DT 01	-0.281	0.382	**-0.049**
DT 02	-0.377	0.262	**-0.101**
DT 03	-0.781	0.271	**-0.118**
DT 04	-0.449	0.241	**-0.151**
DT 05	-0.668	0.210	**-0.092**
DT 06	-0.237	0.214	**-0.120**
DT 07	-0.567	0.478	**-0.074**
DT 08	-0.316	0.239	**-0.107**
DT 09	-0.292	0.327	**-0.088**
DT 10	-0.520	0.405	**-0.105**
DT 11	-0.404	0.418	**-0.076**
BMI 01	-0.397	0.269	**-0.029**
BMI 02	-0.638	0.252	**-0.086**
BMI 03	-0.711	0.279	0.027
BMI 04	-0.523	0.263	**-0.009**
BMI 05	-0.511	0.251	**-0.043**
BMI 06	-0.423	0.157	**-0.095**
BMI 07	-0.420	0.201	**-0.053**
BMI 08	-0.302	0.185	**-0.030**
BMI 09	-0.915	0.392	0.076
BMI 10	-0.498	0.365	0.043
BMI 11	-0.569	0.256	**-0.025**
CP 01	-0.504	0.253	**-0.074**
CP 02	-0.862	0.251	**-0.013**
CP 03*	-1.065	0.424	0.069
CP 04*	-1.044	0.398	0.045
CP 05	-0.773	0.224	**-0.025**

Note: Negative values highlighted in bold. An * indicates that due to excessive skewness, Mean absolute error is used to measure the prediction error of both PLS-SEM and a Linear Model (LM), in the rest of the cases Root mean square deviation is used.

An alternative way of assessing the predictive power of the model consists of focusing on the structural model, rather than at the construct level as before. We use a Cross Validated Predictive Ability Test (CVAT), following Liengaard et al. (2021). Our interest lies on the whole model rather than in a specific construct; this research is not proposing a new construct, as the ones employed have been used in multiples papers, rather we focus on the way they interact. Therefore, it is coherent to focus on the predictive power of all the endogenous constructs. The first step compares prediction power of the model against using the indicator averages (IA): If the difference is significantly negative, then the IA prediction error is larger than those of the model and we can proceed to a second step, where the comparison is against the prediction power of a LM; again, the alternative hypothesis is that the value is negative.

Table 2.4 shows the average loss difference and the t-statistic for each construct and the overall model (we include the result for the constructs just for informative purposes). Using both the IA or the LM benchmark the CVPAT difference is significantly negative. Again, this implies that the model can be used for a sample different to the one employed in this thesis.

Table 2.4: Predictive power at construct and overall model.

	PSL-SEM minus Indicators average		PSL-SEM minus Linear model	
	Average loss difference	**T values**	**Average loss difference**	**T values**
DT	-1.085	5.446	-0.321	3.971
BMI	-0.696	5.589	-0.066	0.916$^{\text{non sig.}}$
CP	-0.759	5.359	-0.053	0.506$^{\text{non sig}}$
Overall model	-0.867	6.216	-0.168	3.153

2.5. Results

The structural model resulting from the PLS-SEM analysis is summarised in Figure 2.1. The stability of the estimates is examined by using the t-statistics obtained from a bootstrap test with 10.000 resamples. All the hypothesised relationships are significant, and, therefore, the hypotheses are supported.

Hypothesis 1 is accepted because, as can be seen in Table 2.5, there is a positive relationship between the information capability of companies and digital transformation ($\beta = 0.157$, $p<0.01$). This means that streamline business processes, collect and analyse business data for decision making, efficient communication with their external business partners or good coordination between departments, contribute to the successful digital transformation of the company. This result confirms those of the previous study of Nwankpa and Roumani (2016), who stated that there is a positive relationship between information capabilities and digital transformation.

Table 2.5: Structural model

Paths	*Standardized coefficient*	*Standard deviation*	*Confidence interval*		*VIF*
			5%	*95%*	
		Direct effects			
Information Capability -> DT	0.157**	0.056	0.069	0.254	1.136
Organizational Agility -> DT	0.312***	0.095	0.156	0.470	2.857
Absorption Capability -> DT	0.409***	0.097	0.243	0.563	2.997
DT -> BMI	0.616***	0.055	0.524	0.705	1.000
DT -> CP	0.627***	0.056	0.145	0.367	1.612
Business Model Innovation -> CP	0.600***	0.059	0.502	0.695	1.612
		Indirect effects			
Information Capability -> BMI	0.097**	0.034	0.043	0.154	
Information Capability -> CP	0.099**	0.034	0.044	0.156	
Organizational Agility -> BMI	0.192**	0.064	0.091	0.304	
Organizational Agility -> CP	0.195**	0.063	0.094	0.301	
Absorption Capability -> BMI	0.252***	0.066	0.145	0.361	
Absorption capability -> CP	0.256***	0.070	0.143	0.372	
Digital Transformstion -> CP	0.369***	0.049	0.295	0.457	

Note: ***p <0.001 **p <0.01 *p <0.05; Bootstrapping based on n = 10.000 subsamples. VIF: Variance inflation factor.

Secondly, hypothesis 2 is accepted because organizational agility also has a positive impact on the digital transformation of the companies ($\beta = 0.312$, $p < 0.001$); therefore, if a company can respond quickly to the needs of production, suppliers, customers or market changes, it will be able to face the process of organizational change that digital transformation implies. This result confirms the theories of Vial (2019) and Tallon et al. (2019), which establish a positive relationship between both variables. Thirdly, the existence of a significant direct effect on the relationship between absorption capacity and digital transformation is verified ($\beta = 0.409$, $p < 0.001$) and shows an acceptance of hypothesis 3. This highlights that a company that often seeks new knowledge and skills outside the company and constantly consider how to exploit newly acquired knowledge, skills and technologies can carry out an effective digital transformation. This result is in line with the finding of Müller et al. (2021), who indicates that the acquisition, assimilation, transformation and exploitation of environmental knowledge allows companies to participate in both exploratory and exploitative innovation strategies, which allow the design of new business models that adapt to Industry 4.0.

Finally, we found the existence of significant relationships between digital transformation and business model innovation ($\beta = 0.616$, $p < 0.001$), as well as between business model innovation and company performance ($\beta = 0.600$, $p < 0.001$), so hypothesis 4 is also accepted. In addition, our results show evidence on the partial mediation of business model innovation ($\beta = 0.369$, $p < 0.001$) in the relationship between digital transformation and company performance. This highlights that by obtaining a digital strategy, resources and metrics and the change towards a more flexible organizational structure that allows digital transformation, it is possible to improve the way of doing business, brand reputation, enter new markets and have better financial results. At the same time, it can also influence in that the company has modified the mechanisms of costs and income, the distribution of the product or service, the offer of products or services or the logic of how income is generated.

2.6. Discussion, implications, and conclusions

2.6.1. Discussion and implications

In an environment of digital transformation of society and business in what is called the era of Industry 4.0, it is necessary for companies to acquire knowledge of the environment

and integrate it into their organization, so that together with their resources and skills they can remain competitive.

The objective of this study is to empirically test the relationship between some dynamic capabilities, digital transformation, and company performance, including business model innovation as a mediator. Thus, we contribute to covering the research gaps indicated by Demeter et al. (2021), who point out that it is necessary to know more background information on digital transformation, as well as those pointed out by Ghosh et al. (2022) and Ellström et al. (2021), who point out that it is important to know why companies may be failing in their digital transformation goals. In addition, these authors point to the lack of empirical studies that address the relationship between dynamic capabilities and the digital transformation of companies, to which this work contributes. In the same way, we also contribute to the need expressed by Bouwman et al. (2019) regarding to know the organizational changes necessary for the transformation of the business model.

First of all, the results of our analysis point out that information capability, organizational agility and absorption capability have a positive impact on digital transformation of companies. Secondly, our results are also in line with the dynamic capabilities theory (Teece, 1997) due to in the current environment, both the exploration and exploitation of opportunities in the environment are conditioned by the digital transformation process in which companies are immersed, and which is a necessary condition for survival in the market (Jafari-Sadeghi, 2021). In fact, this study is the first that shows how information capability, organizational agility and absorption capability has a positive impact on digital transformation through an empirical approach. Thus, we contribute to the dynamics capabilities theory by demonstrating that these capabilities are positively related to digital transformation as a unique construct, and not only in a specific technology or aspect of digitalization.

Thirdly, after the validation of the fourth hypothesis, companies can learn about some more mechanisms for technology to improve business benefits (Warner & Wäger, 2019). Specifically, we see how if companies undergo a digital transformation, they can modify their business models to compete in today's rapidly changing market and, in this way, improve their performance. The confirmation of hypotheses 4 also answers the need to know the effect of digital transformation and company performance. Thus, we address the shortage of empirical literature about the effect of digital transformation on company performance that authors such as (Verhoef et al., 2021) had previously pointed out.

Furthermore, we deviate from other studies (Guo & Xu, 2021), which use a narrow definition of digital transformation linked to a particular digital technology and its impact on a certain definition of firm performance, financial outcome. On the contrary, we widen the field by considering the whole digital transformation process and its impact on the overall organizational performance. By doing so, we measured the direct effect of digital transformation on organizational performance in an easier and more reliable way than previous studies did. Moreover, digital transformation was measured using a recently validated scale whilst previous research typically used case studies.

Finally, the study finds that business model innovation has a partial mediating role in the relationship between digital transformation and company performance, responding to the need to investigate the role of digital transformation in directly or indirectly affecting interrelationships among the business model components, how digital transformation enables new revenue models and empirically testing the impact of digital-enabled business model innovation on firm's performance (Ancillai et al., 2023).

Regarding the practical implications, as Ghosh et al. (2022) point out, managers need to know some core dynamic capabilities for digital transformation. So they, through this work, have more knowledge about how to measure organizational agility through specific routines and digital transformation, and, in this way, they can relate both, something that had been expressed as necessary by authors such as Gong and Ribiere (2023). The same happens with routines specific to IT capacity or absorption capability.

Managers should incorporate new digital elements into their products, use new technologies such as Big Data or Blockchain in their operations, or introduce digital metrics to change the logic of how their income is generated. Thus, they can improve their performance through entering new markets, increasing their market share, creating new products or services and improving their quality or improving their brand image and reputation by being more oriented to the current market.

2.6.2. Conclusions, limitations, and future research

This research contributes to ascertaining whether companies are failing in their digital transformation goals because business managers need to know some core dynamic capabilities for digital transformation. In addition, we cover the gap in the literature on the lack of empirical studies that address the relationship between dynamic capabilities and the digital transformation of companies. It also contributes to determining the

organizational changes necessary for the transformation of the business model. However, although this research provides significant progress in the study of the relationship between some dynamic capabilities and digital transformation, we are aware that there are limitations which should be discussed.

Multilevel and longitudinal studies are needed to know the point of view of employees and to consider the effects that dynamic capabilities may have in the medium and long term. In addition, it would be desirable to incorporate new variables into the organizational level model. For example, studying the strategy or the human resource practices that favour dynamic capabilities would be interesting. Also knowing the effect of digital transformation on other types of innovation from a perspective of dynamic capabilities and aspects such as organizational culture or product innovation could be combined to determine their effect on company performance and more research on business model innovation experimentation is needed (Bouwman et al., 2019). For example, it would also be necessary to analyse the innovation paths of the business model to see how digital transformation works in relation to certain technologies, whether with a focus on business growth or profitability.

Finally, it would be interesting to ascertain the impact of other dynamic capabilities on the processes of digital transformation besides those included in this research and adding the moderating role of the size or age of the company could advance this field in a relevant way, since we could find out how small companies behave with respect to large ones or newly created companies with other more mature ones.

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CHAPTER 3:
THE ROLE OF HUMAN RESOURCE PRACTICES IN THE IMPLEMENTATION OF DIGITAL TRANSFORMATION

CHAPTER 3: THE ROLE OF HUMAN RESOURCE PRACTICES IN THE IMPLEMENTATION OF DIGITAL TRANSFORMATION

3.1. Structured abstract[1]

Purpose: Professionals and academics need to know what human resource practices are necessary in the industry 4.0 environment and digital revolution. This research studies some human resource practices in the digital age that favour the implementation of digital transformation. Our arguments suggest that for personnel to be a key asset in digital transformation processes, a strategic alignment is necessary to drive the company towards these objectives.

Design/Methodology/Approach: The hypotheses were tested in a representative sample of 184 companies in the southeast of Spain, using Partial Least Squares.

Findings: Our findings show that human resource practices partially mediate the relationship between strategic alignment and digital transformation. Based on the contingent approach, we also maintain that the company must implement human resource practices that encourage employee behaviours that are consistent with the organization's strategy. This strategic alignment and these human resource practices enable companies to achieve digital transformation in search of superior performance.

Originality/Value: To the best of our knowledge, this empirical study has not been previously carried out. The theoretical model and hypothesis testing provide strategic value for understanding some of the determinants of digital transformation in relation to human resource management.

Practical Implications: In the new digital environment, companies must adopt a set of human resource practices that favour innovative employee behaviour that helps digitally transform their businesses.

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Research limitations/implications: Longitudinal and multilevel studies could increase the strength of the research.

Keywords: Strategic alignment, human resource practices, innovative work behaviour, digital transformation.

3.2. Introduction

The integration and exploitation of new digital technologies are some of the main challenges facing companies nowadays (Hess et al., 2016) because people are permanently connected to electronic devices (Bag, Gupta, Kumar, et al., 2021). These changes can bring about numerous advantages, such as improved efficiency, accessing new markets or improving brand image or reputation (J. J. M. Ferreira et al., 2019). This revolution is driven by internal forces (e.g. changes in organizational structure and in required skills and training) and external forces, such as changes in technological applications (Telukdarie et al., 2018).

To achieve digital transformation, companies require two fundamental aspects: one is related to the use of technologies in the value chain, and the other is related to changes that affect their people, culture and knowledge. The resources required by companies to achieve Digital Transformation (DT) are made up of tangible resources (IT infrastructure), human resources (technical and management skills) and intangible resources (knowledge, customer orientation and synergy) (Anandhi S. Bharadwaj, 2000). Human resources provide a competitive advantage in any organization (Bag, Pretorius, et al., 2021) and companies need to integrate the management of the latter with operations management to offer the best results. Furthermore, the advancement of Industry 4.0 technology, such as artificial intelligence and the internet of things, has led to the automation of many jobs (Bag, Telukdarie, et al., 2021), which has generated a change in job requirements. Technical skills requirements will include experience in programming, Big Data analytics, robotics, and smart systems maintenance (Bag, Pretorius, et al., 2021). Soft skills, continuous learning, analytical, innovative and critical thinking are also increasingly required (Jerman et al., 2020).

Therefore, our research questions are: Do Human Resource Management (HRM) practices in the digital age help explain how decisions made by management foster digital transformation practices? Do digital HRM practices promote innovative behaviours that help the digital transformation of companies? The advancement of digital technologies

requires innovative practices to close the skills gap (Bag, Gupta, & Kumar, 2021). Thus, our objective is to provide solutions for professionals to help them overcome the challenges of human resource development, as well as to identify or propose new methods, tools or innovative practices that can help eliminate challenges in this digital age. Likewise, the Industry 4.0 revolution has highlighted the need for companies to adopt new ways of managing human resources and to know how this management is integrated with their operations. Consequently, the study tries to fill this gap by finding innovative solutions to adapt workers, support them in new socio-technical relationships in organizational systems, and improve performance.

Previous empirical research has not delved into the role of HRM in digital transformation so this study analyses how this function becomes highly relevant in order to produce adequate human capital. Specifically, an essential contribution is to analyse the partial mediating role of these innovative HRM practices in the relationship between strategic alignment and digital transformation.

Strategic alignment has been introduced as an antecedent to digital transformation and digital HRM practices because it allows a management team to integrate digital technology with their business strategy and HRM. Moreover, R. K. Fenech et al. (2019) have highlighted the importance of recognizing the HRM practices appropriate to digital transformation. We find that remote-working, teamwork or promoting employee participation in strategic decision-making are essential to complete this process. This represents a first step forward in determining how HRM should be adapted to this new digital environment. Furthermore, we have discovered that HRM practices in the digital age promotes innovative work behaviour in its employees, which is essential in order to implement and develop digital transformation processes. This is consistent with a contingent approach (Woodward, 1958), which states that if an employer knows what behaviours are needed from its employees, then the organization will adopt practices and procedures that induce those behaviours. Thus, the company would align the interests of the employer and the employee to achieve a better organizational performance.

Furthermore, strategic alignment is a necessary element for achieving digital transformation (Matt et al., 2015). Moreover, we study of the mediating role of HRM practices in the relationship between strategic alignment and digital transformation because it has demonstrated the importance of an alignment of human resource practices with the company's strategy in the search for innovation (Naranjo-Valencia et al., 2018).

In fact, previous literature has shown the importance of a fit between business strategy and HRM (Paauwe & Farndale, 2017). It can be presumed that strategies aimed at promoting digital transformation processes are also a powerful determinant for the promotion of HRM practices oriented to this end. Finally, we provide a digital transformation measure following Verhoef et al. (2019), that has established the need to generate applied definitions of digital transformation.

This study continues with a review of the literature which relates strategic alignment, HRM practices, innovative behaviour and digital transformation, using contingency theory (Woodward, 1958). The following section explains the methodology and presents a description of the main empirical results and conclusions. The chapter ends with a description of its main limitations and future lines of research.

3.3. Literature review and hypothesis development

The digital transformation of an organization refers to the change in its business model using new digital technologies in the processes, products or services offered to clients. This implies the use of digital resources, which vary depending on the moment: Big Data, Artificial Intelligence, 3D printing, Quantum computing or Virtual reality. Moreover, this process implies multiple aspects (Fischer et al., 2020; Gurbaxani & Dunkle, 2019; Verhoef et al., 2019), ranging from the design of digital strategies (Matt et al., 2015; Verhoef et al., 2019) to the change of organizational structure towards greater flexibility, agility and incorporating digital functional areas. This change also promotes the creation of adequate digital metrics and objectives or key performance indicators to adjust the business. Such transformation can be divided into three phases: Firstly, *digitization* implies that companies transform analogue information into digital information (Verhoef et al., 2019); for example, companies digitize internal and external documentation but do not modify value creation activities. Secondly, *digitalization* describes how IT or digital technologies can be used to alter existing business processes (F. Li et al., 2016). Finally, *digital transformation* implies that companies simultaneously address digitization from several dimensions, such as strategies, organizational structure, operations or culture.

3.3.1. Strategic alignment

To compete in an environment of digital revolution, companies that are not digital natives and have a more traditional business model need to adopt strategies that allow them to compete with more agile and disruptive companies (Hess et al., 2016; Matt et al., 2015).

Strategy is the creation of a unique and valuable position in the market (Porter, 1997), which provides a guide for the most appropriate decisions to face the opportunities and threats that arise from the environment.

Digital technology-business strategic alignment is the degree to which the mission, objectives and plans contained in the business strategy are shared and supported by the IT strategy (Gerow et al., 2014). A well-established partnership between both areas provides more fluid and efficient decision-making, facilitating the implementation of digital technology, especially when radical business changes are required in turbulent markets (Li et al., 2021). Furthermore, the strategy for digital transformation must be aligned with other operational or functional plans to act as a unifying link between them (Ismail et al., 2017; Matt et al., 2015). This alignment can be carried out through, for example, structural changes or through the talent inside the organization (Akter et al., 2020). The literature has shown how some HRM practices may fit differently with various strategic positions and how these practices relate to the company performance (Delery & Doty, 1996). Furthermore, it is shown that the relationship between the use of specific HR practices and organizational performance depends on the organization's strategy (Woodward, 1958).

The alignment between digital and business strategies could create a competitive advantage and allow to take advantage of the full potential of the information technology (Gerow et al., 2014). This is a continuous process (not an event) and a requirement for digital transformation, being linked to organizational performance (Gurbaxani & Dunkle, 2019; W. Li et al., 2016; Wu et al., 2015). Moreover, the alignment is decisive to start major processes in the company; in fact, it is necessary for the company to take into account information technologies during the strategy design stage, involving the professionals of these areas.

Delving deeper into the review of empirical studies, some authors have found evidence supporting the above arguments. They state that the adoption of digital strategies was positively related to the digitization of 193 small and medium size enterprises (Eller et al., 2020) and have a positive effect on short-term and long-term financial performance in 152 Chinese companies (Wang et al., 2020). However, as this is an incipient topic, there is a dearth of empirical studies linking strategic alignment with digital transformation.

Consequently, according to the previous arguments, we study a positive relationship between both variables:

H_5: Adopting a *strategic alignment* is positively associated with the *digital transformation* of a company.

3.3.2. The role of human resource practices in digital transformation

One of the great challenges that companies will face in the coming years is to have a team of professionals who can function in the digital environment derived from digital transformation (Ismail et al., 2017). This will inexorably require modifying how to manage people within companies, in order to facilitate the cultural change to cope with the new forms of work. In this study, we consider that HRM practices in the digital age can be the means by which the digital strategy achieves the proposed objectives (Porfírio et al., 2021)

The literature has shown that there are various HRM practices which are favourable to digital transformation such as teamwork (Schwarzmüller et al., 2018) or promoting employee autonomy and team cohesion (Bartsch et al., 2020). However, there is still a shortage of knowledge as to which practices can cause employees to adopt behaviours that facilitate the digital transformation of the company. Firms can achieve a sustainable competitive advantage when HRM practices are aligned with the organizational strategy (Chowhan, 2016). Furthermore, the literature shows the supporting role of an adequate HRM in the strategic alignment of information technology and business functions (Oehlhorn et al., 2020), as well as the importance of a contingent approach in strategic HRM (Delery & Doty, 1996).

A company can adopt HRM practices that ensure that people with the required skills are hired and retained, as well as use HRM practices to ensure that employees are motivated to behave in a manner consistent with the company's strategy. Therefore, we could assume that strategic alignment favours the adoption of certain useful HRM practices in the digital age.

However, there is a lack of studies about the relationship between strategic alignment and these practices. Digital HRM practices can help employees become allies to achieve the digital transformation within an organization. In fact, Potemkin and Rasskazova (2020) demonstrate that the management of companies must consider employees to be the most valuable resource in order to achieve the strategic goals of the company. Contingency

theory implies that the proper implementation of the strategy depends to a large extent on the behaviour of the employees (Woodward, 1958). Despite the absence of research linking HRM practices with digital transformation, different studies have shown there is a relationship between HRM practices and different types of innovation (Barba-Aragón & Jiménez-Jiménez, 2020; Diaz-Fernandez et al., 2017; Kianto et al., 2017). On the other hand, Bag, Dhamija, et al. (2021) show how e-HRM systems are positively associated with company performance.

Consequently, according to the previous arguments, this study proposes a positive relationship between the following variables:

H_6: Digital *HRM practices* mediates the relationship between *strategic alignment* and *digital transformation.*

3.3.3. The mediation of innovative work behaviour

HRM practices are capable of promoting a series of behaviours in employees that encourage them to develop the actions that the company requires (Kooij & Boon, 2018; Zhang et al., 2018). Digital transformation processes consist, to some extent, of the introduction of innovations in the company (Akter et al., 2020). Apart from involving changes in the organization and even in the production process, there is also an innovation in the business model. The literature on employees' behaviour has highlighted the need for employees who exhibit innovative behaviour to introduce any type of innovation in the company. Innovative Work Behaviour (IWB) is the intentional creation, introduction and application of new ideas within a work role, the group or the organization, in order to benefit role performance, the group, or the organization (Janssen, 2000). Moreover, these behaviours imply the identification of problems or opportunities, the generation and evaluation of ideas, their promotion, the search for followers, the development of implementation plans and the funds required to carry them out (Sanz-Valle & Jiménez-Jiménez, 2018; Yang et al., 2019). In fact, employees achieve digital transformation of the organization as another innovation process.

Although HRM can help define different types of behaviours in employees (Schuler & Jackson, 1987), we focus on the study of HRM practices in the digital age that can drive technological innovation processes. Employees benefit from HRM practices implemented by and for digital transformation. In addition, through contingency theory, they could contribute to the transformation and improvement of the organization's

productivity by adopting innovative attitudes (Woodward, 1958). An organization's strategy needs behavioural requirements to be successful. The adoption of digital HRM practices can reward and control employee conduct through their organizational commitment and innovative behaviour.

The previous literature has shown how practices such as teamwork or teleworking can improve the generation of new ideas and creativity (Hoegl & Parboteeah, 2007; Naotunna & Zhou, 2018), which are key to digital transformation (Tekic & Koroteev, 2019). Moreover, there are some studies that have demonstrated the positive relationship of specific HRM practices (Curzi et al., 2019; Javed et al., 2018; Tung, 2016; Widmann & Mulder, 2018) or HRM practices as a whole in IWB (Bos-Nehles & Veenendaal, 2019; Prieto & Pérez-Santana, 2014). Finally, there are studies that show a positive relationship between HRM practices and innovation in companies (Lee et al., 2019; Nieves & Quintana, 2018).

Although there is a lack of empirical studies of the relationship between innovative work behaviour and digital transformation, the literature shows a positive relationship between this behaviour and innovation in companies (Noopur & Dhar, 2019). In spite of the relevance of this argumentation, to our knowledge, the mediating effect of innovative behaviour in the relationship between HRM practices and innovation has rarely been tested empirically (Sanz-Valle & Jiménez-Jiménez, 2018). Consequently, according to the previous arguments, this chapter proposes a positive relationship between both variables.

H_7: *Innovative work behaviour* mediates the relationship between *HRM practices* and *digital transformation.*

3.4. Methodology

3.4.1. Data collection and sample

Various business associations were contacted and then the study was presented to their members to encourage their involvement. Feedback was obtained from the managers of the associations to make sure that no problems would arise from the wording of the question and a pretest was carried out. An electronic questionnaire was administered via e-mail in March 2020 and was distributed to companies with more than ten employees located in Murcia (southeast Spain). The collecting process ended in April 2020. The population is made up of 974 manufacturing companies affiliated to the most relevant

business organizations in this area. We use the code from Spanish *Clasificación Nacional de Actividades Económicas* (CNAE 2009) to classify the firms. The study includes firms from a variety of sectors, not only form the code C "Manufacturing industry", as many firms could be classified in two codes (for example, code A, "Agriculture", due to the strong export-focused food-processing sector in the region). Through collaboration with these associations, contact information and a research support letter were available.

The study design aimed to ensure representation in terms of size, sector, and geographic distribution. We used the database of SABI ("Sistema de Análisis de Balances Iberícos") to ensure that our final sample was representative of the population. The survey was directed to the CEO of the company, as he or she would possess a broader vision of all the processes encompassed in the study. Information was collected through an institutional website for conducting surveys. Cover letters were sent explaining the purpose of the research, data collection procedures, and confidentiality policies. Finally, 184 valid responses were collected, which represents a response rate of 19% of the study population.

3.4.2. Measures

Seven-point Likert scales were used for all measurements. All of the scales used were translated into Spanish to send the questionnaires to the CEOs and then translated back into English. The questionnaire included the following scales:

Digital technology-business strategic alignment, using the Li et al. (2021) scale and *HRM practices* are measured by the scale of Goswami and Upadhyay (2019).

Employee's innovative work behaviour was measured using the scale developed by Scott and Bruce (1994) which was complemented using some items from the scale created by Kleysen and Street (2001).

We measured *digital transformation* with a practical adaptation of the theoretical study of Verhoef et al. (2019). After the depuration process, two items were erased.

The final items used, after the confirmatory factor analysis, are presented in Table 3.1.

Table 3.1: Measurement and factor loading

Constructs	Measures	Loadings	Standard deviation	T-values	Reliability and model adjustment [a]
Digital technology-business strategic alignment	In our company: (1- Totally disagree; 7- Totally agree)				
	1. Digital technology has been integrated with the commercial strategy so that they are developed together.	0.864	0.022	39.178	Cronbach α=0.858
	2. The employees share the importance of digital technology in the design of the strategy	0.876	0.024	36.083	ρ_α=0.859
	3. The business strategy has been designed with digital technology in mind.	0.86	0.029	29.401	SCR=0.904
	4. Other department heads or managers are consulted before making strategic decisions	0.749	0.04	18.924	AVE=0.703
Digital HRM practices	During the last 3 years to what extent has been achieved (1 = totally disagree; 7 = totally agree)				
	1. Align employees with the vision and values of the company	0.883	0.018	50.449	Cronbach α=0.934
	2. Create a good work environment through proper leadership	0.899	0.018	50.742	ρ_α=0.936
	3. Generate a reward system for deserving employees based on objective criteria	0.811	0.028	28.545	SCR=0.947
	4. Implement telework policies	0.738	0.032	23.084	AVE=0.719
	5. Involve employees in the strategic decision making of the company	0.861	0.024	35.296	R^2=0.551
	6. Make strategic decisions	0.846	0.025	33.629	
	7. Teamwork	0.886	0.017	51.275	
Innovative work behavior	Indicate how often the employees of your company, in their daily work, adopt the following behaviors: (1 = Never; 7 = Always)				
	1. Seek how to improve existing processes, technology, products, services, or work relationships	0.892	0.019	46.781	Cronbach α=0.964
	2. They propose creative ideas	0.909	0.014	66.503	ρ_α=0.966
	3. They test new ideas, trying to evaluate them	0.923	0.011	84.916	SCR=0.966
	4. Promote and defend the new ideas of others	0.907	0.015	59.628	AVE=0.801
	5. They try to persuade others of the importance of a new idea or solution	0.868	0.035	25.013	R^2=0.540
	6. They try to find the necessary funds to start the new ideas	0.831	0.025	33.001	
	7. They develop adequate plans and programs to implement the new ideas	0.912	0.015	61.173	
	8. In general, they are innovative	0.913	0.014	66.948	
Digital Transformation	Our company uses: (1 = Little use; 7 = Much use)				
	1. A flexible organizational structure that allows us to face the changes derived from DT	0.745	0.036	20.846	Cronbach α=0.931
	2. Digital components in the product or service offered to customers	0.784	0.032	24.438	ρ_α=0.935
	3. Digital channels of communication with employees: employee portal, email or whatsapp groups, digital newsletter,etc.	0.81	0.029	28.202	SCR=0.941
	4. Communication channels with suppliers: online orders, digital purchasing center, etc.	0.752	0.041	18.279	AVE=0.593
	5. Digital order forms	0.714	0.04	17.769	R^2=0.678
	6. Digital applications for internal financial statements or Blockchain	0.845	0.022	37.928	
	7. Internal and external digital documentation	0.749	0.036	20.781	
	8. Big Data analysis of information	0.741	0.04	18.696	
	9. Digital surveys to measure customer satisfaction	0.804	0.029	27.692	
	10. Digital metrics to measure customer satisfaction: Visits to the web, visits to digital channels, interactions on social networks, etc.	0.816	0.027	29.907	
	11. Dashboard on company results	0.7	0.042	16.682	

[a]: ρ_α (Dijkstra and Henseler, 2015). SCR: Scale composite reliability. AVE: Average variance extracted. Model adjustumente: R^2 for the three dependent variables.

Henseler (2017) establishes three main types of measurement models depending on how the variables are defined (composites, reflective and causal-formative). Our variables are all derived from scales with a theoretical background. Therefore we have used Mode A composites to operationalize them (Henseler, Ringle, et al., 2016b).

3.4.3. Data analysis

The structural equation model (SEM) was tested using the Partial Least Squares (PLS) technique (Henseler, Hubona, et al., 2016). PLS-SEM was selected because of the characteristics of our model and the nature of composite constructs. Also, this method was employed with a confirmatory purpose (Henseler, 2018). The software employed is SmartPLS 3.3.3.

For testing the hypotheses, PLS-SEM uses a two-stage approach. Firstly, the measurement model is studied to assess the adequacy of the construct. Secondly, the structural model is evaluated, and provides the significance of the coefficients derived from each of the hypotheses analysed.

To confirm the measurement model, several tests were developed with the goal of testing the reliability and validity of the composites (see Table 3.1). The individual indicator reliability values were higher than 0.7 (W.W. Chin, 1998). Also, Cronbach's Alpha values (Roldán & Sánchez-Franco, 2012) and Dijkstra and Henseler (2015) rho alpha are well within the accepted range and composite reliability (CR) values (Bagozzi & Yi, 1998) were greater than 0.7. Finally, convergent validity was evaluated using the Average Variance Extracted index (AVE) (Fornell & Larcker, 1981), that provides values for all of the constructs above 0.5 (Bagozzi & Yi, 1998).

Table 3.2: Correlations matrix and reliability

Constructs	*Correlations*			
	1	*2*	*3*	*4*
1. Strategic alignment	**0.839**	0.831	0.725	0.85
2. HRM practices	0.744	**0.848**	0.773	0.798
3. IWB	0.66	0.736	**0.895**	0.721
4. Digital transformation	0.77	0.754	0.692	**0.77**

Notes: Diagonal elements (bold figures) are the square root of the variance shared between the constructs and their measures. Below diagonal elements are the correlations between constructs. Above diagonal elements are the Heterotrait-Monotrait Ratio (HTMT) values.

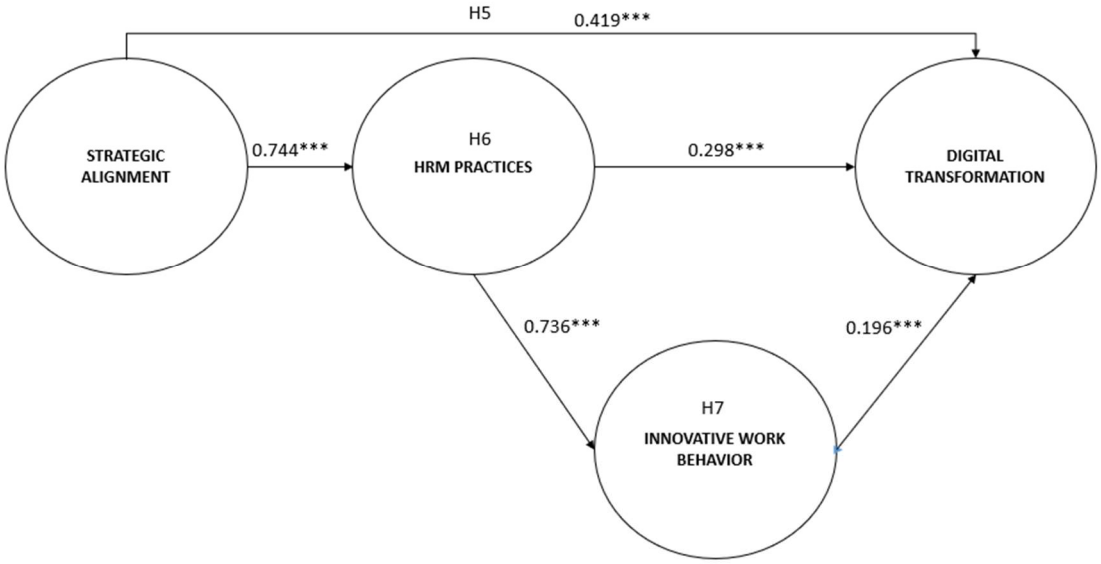
Discriminant Validity was tested using two methods. Firstly, we compare whether the square root for each AVE value is greater than the correlation values among the latent

variables (Fornell & Larcker, 1981). Secondly, we apply the heterotrait-monotrait (HTMT) criterion (Henseler et al., 2015). Table 3.2 shows in bold on the diagonal the square root of each AVE value, which exceeds the correlation with any other latent variable (values under the diagonal). The values for the HTMT criterion are shown above the diagonal and all of them are less than 0.85. Thus, from an examination of the results in Table 3.2, we can state that all of the constructs are reliable.

3.5. Results

The structural model resulting from the PLS-SEM analysis is summarised in Figure 3.1. The stability of the estimates is examined by using the t-statistics obtained from a bootstrap test with 5.000 resamples. All the hypothesised relationships are significant, and, therefore, the hypotheses are supported.

Figure 3.1: Results of the structural model



Note: *p < 0.05; **p < 0.01; ***p < 0.001

As can be seen in Table 3.3, there is a significant relationship between the strategic alignment of companies and digital transformation ($\beta = 0.419$, $p<0.001$). Thus, we empirically contrasted that companies that are capable of aligning their business strategy and their digital strategy can undertake digital transformation more effectively.

Table 3.3: Structural model

Paths	*Standardized coefficient*	*Standard Deviation*	*Confidence interval*	
			5%	*95%*
	Direct effects			
Strategic alignment → HRM practices	0.744***	0.034	0.684	0.796
Strategic alignment → DT	0.419***	0.069	0.310	0.534
HRM practices → IWB	0.736***	0.037	0.674	0.794
HRM practices → DT	0.298***	0.073	0.178	0.415
IWB → DT	0.196***	0.065	0.089	0.300
	Indirect effects			
HRM practices → IWB → DT	0.144**	0.049	0.065	0.224
Strategic alignment → HRM practices → IWB	0.548**	0.043	0.475	0.618
Strategic alignment → HRM practices → DT	0.222**	0.056	0.131	0.314

Note: ***p <0.001 **p <0.01 *p <0.05; Bootstrapping based on n = 5.000 subsamples.

To deepen our understanding of how strategic alignment facilitates digital transformation, the possible mediation of implementing some HRM practices was analysed. Firstly, it there is proof that the strategic alignment contributes to adopting some HRM practices (β = 0.744, p <0.001), while HRM practices are also related to digital transformation (β = 0.298, p <0.05). In addition, the existence of a significant indirect effect through these specific HRM practices is verified (β = 0.222, p <0.05). All this highlights that adopting some HRM practices partially mediates the relationship between strategic alignment and the achievement of digital transformation. This implies that HRM practices play a crucial role in the implementation of a digital transformation process.

Moreover, we found the existence of significant relationships between HRM practices and IWB (β = 0.736, p <0.001), as well as between IWB and digital transformation (β = 0.196, p <0.01). In addition, our results show evidence of the partial mediation of IWB (β = 0.144, p <0.01) in the relationship between HRM practices and digital transformation. This means that employees with innovation-oriented behaviours will be able to face digital processes with a greater guarantee, since they will be able to learn, assimilate changes and solve the problems that digital transformation requires.

3.6. Discussion

The implementation of digital transformation depends on the skills of employees and management can influence these capabilities by hiring experts or modifying HR policies (Bag, Pretorius, et al., 2021). In our study, a theoretical model was presented which demonstrates how HRM practices in the digital age and employee behaviour play a

decisive role so that companies can obtain the expected results in their organizational strategies. This in turn leads to digital transformation.

Firstly, regarding the relationship between strategic alignment and digital transformation, our findings emphasize the importance of the participation and agreement of employees from different areas of the company. These results are in line with other research that indicates the importance of adopting an appropriate digital transformation strategy (Ismail et al., 2017; Matt et al., 2015). Secondly, our results show that digital HRM practices positively mediate the effect of a strategic alignment on digital transformation. This highlights the importance of the role of HRM in the transformation process of companies. It suggests that the success of this type of strategy not only resides in good technological equipment, but also in effective management of the human capital of companies. These results also respond to the request for an in-depth study of HRM for digital transformation proposed by authors such as R. Fenech et al. (2019).

Finally, our study also shows that HRM in the digital age favours the development of employee innovative behaviours, which were configured as an explanatory mechanism of how innovation processes are implemented. These findings are in line with other works (Naranjo-Valencia et al., 2017; Sanz-Valle & Jiménez-Jiménez, 2018), but more linked to technological innovations. Therefore, we address this lack of literature. When people from different areas of the organization understand and align themselves to formulate a digital transformation strategy, it can be effective in carrying out successful digital transformation of companies. Thus, we found new consequences of the strategic alignment process in companies.

3.6.1. Theoretical contributions

This study widens the understanding of the importance of personnel management in the digital transformation processes of companies, considering both the perspectives of HRM practices and that of employee behaviours. The main contributions are the following:

Firstly, despite the importance attributed to digital transformation in the company (Verhoef et al., 2019; Vial, 2019), there is a lack of research into the role of HRM in its implementation. In fact, Bag, Yadav, et al. (2021) point out that aligning human resource practices with the Industry 4.0 is expected to enable digitization of training, empowerment of employees, cross-functional teamwork and learning. Our study analysed how the HRM function acquires a very relevant role to produce adequate human capital.

Specifically, an essential contribution is the analysis of the partial mediating role of digital HRM practices in the relationship between strategic alignment and digital transformation. This is a relevant issue which had not been previously addressed by other empirical studies.

Secondly, we expanded the literature on specific HRM practices in the digital age that facilitate digital transformation processes. R. K. Fenech et al. (2019) have highlighted the importance of knowing the HRM practices appropriate to digital transformation. In this case, maintaining an appropriate leadership style, adopting teleworking opportunities, creating a good climate or employee participation in strategic decision-making are essential to this process.

Thirdly, previous research frequently assumes that HRM practices improve company results due to their influence on employee behaviour. In fact, Porfírio et al. (2021) have pointed out the need to explore how to obtain the commitment and involvement of employees in the digital transformation process. In this study, we show that HRM practices adapted to this digital environment promote an innovative behaviour of the employees which is essential to implement and develop digital transformation processes.

Moreover, we contribute to the literature with the identification of some factors that decisively influence digital transformation. Beyond what has been said about HRM practices and innovative behaviour, we draw attention to the need for seeking a strategic alignment. This is relevant since the company's strategy is essential for implementing any process that affects the business model followed by the company. Thus, this research can further contribute to understanding the new antecedents of the HRM practices in the digital age and digital transformation in companies. This is in line with the contingency theory, which states that the company must implement HRM practices that encourage employee behaviours that are consistent with the organization's strategy (Woodward, 1958). This alignment of strategy and HRM practices allows companies to achieve digital transformation in search of superior performance.

Finally, this study makes a relevant effort to measure the digital transformation processes of companies. Although the literature frequently points out the importance of digital transformation (Verhoef et al., 2019; Vial, 2019), there is a shortage of empirical research, based more on case studies.

3.6.2. Practical implications

Managers must begin to design their organizational strategies, taking into account the internal technological and human resources with which they can face the external challenges of the environment. Thus, they can adapt their business models. This also means developing a strategic approach to HRM that leads companies to consider their employees when designing business strategies. From this perspective, managers must be more sensitive to the need to make greater investment in their human capital through human resource practices adapted to the digital environment.

Managers and HRM professionals must adopt training practices related to emerging technologies, encourage remote-working (Bennett & McWhorter, 2021; Schwarzmüller et al., 2018), allow employees to participate in strategic decisions and have more agile organizational structures (Verhoef et al., 2019). These practices can make the employees more involved, engaged with the organization, adopt innovative behaviours, and contribute more to the digital transformation of the organization.

3.7. Limitations and future research

Industry 4.0. needs more research related to the field of human resource development. Our research does constitute significant progress in understanding why and in what ways employees carry out the digital transformation of companies after the strategic alignment. However, we are aware that there are limitations, which should be discussed.

Firstly, we only obtained one response per company. Given that the questionnaire was addressed to the CEO, who possesses a global vision, it would be noteworthy to collect information at the employee level and assess a multilevel study. Therefore, longitudinal studies and multilevel analysis could advance research in this area. Secondly, the survey did not include questions to assess and correct for the common method bias problem, as suggested by Tehseen et al. (2017)

Furthermore, the objective of focusing practices on the manufacturing sector is derived from seeking a greater integration of practices in turn derived from digital transformation. In this case, manufacturing companies are involved in greater automation processes of their production processes than those derived from the service or purely agricultural sectors. In any case, in future lines of research we propose to extend this study to other sectors.

Finally, analysing the effect of other companies' HRM practices and policies on the digital transformation process studied in this chapter would help to understand how employees and organizations could be more efficient in generating innovative behaviour to make their company more competitive.

3.8. Conclusion

The Industry 4.0 revolution has highlighted the need for companies to adopt new ways of managing human resources and to know how this management is integrated in their operations. Consequently, this study fills this gap by finding innovative solutions to adapt workers, support them in new socio-technical relationships in organizational systems, and improve performance.

These include a series of HRM practices which must be implemented to favour the digital transformation process of companies: aligning employees with the vision and values of the company, implementing remote-working policies, creating a good work environment through proper leadership, generating a reward system for deserving employees based on objective criteria. Furthermore, involving employees in the strategic decision making of the company, allowing employees to participate in strategic decisions or creating a culture of teamwork conform to practices that we must adopt in the digital age.

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CHAPTER 4:
ICT TRAINING, DIGITAL TRANSFORMATION AND COMPANY PERFORMANCE: AN EMPIRICAL STUDY

CHAPTER 4: ICT TRAINING, DIGITAL TRANSFORMATION AND COMPANY PERFORMANCE: AN EMPIRICAL STUDY

4.1. Structured abstract[2]

Purpose: We present a model for assessing the effects of employee information and communication technologies (ICT) training on organizations' results. We also introduce digital transformation as a mediator between the two concepts and study the role of organizational commitment and human capital in terms of digital transformation.

Design/Methodology/Approach: Surveys were completed by the CEOs of 184 Spanish companies, and their responses were analysed with Partial Least Squares.

Findings: Our results empirically analyse the proposed theoretical model and highlight that human capital and organizational commitment partially mediate the link between ICT training and digital transformation. Furthermore, there is a direct relationship between ICT training and company performance.

Originality/Value: Despite heavy theoretical emphasis on the study of the conditions necessary for the digital transformation of companies, few studies have empirically analysed the effects of adopting certain practices for its implementation. This study focuses on analysing the effect of ICT training, which is configured as a tool capable of improving staff knowledge and increasing employee commitment. This is essential for adopting organizational change such as digital transformation.

Practical Implications: Directors and managers should invest more resources in the human capital of their company through ICT training. In fact, it can improve organizational commitment, encouraging employees to adopt innovative behaviours, thus allowing for the necessary digital transformation.

Keywords: ICT training, organizational commitment, human capital, digital transformation, company performance.

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4.2. Introduction

The fourth industrial revolution is transforming companies within all sectors and is affecting all levels of society (Steiber et al., 2021, Agostini et al., 2020). The use of new technologies is improving the efficiency of companies' operations, optimizing the management of their processes and improving their market orientation (Verhoef et al., 2021). In some ways, it is changing how companies create value and interact with customers (Matarazzo et al., 2021, Matt et al., 2015).

In particular, digital transformation is a process in which companies respond to the changes in their environment through the use of digital technologies by altering their value creation processes (Vial, 2019). Verhoef et al. (2021) define organizational digital transformation as the innovation of companies' business models through the introduction of digital technologies in their processes and / or their outputs. Thus, it encompasses core business processes, operations, capabilities and business strategy (Ukko et al., 2019). Furthermore, it introduces a number of new digital resources that, together with its structure, strategy, metrics and objectives, can enable the organization to carry out its main processes and improve its performance (Fischer et al., 2020, Verhoef et al., 2021).

One of the aspects that is frequently pointed out as highly relevant for the implementation of digital transformation within organizations is their human factor (Sousa and Rocha, 2019), as the lack of proper human resources can hinder the innovation process (Spender et al., 2017). The pivotal role of the human capital has been recognized both in academic literature (Fenech et al., 2019) and by practitioners. In this sense, the BCG report "Flipping the Odds of Digital Transformation Success" (2020) (p.10) clearly states that "The technology is important, but the people dimension is usually the determining factor". In confirmation of this, there are five factors, which, according to the "McKinsey Global Survey on digital transformation" (2018), are crucial for improving the digital transformation chances of success; four are directly linked to companies' HR (leadership, capability building, empowering workers, and communication).

Several studies suggest that the role of people within organizations will become even more relevant in the coming years due to the lack of qualified professionals possessing the skills required to carry out business transformation (Kane et al., 2015). Therefore, it will be necessary to identify how to prepare employees accordingly. In this sense, information and communication technologies (ICT) training is fundamental for training

employees in the digital skills necessary to face the transformation required by the current dynamic environment (Teng et al., 2022, Sousa and Rocha, 2019). Furthermore, according to the Human Capital Theory, organizations can obtain economic benefits by investing in their people, in particular by providing them with training (Sweetland, 1996). Several studies demonstrated this to be true in terms of general training (Nafukho et al., 2004). It may thus be of value to understand if this is also true for ICT training as, to the best of our knowledge, no previous research has studied this topic.

Consequently, to understand if organizations are prepared to face the complex changes posed by digital transformation, it is necessary to study the way they provide their employees with ICT training (Bag et al., 2021a). Addressing this issue has numerous advantages, such as determining the effects of training on employees, what behaviours they adopt, how they commit themselves and what they give the company in return. In fact, according to the Social Exchange Theory, when employees perceive the support of their organizations, they are likely to return the gesture, as their commitment will increase (Cropanzano and Mitchell, 2005). This will have positive effects for both the individual and the organization. Thus, the role of organizational commitment in the context of ICT training also deserves further investigation, as to the best of our knowledge no previous study explored this issue.

However, these are not the only research gaps that can be found. In fact, according to Verhoef et al. (2021) there is a shortage of empirical literature regarding digital transformation effect on companies' performance, as previous studies are typically case studies which focus their attention on a particular technology, not considering the whole digital transformation process. Moreover, they typically only take into account the financial perspective, and not the whole organizational performance. Furthermore, authors such as Bag et al., 2021b have highlighted a shortage of literature analysing the effects of ICT training on digital transformation and company performance, as previous research had typically just focused its attention on the relationship between ICT training and individual or organizational productivity (van Deursen and van Dijk, 2014). In fact, ICT training has typically been meant to improve the skills of individuals (Erasmus and Joubert, 2017), with the purpose of providing them with the needed wealth of knowledge, for example, to make them suitable for promotions (upskilling) (Abuhmaid, 2011), or promote job reinstatement or professional retraining (reskilling) (Caparrós Ruiz, 2022).

In order to fill these gaps, this study attempts to more deeply understand the relationship among ICT training, digital transformation and company performance. In particular, this research will try to assess whether the ICT training provided by organizations is able to improve their human capital and enhance their employees' commitment to the organization, making them more likely to achieve organizational objectives, with positive effects on the organizations' digital transformation processes and on their performance. To do so, a quantitative approach was used, sending questionnaires to the CEOs of manufacturing firms and analysing their answers, using the Partial Least Squares technique (Richter, Hauff, Ringle, & Gudergan, 2022).

By doing so, we deepen our understanding of the importance of HR management in the digital transformation process of organizations, as we consider the whole process and assess its impact on the whole organizational performance. In particular, we provide further confirmation of the fact that, for digital transformation to be successful, not only do companies need to have good technological equipment, but also to properly manage their human capital, obtaining their employees' commitment through their engagement. Furthermore, we contribute to the Human Capital Theory and Social Exchange Theory by demonstrating their validity not only in relation to general training, but also in the specific context of ICT training. Finally, we aid companies and institutions in designing ICT training modules, improving both the employability of employees and the competitiveness of companies, with positive effects for the whole of society.

4.3. Literature review and hypothesis development

4.3.1. Digital transformation

Academic and professional research regarding companies' digital transformation has increased exponentially in recent years (Zhai et al., 2022, Teng et al., 2022). This is due to the disruptive implications of new digital technologies, which has made the adoption of new business models and the delivery of new products, services and experiences fundamental for engaging and retaining increasingly digitally proficient customers (Nambisan et al., 2019).

Digital transformation is a process in which companies partially or totally alter their business model by introducing digital technologies within the whole business processes. This implies the use of digital resources (e.g. Big Data technology), the design of digital growth strategies (Matt et al., 2015), the change of organizational structure towards

greater flexibility and agility, incorporating digital functional areas, and the use of proper online metrics and goals to customize the business model (Verhoef et al., 2021, Fischer et al., 2020, Vial, 2019). In this sense, companies are accelerating their digital transformation to enhance their competitiveness (Guo and Xu, 2021). If a company transforms digitally, it could increase its market share, enter new markets, improve its brand image or reputation, and improve the quality or quantity of the service / product offered (Ferreira et al., 2019), because the use of digital processes and technologies makes it possible for an increasingly digitally proficient consumer to acquire products more efficiently. Thus, the ways of capturing and creating value change when companies transform digitally, as they can join the ecosystem formed by other digital platforms. However, digital transformation may not lead to higher company performance if digital applications are not properly adopted (Ukko et al., 2019). In fact, digital transformation processes can be very complex, due to the effort needed to carry them out and to make the needed adjustments, and costly, especially due to investment in hiring capable people or in training talented people to improve their technological skills (Guo and Xu, 2021).

Consequently, when companies choose to adopt a digital transformation strategy, it has to be based on their needs and objectives. By doing so, organizations can improve their results and make their processes more efficient (Zhai et al., 2022, Ukko et al., 2019). Therefore, considering digital transformation as a long-term investment can improve companies' performance (Teng et al., 2022, Zhai et al., 2022, Wang et al., 2022). In fact, it has been pointed out that digital transformation has a longer-lasting positive effect on operational than on financial performance (Guo and Xu, 2021). It has also been noted that digital transformation improves companies' communication and saves costs (Teng et al., 2022, Zhai et al., 2022), for example, through the implementation of Enterprise Resource Planning (Guo and Xu, 2021). In fact, digital transformation reduces organizational barriers by granting access to new knowledge and relationships, which implies greater innovation and internationalization (Zhai et al., 2022).

Some papers associate digital transformation with improvements in several dimensions of company performance, such as innovation, financial performance, growth, reputation or competitive advantage (Vial, 2019). Wang et al. (2022) point out that using Big Data, artificial intelligence and blockchain improves cost savings, operational efficiency, innovation and performance. Furthermore, Guo and Xu (2021) affirm that 3D printing,

one of the latest evolutions produced by digital transformation, speeds up new product development. Thus, Wang et al. (2022) and Zhai et al. (2022) state that companies that have digitally transformed perform better than those that have yet to do so.

Consequently, according to the previous arguments, this study sustains the following hypothesis:

H_8: *Digital transformation* is positively associated with *company performance.*

Although many elements have to be considered when developing digital transformation, such as a company's strategy and culture, recent literature suggests that the key element may lie more in human resource development than in purely technological issues (Ukko et al., 2019, Barba-Aragón and Jiménez-Jiménez, 2020).

4.3.2. ICT Training and company performance

It is known that a large percentage of employees do not have sufficient digital skills to cope with the current digital transformation needs of companies. This can harm their productivity and have negative effects on business competitiveness, the economy and society as a whole (Ruiz, 2020).

Furthermore, it has been demonstrated that the growth of companies is increasingly being influenced by having employees with the adequate level of digital skills (Shakina et al., 2021), thus making it necessary to provide permanent ICT training (Falck et al., 2016). This has been researched more and more in recent years. In fact, as companies increase investment in ICT resources, they require more qualified workers (Ruiz, 2020), who not only need basic digital skills, but a whole set of cognitive, social and emotional attributes to use technologies and perform in a digital context (Adenekan and Jimoh, 2021). Consequently, companies wanting to transform digitally need to improve their employees' learning i.e. their willingness and ability to upskill and reskill, through ICT training, thus elevating the role of the educational system as essential when it comes to individual employability (Ruiz, 2020).

Companies also need to invest in employees with digital skills to improve company performance (Taştan and Gönel, 2020), otherwise, the current skills mismatches can produce negative effects (Ruiz, 2020). Companies can generate a competitive advantage by developing their employees' skills more simply than acquiring them externally, since access to ICT resources is easier than hiring professionals with the required digital skills.

Through the development of human resources, behaviour, knowledge and skills of employees, business results can be improved (Duică et al., 2020). Therefore, companies need to intensify their activities in ICT training to face the digital transformation process through their employees' skills (Ruiz, 2020, Taştan and Gönel, 2020). Previous studies demonstrated that training financed by the company or received in the workplace by colleagues and/or supervisors is more efficient at improving digital skills than those financed by the public administration or the worker him-/herself (Ruiz, 2020).

ICT training can improve company performance in different ways. Firstly, it improves employees' participation in new products / services development through the use of new technologies (Duică et al., 2020). Secondly, it influences employees' attitudes towards new technologies, and can promote an improvement in the company's image or reputation. It also helps them to better understand what they are currently doing in their work, thus increasing their productivity. Furthermore, it facilitates access to new markets because employees are prepared to face new challenges. In addition, companies' investment in ICT training can help employees increase productivity and, therefore, they can contribute to improving performance.

The positive relationship between ICT training and company performance finds its theoretical root in the Human Capital theory, which states that economic benefits may be obtained by investing in people (Sweetland, 1996). According to this theory, the learning capacities of people are as important as any other resources when it comes to the production of goods and/or services (Lucas Jr, 1988) and, consequently, the organization will obtain better results when they are used in a more effectively (Schultz, 1961). In particular, education and training are considered to be the most important kind of human capital investment (Sweetland, 1996), as they provide the workforce with the capabilities and skills needed to increase their productivity and performance and, consequently, those of their companies (Nafukho et al., 2004).

However, there is a shortage of literature regarding the positive relationship between ICT training and company performance (Shen and Tang, 2018), as previous research focused on the ICT training impact on individual or organizational productivity: for example, Lee et al. (2022) found that ICT training improves employees' productivity, although this

effect decreases with age; or, Taştan and Gönel (2020), who concluded that the degree of digital skills of the workforce positively influences companies' productivity.

Therefore, this study tries to remedy this lacuna. According to the previous arguments, this study sustains the following hypothesis:

H_9: *ICT Training* is positively associated with *company performance.*

4.3.3. ICT Training and digital transformation

It is increasingly recognized that for digital transformation to be a competitive advantage, human capital, intellectual capital and knowledge are crucial (Fenech et al., 2019).

Companies' digital transformation requires investment in new technologies and in the development of adequate skills so that employees can interact with these technologies (Troise et al., 2022). Thus, the implementation of ICT training programmes is permanently required for people both in their working and non-working lives (Brunetti et al., 2020). In this sense, the current environment seeks employees with digital skills and who are capable of dealing with digital transformation, so their development is a strategic management tool to deal with what the Industry 4.0 environment demands (Sousa and Rocha, 2019). Therefore, in the digital transformation process, companies are increasingly recognizing the importance of ICT training, which is perceived as ever more necessary for their future (Teng et al., 2022). However, as the digital divide that can be identified in the labour market is predicted to increase in the coming years (Prezioso et al., 2020), reskilling and upskilling of employees have become essential. Consequently, as the willingness to learn new skills is highly valued for companies when hiring, the capacity and receptivity of employees for ICT training deserves future research attention (Trenerry et al., 2021).

One of the biggest challenges in a company's digital transformation process is having people with the right skills (Teng et al., 2022, Trenerry et al., 2021, Sousa and Rocha, 2019). However, managers and directors responsible for the development of digital skills of employees do not seem to be clear about how important it is to measure the skill levels of employees, even if this should be a priority (Prezioso et al., 2020). Recognizing which digital skills employees have or lack, and which ones are essential, is crucial for digital transformation. For their part, employees must understand that if this process of change does not take place, the company may not survive, due to the increasing challenges and difficulties brought by digital transformation. Therefore, it is important to involve them

through ICT training and count on their willingness to participate (Brunetti et al., 2020), as remaining competitive depends on employees' ability to update and acquire new digital skills (Prezioso et al., 2020). Public administrations are also emphasizing the increasing importance of providing ICT training to their employees (Brunetti et al., 2020). In addition to training, attracting new profiles, such as data scientists, is essential not only for transformation but also to transfer knowledge to colleagues. Having a combination of ICT skills among employees is ideal for the transformation processes (Prezioso et al., 2020).

Providing employees with adequate ICT training opportunities influences companies' digital transformation as it increases employees' knowledge of new technologies. Thus, employees can use new tools allowing the company, for example, to use digital communication channels with employees and suppliers, or to involve Big Data analysis in the organization. Likewise, the attitudes of employees influenced by ICT training allow the organization to use a flexible organizational structure which facilitates adaptation to organizational change. This training can also influence the management team's awareness of the need for a technology-aligned business strategy.

There is a shortage of empirical studies relating ICT training and digital transformation. However, in a study conducted in a multinational company, Prezioso et al. (2020) found that their managers see the need to implement ICT training initiatives for digital transformation processes. There are also case studies in this line. An example is that of Brunetti et al. (2020), which establishes that it is essential to update digital skills within companies, and that of Fenech et al. (2019), which shows how HR managers point out that they increasingly need ICT training to implement change processes.

Thus, this study sustains the following hypothesis:

H_{10}: *ICT Training* is positively associated with *digital transformation.*

4.3.4. The mediating role of organizational commitment and human capital

Training is essential to generate and acquire new technological knowledge. It is a planned activity that aims to improve employees' performance by imparting skills (Ocen et al., 2017) and would thereby increase employees' knowledge and commitment to implementing digital transformation processes. However, differently from what has happened in most recent studies, according to Trenerry et al. (2021) research on digital

transformation should focus not only on the business and strategic level, but also on more employee-related factors. In fact, according to Rauch and Ansari (2022), the general understanding of the mechanisms determining the response of workers towards disruptive technological changes is still unclear and needs to be further explored. Consequently, in order to provide a better comprehension of the effect of ICT training on digital transformation, we have to better explore employees' roles.

In particular, according to several previous studies, organizational commitment is one of the most crucial factors affecting digital transformation processes, as it can strongly influence workers' perception of change (Schallmo et al., 2017, Verhoef et al., 2021, Vial, 2019). Porter et al. (1974) defined it as how strongly an individual identifies with and involves him-/herself in any specific organization. According to the authors, the main effects of organizational commitment on the employees relate to the strength of belief in and adherence to the objectives of an organization, the amount of effort they are willing to expend for the organization and loyalty to the organization, as well as how hard they work toward its goals. Later on, Allen and Meyer (1990) revisited the concept by proposing a three-component model of organizational commitment integrating the previous conceptualizations. According to them, organizational commitment involves employees' engagement in their company through: the *affective* component, referred to as "employees' emotional attachment to, identification with, and involvement in the organization"; the *continuance* component, referred to "commitment based on the costs that employees associate with leaving the organization"; the *normative* component, "referred to employees' feelings of obligation to remain in the organization".

By taking into account all these characteristics of organizational commitment, Favoretto et al. (2021) consider it as a crucial factor for organizations' digital transformation, as it encompasses all the common internal factors enabling digital transformation, like organizational strategy, values and structure. In fact, in order for organizations to overcome the complex challenges that digital transformation presents, their employees need to align not only with organizational strategy, but also with their companies' identities and values (Schneider et al., 2018). Furthermore, according to several studies (Kwn and Kim, 2020, Battistelli et al. 2019), the adoption of innovative behaviours by companies' employees, which enable the digital transformation processes, depends more on affective factors than on the specific requirements or characteristics of their job, thus

further confirming the fundamental role of organizational commitment to digital transformation.

Several previous studies empirically demonstrated the positive relationship between employee training and organizational commitment (Fletcher, 2016, Babakus et al., 2017). This relationship finds its theoretical roots in the Social Exchange Theory (Lévi-Strauss, 1969), which states that, when individuals receive some kind of benefit from someone, there is a strong probability of corresponding empathy and assistance to those with whom they have a social exchange relationship (Cropanzano and Mitchell, 2005). Consequently, employees perceiving that their organizations are trying to support them are likely to return the gesture, and employees are wont to exchange their commitment for their employers' support (Eisenberger et al., 1986, Eisenberger et al., 1990). Consequently, the response of employees when receiving training and development opportunities can result in higher commitment to their firm, as they may have the perception that, through training, they may expand their career opportunities and possibilities, for example by the acquisition of new skills making them suitable for promotion to new roles (Fletcher, 2016, Babakus et al., 2017). Focusing our attention more closely on training related to new technologies, the commitment which employees acquire in response to the opportunities received from this specific training leads them to adopt innovative attitudes and behaviours (Michaelis and Markham, 2017, Montani et al., 2019, Battistelli et al., 2019), which will consequently contribute to the digital transformation of the firm. Additionally, investment in ICT training also results in greater individual performance from employees, due to the acquisition of new knowledge, skills and experience, which improves collective results (Barba-Aragón and Jiménez-Jiménez, 2020). The most highly trained employees will consequently be more involved with organizations' digitization processes (Montani et al., 2019), which have an impact on the speed and effectiveness of the digital transformation process.

To sum up, employees who perceive that their company is providing them with ICT training opportunities would improve their task performance and be grateful to their employer and, therefore, develop greater commitment, which will in turn have a positive effect on the company's digital transformation process.

Thus, this study sustains the following hypothesis:

H_{11}: *Organizational commitment* mediates the relationship between *ICT training* and *digital transformation.*

However, in order for organizations to thrive in the era of Industry 4.0, their workforce needs to be always more adaptable, resourceful, resilient and interdisciplinary, with important shifts in several characteristics like competences, education, well-being and innovation (Flores et al., 2020). In particular, several studies identified organizations' human capital, defined as an employee's stock of knowledge, skills, and abilities (Coff and Kryscynski, 2011), as a strategic asset in the context of smart manufacturing and Industry 4.0 (Agolla, 2018), making it a primary source of competitive advantage (Ma et al., 2019). For example, Chu et al. (2019) found a positive relationship between the information technology capabilities of Chinese manufacturing companies' employees and their organizations' digital transformation processes and innovation. Similar results were obtained by Guinan et al. (2019), who found a positive relationship between organizations' talent management activities aiming at improving human capital and their companies' digital transformation processes. Equally, Kianto et al. (2017) identified human capital as a positive mediator of the relationship between organizations' knowledge-based human resource management practices and digital transformation processes.

It is thus possible to state that organizations' human capital plays an increasingly pivotal role in companies' digital transformation processes (Sousa and Rocha, 2019). However, as Industry 4.0 is posing increasingly disruptive challenges, organizations must upgrade their human capital at different levels (technical, psychological, social) (Flores et al., 2020). For this to happen, organizations need to provide their employees with proper training modules and activities. In fact, according to most recent empirical studies, organizations' investment in training can improve their employees' performance and, consequently, that of the organization (Ismail, 2016, Riley et al., 2017, Vidal et al., 2019). The reason behind this phenomenon lies in the fact that providing employees with training not only increases the fit in terms of their actual knowledge and skills and those that they are supposed to possess (De Winne and Sels, 2010), but it also positively impacts on their motivation (Elnaga and Imran, 2013) and commitment (Ocen et al., 2017), thus positively affecting their human capital. In particular, in the context of the fourth industrial revolution, organizations need to furnish their employees with the needed ICT training, as this will provide them with both the intangible and knowledge-related resources needed

to create value through digital transformation (Guinan et al., 2019). In fact, the acquisition of new knowledge, skills and experience related to new technologies derived from the ICT training received by their firm will not only allow employees to be involved in their companies' digital transformation process, but also to share their knowledge and use their capabilities to properly carry out and, in some case, guide the digital transformation process itself (Butschan et al., 2019). According to Flores et al. (2020) this is due to the fact that ICT training not only provides employees with the skills and technical competences needed to operate in this new context, but it also supplies them with cognitive and social abilities supporting their interactions and collaboration. It thus enriches organizations' human capital from a holistic point of view.

Consequently, according to the above, we formulate the following hypothesis:

H_{12}: *Human capital* mediates the relationship between *ICT training and digital transformation.*

4.4. Methodology

4.4.1. Data collection and sample

We contacted several organizations and then presented the study to their members. Feedback was asked from managers to assure that no issues would occur from the wording of the questions. In 2020, just before the outbreak of the Covid-19 pandemic, a survey was conducted by email and sent to 947 firms with more than ten employees in Spain and which are affiliated to the principal business associations in the area. Companies were classified according to the Spanish Classification of Economic Activities (CNAE). The study included firms not only from the code C "Manufacturing industry", as many of them were also classified in other codes (e.g. code A, "Agriculture", due to the wide diffusion of export food-processing companies in the area).

The research was designed to ensure that the final sample properly represented the population with regard to their dimension, business, and geographical location. To do so, the SABI ("Sistema de Análisis de Balances Iberícos") database was used. CEOs were asked to complete the survey, as they would have a broader vision of all the processes considered in the research. An institutional platform for conducting questionnaires was used to collect the information. Study purpose, data acquisition procedure and privacy

statement were explained through a cover letter. In the end, we obtained 184 valid responses, with a 19% response rate.

4.4.2. Measures

Seven-point Likert scales were used for all measurements. They included the following scales:

ICT training, using an adaptation of the Shen and Tang (2018) scale. One of the items used in the executive survey was: "During the last year, the training that my company provides for workers offers adequate learning opportunities in new technologies".

Organizational commitment is measured by the Jaworski and Kohli (1993) scale. One of the items used was "Employees would make personal sacrifices if it were important for the good of the company".

Human capital was measured by the Subramaniam and Youndt (2005) scale. One of the items used was "Our employees are creative and bright".

The Nicolás-Agustín et al. (2022) scale measures *digital transformation*. One of the items used was "My company uses digital components in the product or service offered to customers". After the filtering process, two items were erased.

Company performance was measured by the Ferreira et al. (2019) scale. One of the items used was "In the last three years, our company has increased its market share".

The final items used, after confirmatory factor analysis, are presented in Table 4.1.

The variables in this study are modelled as composites (Henseler et al., 2016), since they are design constructs or artifacts resulting from theoretical thinking (Henseler, 2017). Specifically, Mode A composites have been used for their operationalization.

Table 4.1: Measurement and factor loading

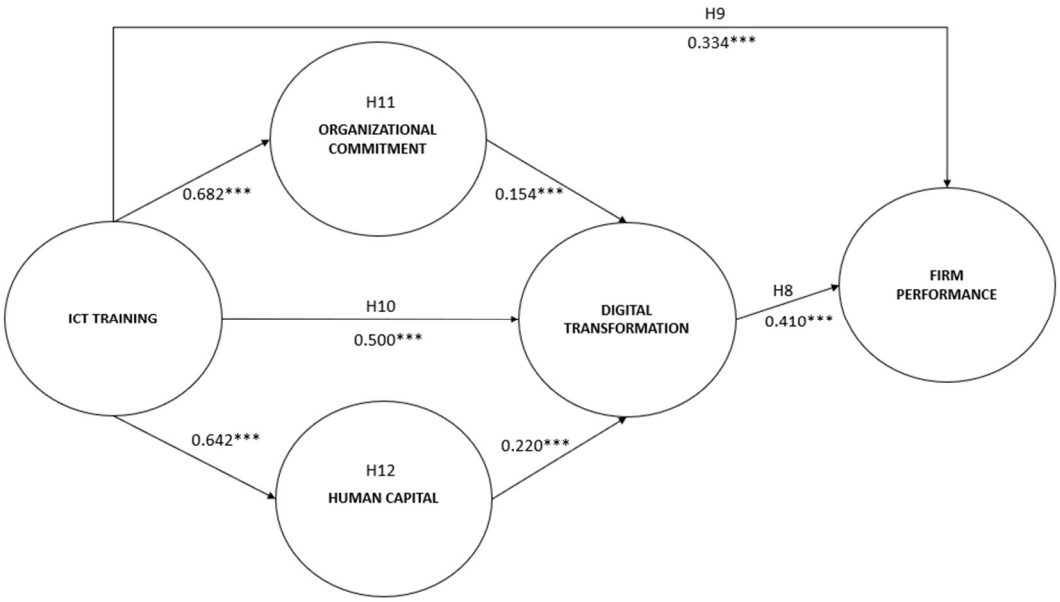
Constructs	Measures	Loadings	T-values	Reliability and model adjustment [a]
ICT training	During the last year, the training that my company provides to workers: (1- Totally disagree; 7- Totally agree)			
	1. Offers adequate learning opportunities in new technologies	0.942	76.291	Cronbach α=0.967
	2. It serves to increase your knowledge of new technologies and develop new skills	0.972	170.374	ρ_α=0.967
	3. It influences your attitudes towards new technologies	0.966	150.14	SCR=0.976
	4. Helps them better understand what they do at work	0.936	71.139	AVE=0.910
Human capital	Indicate your degree of agreement with the following statements regarding your employees (1 = totally disagree; 7 = totally agree)			
	1. They are highly qualified	0.806	18.379	Cronbach α=0.900
	2. They are recognized as the best in our sector	0.789	19.732	ρ_α=0.909
	3. They are creative and bright	0.906	61.908	SCR=0.926
	4. They are experts in the tasks they perform	0.838	28.635	AVE=0.714
	5. They bring new ideas and knowledge	0.881	43.027	R^2=0.409
Organizational commitment	Indicate how often the employees of your company, in their daily work, adopt the following behaviours: (1 = low; 7 = high)			
	1. Employees would make personal sacrifices if it were important to the good of the company.	0.764	15.893	α=0.936
	2. Overall, employees are proud to work for this company	0.919	72.631	ρ_A=0.948
	3. Employees often go beyond fulfilling their obligations to ensure the smooth running of the business.	0.886	35.352	SCR=0.952
	4. Our employees are committed to this company	0.954	111.595	AVE=0.800
	5. Employees like this company	0.936	89.531	R^2=0.462
Digital transformation	Our company uses: (1 = Little use; 7 = Much use)			
	1. A business strategy has been designed with digital technology in mind	0.731	17.576	Cronbach α=0.933
	2. A flexible organizational structure that allows us to face the changes derived from digital transformation	0.729	18.734	ρ_α=0.938
	3. Digital components in the product or service offered to customers	0.744	19.526	SCR=0.942
	4. Digital channels of communication with employees: employee portal, email or WhatsApp groups, digital newsletter.	0.769	20.921	AVE=0.576
	5. Communication channels with suppliers: online orders, digital purchasing center, etc.	0.786	23.331	R^2=0.612
	6. Digital order forms	0.729	15.773	
	7. Digital applications for internal financial statements or Blockchain	0.7	16.758	
	8. Internal and external digital documentation	0.857	42.517	
	9. Big Data analysis of information	0.725	17.359	
	10. Digital surveys to measure customer satisfaction	0.723	16.39	
	11. Digital metrics to measure customer satisfaction: Visits to the web, visits to digital channels, interactions on social networks, etc.	0.795	24.187	
	12. Dashboard on company results	0.807	27.169	
Firm Performance	In the last 3 years your company: (1 = Totally disagree; 7 = Totally agree)			
	1. Has increased market share	0.817	22.668	Cronbach α=0.897
	2. Has entered new markets	0.807	19.483	ρ_α=0.920
	3. Has improved brand image or reputation	0.897	37.538	SCR=0.924
	4. The quality of the service or product has increased	0.915	68.464	AVE=0.709
	5. The range of products or services offered has increased	0.765	15.663	R^2=0.478

[a]: ρ_α (Dijkstra and Henseler, 2015). SCR: Scale composite reliability. AVE: Average variance extracted. Model adjustment: R^2 for the three dependent variables.

4.4.3. Data analysis

Based on the characteristics of our model and the nature of composite constructs, we have tested the structural equation model (SEM) outlined in Figure 4.1 using the partial least squares (PLS) technique (Henseler et al., 2016) implemented in SmartPLS 3.3.3. Moreover, attending to (Henseler, 2018) PLS could be used for confirmatory, explanatory, exploratory, descriptive and predictive types of research. In this case, due to the novelty of the model, we have opted for an exploratory approach. Although the method is robust in terms of deviation from normality, an excessive deviation can affect the results. Hence, as a preliminary step, for each item, both excess kurtosis and skewness were computed. The standard value that indicates a highly non-normal distribution is 2.0 (in absolute terms) and only one out of thirty-three indicators exceeded that limit and only for excess kurtosis. Therefore, they were all considered in the next step.

Figure 4.1: Results of the structural model



Note: *p < 0.05; **p < 0.01; ***p < 0.001

Table 4.1 shows the results of the test applied to assess the reliability and validity of the composites. The individual indicator reliability values were higher than 0.7 (Chin, 1998), as were all composite reliability (SCR) values (Bagozzi and Yi, 1988), Cronbach's Alpha values (Roldán and Sánchez-Franco, 2012), and ρ_α (Dijkstra and Henseler, 2015), which is a consistent reliability measure. The Average Variance Extracted index (AVE) (Fornell

and Larcker, 1981), for convergent validity provides values for all the constructs above the 0.5 threshold (Bagozzi and Yi, 1988). The two items removed from the digital transformation construct had very low individual indicator reliability (0.617 and 0.353).

Table 4.2 shows two tests for discriminant validity. In bold on the diagonal the square root for each AVE is displayed and the values exceed the correlation with any other latent variable (values under the diagonal), confirming that discriminant validity holds (Fornell and Larcker, 1981); this did not hold for digital transformation when all items were included, confirming the need to remove them from the analysis. Also, the requirement of the heterotrait-monotrait (HTMT) criterion, diagonal values lower than 0.85 (Henseler et al., 2015), are fulfilled (values above the main diagonal). Thus, all of the constructs are reliable.

Table 4.2: Correlations matrix and reliability

Constructs	*Correlations*				
	1	*2*	*3*	*4*	*5*
1. ICT training	**0.954**	0.712	0.685	0.772	0.671
2. Organizational commitment	0.682	**0.894**	0.78	0.685	0.592
3. Human capital	0.642	0.719	**0.845**	0.696	0.565
4. Digital transformation	0.747	0.654	0.653	**0.759**	0.698
5. Performance	0.64	0.568	0.531	0.659	**0.842**

Notes: Diagonal elements (bold figures) are the square root of the variance shared between the constructs and their measures. Below diagonal elements are the correlations between constructs. Above diagonal elements are the Heterotrait-Monotrait Ratio (HTMT) values.

4.5. Results

The main results of the structural model obtained from the PLS-SEM analysis are summarized in Figure 1. A bootstrap test with 5000 resamples is used to generate the t-statistics employed to assess the stability of the estimates. Using these values, all the hypothesized relationships are significant, and, therefore, all the hypotheses are supported.

As can be seen in Table 4.3, the relationship studied in the eighth hypothesis is significant ($\beta = 0.410$, $p<0.001$), therefore a relationship exists between digital transformation processes and company performance. Thus, organizations can implement digital transformation of their processes to achieve competitive improvements through new ways of generating value and profitability for the company.

Table 4.3: Structural model

Paths	*Standardized coefficient*	*Standard Deviation*	*Confidence interval*	
			5%	*95%*
Direct effects				
Digital transformation → Performance	0.410***	0.096	0.237	0.607
ICT training → Performance	0.334***	0.100	0.122	0.511
ICT training → Digital transformation	0.500***	0.075	0.349	0.642
ICT training → Organizational commitment	0.682***	0.043	0.595	0.762
ICT training → Human capital	0.642***	0.047	0.550	0.731
Organizational commitment → Digital transformation	0.154*	0.080	0.000	0.313
Human capital → Digital transformation	0.220**	0.079	0.068	0.375
Indirect effects				
ICT training → Organizational commitment → Digital transformation	0.105*	0.056	0.000	0.221
ICT training → Human capital → Digital transformation	0.142**	0.053	0.043	0.251
ICT training → Digital transformation → Performance	0.205**	0.067	0.996	0.354

Note: ***p <0.001 **p <0.01 *p <0.05; Bootstrapping based on n = 10.000 subsamples.

In addition, the importance of the human element has also been reviewed. Firstly, the results show that ICT training becomes a powerful element for improving companies' results ($\beta = 0.334$, $p<0.001$), demonstrating a positive relationship in the ninth hypothesis of this study. Thus, it is shown that investment in this type of training can provide an economic return for the company.

Likewise, a positive relationship has been obtained between ICT training and digital transformation processes ($\beta = 0.500$, $p<0.001$). This implies that investment in ICT training promotes companies' digital transformation. Moreover, Table 4.3 also reflects the direct effect of such training on company performance through digital transformation ($\beta = 0.205$, $p<0.01$), helping to understand how investments in ICT training improve companies' competitiveness.

The possible mediations of organizational commitment and human capital is analysed as a channel through which ICT training facilitates digital transformation. In the first place, it has been seen that ICT training contributes to organizational commitment ($\beta = 0.682$, $p <0.001$) while this organizational commitment is related to digital transformation ($\beta = 0.154$, $p <0.05$). In addition, the existence of a significant indirect effect is verified ($\beta = 0.105$, $p <0.05$). This highlights that organizational commitment partially mediates the relationship between training in new skills and digital transformation. It also implies that employees commit to a company when they are shown commitment in the form of ICT

training and development opportunities, which leads to those employees participating in the digital transformation processes required by the organization.

The results of the tests verify a significant relationship between ICT training and human capital ($\beta = 0.642$, $p < 0.001$), as well as between human capital and digital transformation ($\beta = 0.220$, $p < 0.01$). Taking into account the existence of a significant indirect effect through human capital ($\beta = 0.142$, $p < 0.01$), evidence is obtained of the partial mediation of this last variable in the relationship between training and digital transformation. This means that employees are able to carry out the digital transformation processes which are required to improve their adaptation to the current environment due to the knowledge, skills and experience which they obtain thanks to the investment in training from their company.

In addition to the statistical significance, it is also appropriate to assess the relative importance of direct and indirect effects using the ratio between the indirect effect over the total one (Variance accounted for). Firstly, in the relation between ICT training and digital transformation the indirect effect through OC accounts for 14.1% of the total effect (0,105/(0.500+0.105+0.142)) and the one through HC represents 19.0%. Secondly, one third of the total effect of ICT training on digital transformation is channelled through the mediators. Similarly, the VAR for ICT training and company performance is 38.0% (0.205/(0.334+0.205)). Hence, the mediator variables are not only statistically significant but also relevant in an economic sense.

4.6. Discussion and contributions

This study deepens comprehension of the relevance of HR for digital transformation, considering both the viewpoint of a human resource management practice such as ICT training, as well as the behaviour of employees in the search for improving business results. In this sense, the main contributions are the following.

4.6.1. Theoretical contributions

Firstly, the results of our analysis confirm our eighth hypothesis, i.e., that the digital transformation of companies has a positive impact on their performance. We thus address the shortage of empirical literature in this regard that authors such as Verhoef et al. (2021) had previously pointed out. Furthermore, we did not focus on the effect of a particular digital technology on organizations' financial performance, as most previous studies did

(Guo and Xu, 2021). On the contrary, we considered the whole digital transformation process and its impact on the whole organizational performance. By doing so, we measured digital transformation direct effect on organizational performance in an easier and more reliable way than previous studies did. Moreover, digital transformation was measured through the use of a recently validated scale whilst previous research typically used case studies (Nicolás-Agustín et al., 2022).

Secondly, the analysis confirmed our ninth hypothesis, demonstrating that ICT training is positively associated with company performance. When the company manages to adapt its employees' skills in accordance with the requirements needed for the transformation of the company in the Industry 4.0 environment, it can face the process of organizational change in a better way, thus improving its results. By focusing directly on the relationship between ICT training and company performance we addressed the lack of literature highlighted by several studies, like Shen and Tang (2018). Previous research usually focused only on individual (Lee et al., 2022) or organizational productivity (Taştan and Gönel, 2020).

Our results are also in line with the Human Capital Theory, which states that by investing in people, and particularly in their education and training, economic benefits may be obtained (Sweetland, 1996). In fact, several empirical studies had already demonstrated that by providing employees with training, their productivity and performance could be increased and, consequently, those of their companies (Nafukho et al., 2004) too. However, to the best of our knowledge, our study is the first to apply this theory in the specific context of Industry 4.0. More specifically, we contribute to the Human Capital Theory by demonstrating its validity not only in relation to general training, but also when it comes to ICT training. By doing so, we confirm that training still plays a crucial role even in the context of the Fourth Industrial Revolution, as it is still capable of influencing the performance of employees and, consequently, of their companies.

Furthermore, despite the importance currently attributed by the scientific literature to companies' digital transformation (Verhoef et al., 2021, Vial, 2019), there is a shortage of research regarding the role played by HRM in its implementation, a gap in which this study offers its contribution. In fact, in accordance with previous studies stating that employee skills can enhance companies' digital transformation and that their capacities can be improved by investing on ICT training (Duică et al., 2020), the analysis confirmed our tenth hypothesis i.e. that ICT training is positively associated with companies' digital

transformation processes. Therefore, our results suggest that for succeeding in digital transformation companies not only need to have good technological equipment, but also need to properly manage their human capital. This conclusion is further strengthened by the confirmation of hypotheses 11 and 12, demonstrating that organizational commitment and human capital partially mediate the impact of ICT training on digital transformation.

The confirmation of these hypotheses partially responds to Porfírio et al. (2021), who highlighted the need to study how to involve employees in and get them to commit to digital transformation. In fact, although we did not provide a specific and omni comprehensive pattern to do so, we showed that providing employees with ICT training promotes the organizational commitment needed for employees to adopt the innovative behaviours that are essential for implementing and developing digital transformation processes (Kwon and Kim, 2020). This can consequently be a starting point for the implementation of a more complex strategy able to further enhance employees' commitment to digital transformation from a holistic point of view. These results highlight once more the importance of the role played by investment in ICT training in the management of organizational change, especially in relation to technological transformation. Furthermore, the analysis of the partial mediating role of organizational commitment and of companies' human capital represents an elementary takeaway in the analysis of the relationship between the practice of ICT training and digital transformation. To the best of our knowledge, this issue had not been addressed by previous studies.

The confirmation of hypotheses 10, 11 and 12 also answers the need to further explore the role of HRM in digital transformation, which had been highlighted by several scholars (Fenech et al., 2019). Furthermore, our results are in line with the Social Exchange Theory (Lévi-Strauss, 1969), stating that individuals are likely to try to return the benefits they have received from someone. We contribute to this theory by widening its application not only in relation to general training, but also with specific reference to ICT training. In fact, our study demonstrates that, by providing employees with ICT training, the organizational commitment is increased, and this can impact on the firm's digital transformation process.

4.6.2. Practical implications

In line with previous research, our study provides further confirmation of the fact that directors and managers should invest more in their companies' human capital through ICT training (Lee et al., 2022). In fact, these practices can increase employees' involvement and commitment to the organization (Schallmo et al., 2017), encouraging them to adopt more innovative behaviours (Kwon and Kim, 2020). In this way, they can better contribute to the necessary digital transformation in these times of the Industry 4.0 revolution.

In addition, as the lack of digital skills is a global problem (Nair, 2019), this study can establish recommendations for social dialogue and collective bargaining in each country, with the involvement of different stakeholders. For example, through the introduction or reinforcement of ICT training in primary and secondary schools or public universities, governments can increase their population's digital skills.

Even if these initiatives will not be able to provide students with the whole set of skills required in the Industry 4.0 environment, they will facilitate organizations' access to talents which are not totally neophyte to the needed knowledge, thus providing the basis for a smoother entrance into the labour market. By doing so, governments would also promote the establishment of a culture conducive to research & development and innovation. They may also create specific funds for ICT training, which would further push companies, and society in general, towards digital transformation.

In addition, business organizations can jointly purchase access to learning plans enabling them to undertake ICT training at a lower cost. This is especially interesting for SMEs, as they may have fewer funds available. Likewise, trade union organizations can also be trained in digital skills to transfer this knowledge to their associates. In order to do so, they may decide to invest in order to attract certified trainers who could guide organizations' ICT training process.

Finally, this research highlights the importance for people to be trained autonomously and on a continual basis to always have skills that improve their employability. In particular, it provides further confirmation of the fact that, in the context of Industry 4.0, training must no longer be seen as an option, but as a necessity.

4.7. Limitations and future research lines

Although this research provides significant progress in the measurement of digital transformation in firms and examines the relationship among ICT training, digital transformation, and performance, we are aware that there are limitations which should be discussed.

Firstly, we only obtained one response per company. Thus, in addition to interviewing managers or owners, it would be interesting to know the opinion of employees.

Secondly, data were collected at a specific moment in time, portraying the image of that particular situation, due to the complexity of granting the permission of such a large sample of companies to measure the same variables at different moments in time. Therefore, longitudinal studies could advance the research, considering the effects that ICT training and digital transformation may have in the medium and long term.

Thirdly, it would be desirable to incorporate new variables into the organizational level model. In this regard, aspects such as organizational capabilities, product and business model innovation could be combined to determine their effect on company performance.

Lastly, it would be interesting to know the impact of other HRM practices on the processes of digital transformation besides the performance variables addressed in this study.

4.8. Conclusion

This research helps to understand some of the determinants and consequences of the digital transformation process in companies. Our results highlight positive ICT training effects on digital transformation and company performance. The evidence further reveals that human capital and organizational commitment act as mediators between ICT training and digital transformation. In light of these results, we can state that digital transformation must be accompanied by ICT training for employees, making this human resource practice essential for the implementation of these processes.

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CONCLUSIONS

CONCLUSIONS

The main objective of this study was to analyse the implications of dynamic capabilities and individual competences in the successful implementation of digital transformation processes in companies. Given that digital transformation is halfway between the foreseen expectation of its benefits, and the fear of the possible decline it may cause in the way traditional companies generate value, it is an academic field that is attracting increasing interest. Moreover, due to its novelty, it has not been treated in sufficient depth in previous literature, especially empirically.

This thesis has analysed this in greater detail, not only by identifying what kind of skills and competences are needed to drive digital transformation, but also by looking at the effects it has on company performance.

To this end, we have reviewed, analysed and synthesised the literature related to digital transformation and its value-generating processes, the literature that analyses dynamic capabilities and, finally, the literature that explores employee competencies, including that which is related to human capital, behaviours and the human resource management practices needed to boost these competencies.

Following the review of the general conceptual framework, a general theoretical model has been proposed, which has been disaggregated into three empirical studies in the three preceding chapters.

Next, we present the main conclusions of this work, differentiating between those obtained in the more conceptual chapter and those proceeding from empirical studies. Subsequently, we point out the main implications for the business world and the most important contributions and limitations of this research. Finally, some of the future areas of research arising from this work are indicated.

Hence, this study provides a holistic view of digital transformation in companies, highlighting the importance of driving the development of certain organisational capabilities, employee competencies and management practices. It offers valuable lessons for executives and managers seeking to adapt to an ever-changing digital environment and seize the opportunities provided by digital transformation in their organisations.

C.1. Conclusions from the literature review

The literature review conducted in the conceptual chapter highlights that in an environment of digital transformation, in the era of Industry 4.0, knowledge and adaptation to change are essential if companies are to remain competitive (Mele et al., 2023). Meeting these challenges means that companies must be able to understand the behaviour of various internal factors that influence an organisation's ability to address digital transformation and its impact on business performance (Konopik et al., 2022).

A fundamental aspect that informs these ideas is the assumption that the knowledge acquired by the company, immersed in organisational structures and practices, does not allow the company to adapt to the changes demanded by the digital transformation, because the way of generating value is totally different (Cepeda-Carrion et al., 2012).

Companies must be able to constantly introduce new external knowledge and be able to adapt it to the specific reality of their companies. This is no easy task without changing the way staff perform tasks and dealing with the problems of a highly demanding and changing environment, which in turn requires a new way of managing the company's human resources (Weber et al., 2022).

The aforementioned propositions help us to understand that, in the coming years, because digital transformation is imminent, companies' current resources and capabilities may be devalued. If the competitive pressure on companies is already high, the threat (and opportunity) of the digital age will add pressure for technological intensification and digitalisation of companies, which will in turn cause greater instability and uncertainty in the environment. This will test the foundations on which companies stand (Heubeck, 2023).

The theoretical review has highlighted that, while the fundamental source of success is considered to be based on the company’s having adequate resources and capabilities, as suggested by the Resources and Capabilities Theory (Barney, 1991), the company needs to be able to constantly update them. That is why a Dynamic Capabilities (Teece et al., 1997) focus has been used as a general conceptual framework. This does not imply that each study has been complemented by other theoretical approaches more in line with its specific problems.

The Dynamic Capabilities perspective assumes this need for change and is committed to

integrating, reconfiguring, obtaining and setting aside resources to adjust to market changes or even to generating them (Eisenhardt y Martin. 2000, p.1107). In our research field of study this theory would argue that digital adaptation is essential for survival in today's marketplace. This digital adaptation does, however, require the generation of new knowledge and learning.

The literature review focusing on Dynamic Capabilities points out that some capabilities, such as information capacity, absorptive capacity or organisational agility, are essential for companies to successfully adapt to digital transformation (Chu et al., 2019; Gong & Ribiere, 2023; Siachou et al., 2021).

In addition, the review shows that employee competencies also play an important role in this implementation (Kianto et al., 2017; Vial, 2019). Not surprisingly, the shift away from manual-labour-intensive activities towards activities in which machines play a greater role in the production process, requires new knowledge, attitudes and behaviours. Obviously, it also requires a different way of managing these human resources (Kianto et al., 2017; Vial, 2019).

By way of conclusion to this conceptual section, an overall theoretical mould was established in which a company is considered to need to foster a series of dynamic capabilities and individual competences to promote digital transformation. The latter is configured as a way for a company to change its business model and achieve competitive advantages that allow it to survive the changes in the environment.

C.2. Conclusions from the empirical studies

C.2.1. Conclusions of the first empirical study

As noted above, in the context of digital transformation in the Industry 4.0 era, it is essential that companies acquire knowledge of the environment and integrate it into their organisation to remain competitive (Felsberger et al., 2022). This means that companies cannot afford to remain static. On the contrary, they must be willing to continuously adapt and evolve in response to changes in the digital environment. Only in this way will they be able to adapt their business models to the new realities required by the changing environment (Ancillai et al., 2023).

The results of the first empirical study are as follows:

I. Dynamic capabilities have a positive impact on the digital transformation of firms, underpinning the theory of dynamic capabilities, which suggests that digital adaptation is essential for survival in today's market. Digital transformation, and therefore the need for new knowledge creation, depends on fostering the following:

   (1) Information capability. This capability of a company promotes the use of information technology in capturing business-related information, in decision making or in coordination. The positive evidence found for this capability in digital transformation suggests that this information capability is essential for the knowledge needed to manage a digital company.

   (2) Organisational agility, responding quickly to change and adapting internal processes to respond effectively. The positive relationship found between organisational agility and digital transformation reinforces the idea of the need to respond quickly and agilely to changes in the environment.

   (3) Absorption capacity, incorporating new knowledge that can be used in the company's production processes. Positive evidence reinforces the idea that the success of digital transformation lies in harnessing new knowledge to improve business processes and products.

II. Our results posit that digital transformation enables companies to change their business models and improve their performance. This reinforces theoretical assumptions about the benefits of joining digitalisation processes through changes in the way value is created (Verhoef et al., 2021). This has also been corroborated in our study by noting the following:

   (1) digital transformation has a positive relationship to business performance. Therefore, this study contributes to previous literature that argues that digital transformation is an opportunity to achieve a competitive advantage for those companies that embrace it.

   (2) business model innovation plays a mediating role in the relationship between digital transformation and company performance, suggesting that

digital transformation finds new sources of revenue and improves organisational performance. Moreover, it underlines the fundamental idea that digital transformation is not just about adopting technologies, but also about rethinking and adapting the way the company generates revenue and creates value.

In conclusion, digital transformation provides an opportunity for companies that implement it, to renew their business models by improving their results. However, for this to happen, companies need to foster a series of dynamic capabilities that promote the generation of new knowledge that can be used for the digitalisation of the company.

C.2.2. Conclusions of the second empirical study

Having understood the role played by dynamic capabilities, the objective of the second empirical study focuses on the individual competencies of the employee, understanding that this type of competencies may differ from those used by companies outside this digitization process. In addition, we raise the question of whether these competencies require a specific way of managing human resources (R. Fenech et al., 2019).

Although this field of human resource management for digital transformation has not been extensively analysed, and despite repeated requests for in-depth study by much of the literature (Blanka et al., 2022; Trenerry et al., 2021), it can be seen that companies that are committed to digital transformation must manage their personnel differently.

The results of the study specifically show the following:

I. A positive relationship between the strategy taken and its application in the digital transformation of a company. Digital transformation involves a risky gamble which means high costs and a great chance of failure. This is why it needs the involvement of top management and that all the company's resources be focused on achieving it. The results show high correlation between strategic alignment and the implementation of digitalization, reflecting the importance of drawing up an appropriate strategy for the company.

II. That a strategic alignment with the objectives of digital transformation is related to the use of certain HR practices. As the literature on human resources management points out, the company can adopt different personnel management

models depending on its objectives. In this case, digital transformation requires digitalization-oriented human resources management that promotes teamwork, remote-working, management by objectives or, for example, leadership.

III. A direct and positive relationship has also been found between the aforementioned human resource management and digital transformation. In other words, digital HR management is a decisive element in promoting digital transformation and, consequently, this digitalization requires a different kind of personnel management from that of a traditional company.

IV. That digitalization-orientated human resource management indirectly influences digital transformation as a consequence of promoting certain behaviors in employees.

(1) According to classical behavioral theory, human resource practices will have an impact on employee competencies. Specifically, depending on the type of human resources management, the employee may behave differently. The results show that digitalization-oriented human resources management promotes employee behaviors favorable to incorporating innovations in a company.

(2) Additionally, it has been found that this innovative behavior of an employee is positively related to digital transformation, which indicates that staff play a highly relevant role in implementing this process.

To sum up, this study expands the understanding of the importance of personnel management in the digital transformation processes of companies, considering both the perspective of human resource management practices and its behaviour.

C.2.3. Conclusions of the third empirical study

The last empirical study delves into one human resources practice and its relationship with the digital transformation of the company. Specifically, the third model focuses on analysing training in new technologies (Ruiz, 2020).

Social Exchange theory (Cropanzano & Mitchell, 2005) states that when a company supports its employees, employees are more likely to show greater commitment and

performance at work. This suggests that the company's investment made in training often provides mutually beneficial results.

The analyses of the model test for evidence of significant relationships between the variables measuring new technology training, staff competencies, digital transformation and company performance. The following are the results:

I. Training in new technologies has a positive and direction effect on:

   (1) The digital transformation of a company. This evidence suggests that companies immersed in these digitalisation processes require employees with specialised training in digital skills. This is no *trivial* matter as the changing nature of work in the company from manual to digital work requires a digital employee who is used to dealing with new technology and access to constant information. Without adequate and continuous training in this area, the skills of the company's personnel will become obsolete, rendering them unable to perform the required work.

   (2) Company results. The positive relationship between this type of training and results lies in the ability to use environmental and internal information to design strategies and actions that improve efficiency and innovation in the company. This training helps generate new skills and better understand work being done through technology that is able to deliver and summarise a wealth of information critical to the business.

II. Training in new technologies has a positive and direct effect on digital transformation through:

   (1) the human capital of the company. Human capital refers to the body of knowledge, skills, experience, and capabilities possessed by the people in that organisation. Digital transformation requires companies to have a workforce with high-value knowledge and skills, and training is essential for promoting it. Analyses show that ICT training increases the value of human capital, which in turn helps to foster digital transformation.

   (2) organisational commitment. Employee commitment allows for identification assessment of staff and the company itself. Identification

helps an employee to feel proud, make sacrifices and improve performance at work. The positive relationship observed between IT training and employee engagement reflects the employee's appreciation of the investment made in him/her by the company, which enhances his/her personal skills in exchange for performance expectations. Likewise, it is observed that increased employee engagement is a powerful element for digital transformation, as successful change processes require employees who are committed to the project and to the company.

III. Digital transformation positively influences the results of a company. Similar to the evidence found in the first study, the digitalisation of the company is a determining factor in achieving a competitive advantage.

In summary, the conclusions of this model suggest that the company's human resources are a key factor in driving digital transformation processes. This is why it is so important to analyse how staff are managed in this type of company, with training being a more relevant variable, not only for providing the necessary knowledge, but also for promoting a commitment in employees that binds them to the digitalisation of the company.

C.3. Contributions

Having reviewed the most relevant conclusions of this work, the following are the contributions we consider to be most important:

I. This doctoral thesis has focused on the study of digital transformation. This contributes to filling lacunae in research as identified by Demeter et al. (2021), Ghosh et al. (2022) y Ellström et al. (2021). They point to the need for more general information on digital transformation, in order to understand the reasons for failures in its implementation and the skills required.

II. Existing literature regarding the relationships between dynamic capabilities, workforce competencies, digital transformation and firm performance has been compiled, analysed and synthesised, and a model proposing relationships among these variables has been established.

III. Three empirical studies have been carried out to analyse the relationships proposed in the model. This in itself is a contribution as there has been very little work on these relationships. Although the literature frequently points to the importance of digital transformation, there is a paucity of empirical research. What there is has been based more on case studies than on the use of digital technologies (Verhoef et al., 2021; Vial, 2019).

IV. The Dynamic Capabilities approach has been shown to be an essential perspective for understanding how a company must constantly upgrade its resources and capabilities to drive digital transformation processes and outcomes.

V. In addition, it should be noted that there are some particularly novel elements concerning the relationship with digital transformation:

(1) It provides empirical evidence of the positive impact of information capability, organisational agility and absorptive capacity on the digital transformation of companies. This empirical validation is crucial for strengthening theoretical frameworks and improving our understanding of the practical implications of dynamic capabilities in the context of digital transformation.

(2) Moreover, in contrast to previous studies, which often focused on the impact of specific digital technologies on financial performance (Ferreira et al., 2019), this study has adopted a holistic approach. It measures the direct effect of digital transformation on organisational performance, providing a more comprehensive understanding and easier measurement of this relationship.

(3) Business model innovation is also identified as a partial mediator in the relationship between digital transformation and firm performance. This contributes to understanding how digital transformation influences the components of a business model, enables drawing up new revenue models and empirically tests the impact of digital business model innovation on firm performance.

VI. Despite importance attributed to digital transformation in a business, this study

contributes to resolving the lack of research on the role of employee competences:

(1) Evidence has been provided regarding the importance of employee competences in implementing digital transformation processes. Behaviours, knowledge and skills as well as employee engagement are necessary for digitalisation.

(2) Certain human resource management practices have been shown to support digital transformation directly or indirectly through employee competencies. Of particular relevance is training in information and communication technologies, which stimulates the creation of the necessary human capital.

(3) A relevant contribution is the ascertainment of the partial mediating role of digital human resources practices in the relationship between strategic orientation and digital transformation. This result reinforces the contingent perspective of human resource management (Delery & Doty, 1996) in the field of digital transformation. The company should implement human resource management practices that encourage employee behaviours that are consistent with the organisation's strategy. This alignment of strategy and human resource management practices enables companies to achieve digital transformation in pursuit of superior performance.

VII. Finally, all this also shows that it is essential for companies to digitally transform themselves in order to adapt to the current environment of the digital revolution and this thesis makes a serious effort to measure the digital transformation processes of companies, something that has been much called for by researchers (Verhoef et al., 2021).

C.4. Implications for managers

This thesis presents a number of practical implications for managers undergoing digital transformation processes. There is no shortage of work highlighting the urgency for companies to anticipate and be prepared for the imminent digital age. If, as predicted, the digitalisation of the company means a paradigm shift in which the current way of doing business will not work, any company wishing to adapt to these costly and time-consuming change processes should already be assessing the factors that contribute to its success.

The results of this work suggest that to foster digital transformation they need to pay

attention to organisational capabilities and the competencies of their employees.

On the one hand, companies involved in the digital transformation process need to have dynamic capabilities that stimulate the capture and use of essential knowledge for business management. Our study supports the promotion of information, organisational agility and absorption skills. Although each competence promotes specific knowledge-related aspects, they all share the ability to manage the knowledge needed for a digital enterprise. Although fostering these capabilities is neither simple nor quick, company managers should try to make a firm commitment to them, as they not only provide the necessary knowledge for the initial implementation of the digital transformation, but also guarantee the constant renewal of knowledge and, therefore, the resources and capabilities of the company, which make it competitive.

On the other hand, the company's management must empower the company's staff. This study has shown the importance of the competences of the company's employees, be it their knowledge, skills, behaviour or even their commitment to the company. To foster these competencies, which have been shown to be the backbone of digital transformation, the company must be able to implement human resources practices that enhance them. To do so, it must first define what kind of practices are best suited to the company's strategy for digital transformation. These practices can make employees more engaged, committed to the organisation, adopt innovative behaviours, and contribute more to the digital transformation. According to the literature, managers should encourage human resource practices that promote management by objectives, facilitate remote-working, employee participation, teamwork, or encourage appropriate leadership. Moreover, the company must promote training in information and communication technologies, as this knowledge will be fundamental for the employee to "survive".

Finally, as mentioned above, empirical analysis reveals that digital transformation improves company performance, but this is achieved through a change in the company's business model. This means that company managers must question their traditional way of generating value, opting in most cases for a re-engineering of the business in which digitalisation takes on a new role and the way of doing business involves changes in the source of revenue, cost processes, value creation, distribution, or target customer. These innovations in the business model may be met with great resistance from the company's different stakeholders but will be an unavoidable issue in the face of the new business paradigm shift.

C.5. Limitations

Like any research work, this doctoral thesis is not without limitations that could affect the results obtained.

I. The first limitation is due to the use of cross-sectional data. Thus, the results extracted from the causal relationships presented should be interpreted with caution (Hair et al., 2008). Future areas of research examining these relationships should therefore use longitudinal data.

II. As for the measurement of the digital transformation variable, theoretical work has been used to measure it. Although the creation of this scale is a contribution to the paucity of empirical work, having a scale that has not been validated by other studies entails possible conceptual biases that can be tested if its use is replicated.

III. The variables have been measured from a single informant. This method, although it has its advantages, is prey the drawback that a single key informant assesses both independent and dependent variables.

IV. Despite the effort to use scales validated by previous literature for most of the concepts studied, this does not prevent the information obtained from being subjective in nature. The constructs used respond to the nature of composites, which could hardly be measured with objective variables.

V. Information is only available from senior management. This is an important limitation as the direct opinion of employees is not taken into account. Therefore, we only have the perception of the manager on the different constructs used in the study. Multilevel studies could solve this problem, considerably enriching the contributions.

VI. Caution should always be exercised in extrapolating the results of this research because they have been collected in a given region where company size, business culture or level of digitalisation may differ significantly from what happens in other geographical contexts.

VII. Finally, the absence of analysis of other variables that may influence digital transformation should be taken into account. This thesis has only considered various capacities, competencies, and organisational practices. However, the

literature recognises that other variables such as other dynamic competencies, organisational culture, leadership style or innovation can influence the successful implementation of innovation.

C.6. Future research lines

Before concluding this study, it is worth pointing out some of the areas that can be explored in further work.

On the one hand, future work should overcome the limitations highlighted in this thesis. In particular, we believe it is of great interest to consider longitudinal studies to capture the causal effect on digital transformation. Incorporating additional sources of information and the use of multi-level studies would also improve the validity of the results obtained.

On the other hand, we consider that it would be interesting to explore other aspects that have not been dealt with in this work or have been studied in little depth. In particular, the following areas of research are suggested:

I. Other variables should be incorporated into the model to help understand the challenges of digital transformation. It would be interesting to introduce other dynamic capabilities and thus perform an empirical analysis to test their impact on digital transformation, business model innovation and company performance.

II. It is particularly important to understand the role of organisational learning processes and, especially, the so-called organisational unlearning in order to be able to deal with the management of transition required by the change of business model, required by the digital transformation of the company. The replacement of old knowledge with new digital knowledge can create tensions that need to be managed by the company.

III. This could include contextual variables, such as the size of the company, the industry in which it operates, the maturity of the market and other factors that could influence digital transformation and business performance.

IV. As digital transformation is a constantly evolving process, it would be relevant to differentiate the company according to its digital maturity. This would allow identifying the need and intensity of different organisational capabilities

depending on the stage of implementation of the digital transformation in which the company finds itself.

V. It would be interesting to conduct further research in the area of human resource management within the studied scenario. While our study is a significant step forward in understanding why and how employees drive the digital transformation of companies, further studies could go further in defining the human resources management policies that need to be implemented to digitally transform companies.

VI. Another area that could help further explore the relationship between dynamic capabilities and digital transformation would be to consider possible moderating variables such as market turbulence or competitive intensity. These variables can help to understand the reasons why entrepreneurs choose to go digital.

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ANNEX

ANNEX

Cuestiones sobre su empresa

Le recordamos que los datos que se obtengan se tratarán de forma confidencial. Le rogamos que por favor responda a todas las preguntas de una forma sincera. Las cuestiones que contienen un asterisco requieren que se contesten para poder finalizar y guardar la encuesta.

Por favor, indique, si lo considera oportuno, el nombre de su empresa (por ejemplo: Boss Digital Group S.L.)

Por favor, si usted desea recibir el análisis de los resultados, indique el correo electrónico corporativo al que habría que remitirlo (por ejemplo: juan.serrano@industria.es)

Indique en qué sector productivo ubicaría a su empresa

[ ] Agricultura, ganadería, silvicultura y pesca
[ ] Industrias extractivas
[ ] Industria manufacturera
[ ] Suministro de energía eléctrica, gas, vapor y aire acondicionado
[ ] Suministro de agua, actividades de saneamiento, gestión de residuos y descontaminación
[ ] Construcción
[ ] Comercio al por mayor y al por menor; reparación de vehículos de motor y motocicletas
[ ] Transporte y almacenamiento
[ ] Hostelería
[ ] Información y comunicaciones
[ ] Actividades financieras y de seguros
[ ] Actividades inmobiliarias
[ ] Actividades profesionales, científicas y técnicas
[ ] Actividades administrativas y servicios auxliares
[ ] Administración Pública y defensa; Seguridad Social obligatoria
[ ] Educación
[ ] Actividades sanitarias y de servicios sociales
[ ] Actividades artísticas, recreativas y de entrenimiento
[ ] Otros servicios
[ ] Actividades de los hogares como empleadores de personal doméstico; actividades de los hogares como productores de bienes y servicios para uso propio
[ ] Actividades de organizaciones y organismos extraterritoriales

Indique cuántos trabajadores (incluyéndose usted) tiene su empresa

[ ] De 10 a 19
[ ] De 20 a 49
[ ] De 50 a 249
[ ] 250 o más

En nuestra empresa:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Se ha integrado la tecnología digital con la estrategia comercial para que se desarrollen conjuntamente	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Sus empleados comparten la importancia de la tecnología digital en el diseño de la estrategia	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
La estrategia de negocio se ha diseñado teniendo en cuenta la tecnología digital	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Se consulta con otros responsables de departamento o directivos antes de tomar decisiones estratégicas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Indique su grado de acuerdo con las siguientes afirmaciones respecto a sus empleados:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Están muy cualificados	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Son reconocidos como los mejores de nuestro sector	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Son creativos y brillantes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Son expertos en las tareas que desempeñan	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Aportan nuevas ideas y conocimientos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Indique con qué frecuencia los empleados de su empresa, en su trabajo diario, adoptan las siguientes conductas:

	Baja 1	2	3	4	5	6	Alta 7
Buscan cómo mejorar los procesos, tecnología, productos, servicios o relaciones de trabajo existentes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Proponen ideas creativas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Prueban las nuevas ideas, tratando de evaluarlas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Promueven y defienden las nuevas ideas de otros	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Tratan de persuadir a los demás de la importancia de una nueva idea o solución	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

	Baja 1	2	3	4	5	6	Alta 7
Tratan de encontrar los fondos necesarios para poner en marcha las nuevas ideas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Desarrollan planes y programas adecuados para implantar las nuevas ideas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
En general, son innovadores	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Indique su grado de acuerdo con las siguientes afirmaciones:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Los empleados harían esfuerzos personales si fuera importante para el bien de la empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
En general, los empleados están orgullosos de trabajar para esta empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Los empleados a menudo van más allá del cumplimiento de sus obligaciones para garantizar el buen funcionamiento de la empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Nuestros empleados están comprometidos con esta empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
A los empleados les gusta esta empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

La empresa en su proceso productivo hace uso de:

	Poco uso 1	2	3	4	5	6	Mucho uso 7
Tareas rutinarias automatizadas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Robots en el proceso productivo	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Componentes digitales en el producto o servicio ofrecido a los clientes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Canales digitales de comunicación con empleados (portal del empleado, grupos de correo electrónico o whatsapp, boletín informativo digital)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Canales digitales de comunicación con proveedores (pedidos online, central digital de compras, etc)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

	Poco uso 1	2	3	4	5	6	Mucho uso 7
Formularios digitales para los pedidos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Aplicaciones digitales para declaraciones financieras internas o Blockchain	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Documentación interna y externa digital	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Análisis mediante Big Data de la información	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Encuestas digitales para medir la satisfacción del cliente (métricas y objetivos)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Métricas digitales para medir la satisfacción del cliente (visitas a la web, visitas a los canales digitales, interacciones en redes sociales, etc.)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cuadro de mando sobre los resultados de la empresa (costes, ingresos, rentabilidad, ROI, etc.)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Indique en qué grado el uso de las tecnologías de la información es útil para:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Agilizar los procesos comerciales	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Recoger y analizar datos comerciales para una mejor toma de decisiones	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Para una comunicación eficiente con sus socios comerciales externos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Para la coordinación entre departamentos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

En nuestra empresa:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Tenemos la capacidad de responder rápidamente a las necesidades de los clientes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Tenemos la capacidad de adaptar rápidamente la producción a los cambios de la demanda	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Tenemos la capacidad de hacer frente rápidamente a problemas con algún proveedor	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Implementamos rápidamente decisiones para reaccionar a los cambios de mercado	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Buscamos continuamente formas para reinventar o rediseñar nuestra empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Vemos los cambios de mercado como oportunidades para mejorar la rentabilidad de la empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Contamos con una estructura organizativa flexible que permite hacer frente a los cambios derivados de la transformación digital	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

En nuestra empresa:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Con frecuencia buscamos nuevos conocimientos y habilidades fuera de la empresa (por ejemplo, a través de cursos, asistencia a eventos, etc.)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Registramos y almacenamos los conocimientos recién adquiridos para su uso futuro (por ejemplo: información adquirida en eventos, cursos, etc..)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Analizamos la utilidad del nuevo conocimiento externo para nuestro conocimiento existente	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Somos competentes en la integración del conocimiento recién adquirido en las formas actuales de hacer las cosas	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Constantemente consideramos cómo explotar los conocimientos, habilidades y tecnologías recién adquiridos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

En comparación con sus competidores, indique en qué grado en los últimos tres años su empresa ha:

	Muy por debajo 1	2	3	4	5	6	Muy por encima 7
Mejorado la calidad de los componentes y materiales de sus productos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Reducido los costes de los materiales y de producción de sus productos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Introducido modificaciones en sus productos que facilitan su uso y aumentan la satisfacción de los consumidores	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Desarrollado nuevos productos con especificaciones técnicas y funcionalidades totalmente distintas a las de los productos actuales	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Desarrollado nuevos productos con componentes y materiales totalmente diferentes a los actuales	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

En su empresa, durante los 3 últimos años, han cambiado:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Los clientes potenciales	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
La oferta de productos y servicios	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Su posicionamiento en el mercado	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Las principales competencias y recursos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Las actividades internas de creación de valor	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
El rol y la participación de los proveedores y clientes en la creación de valor	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
La distribución	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Los mecanismos de ingresos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Los mecanismos de costes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
La propuesta de valor hacia los clientes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
La arquitectura de creación de valor	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
La lógica de cómo se generan los ingresos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

En los 3 últimos años su empresa:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Ha incrementado la cuota de mercado	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Ha accedido a nuevos mercados	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Ha mejorado la imagen de marca o reputación	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Ha aumentado la calidad del servicio o producto	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Ha aumentado la gama de productos o servicios que ofrece	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Durante el último año, la formación que proporciona mi empresa a los trabajadores:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Ofrece oportunidades adecuadas de aprendizaje en nuevas tecnologías	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Sirve para aumentar su conocimiento en nuevas tecnologías y desarrollar nuevas habilidades	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Influye en sus actitudes con respecto a las nuevas tecnologías	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Les ayuda a entender mejor lo que hacen en su trabajo	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Durante los 3 últimos años en qué medida se ha conseguido:

	Total desacuerdo 1	2	3	4	5	6	Total acuerdo 7
Alinear a los empleados con la visión y los valores de la empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Crear un buen ambiente de trabajo a través de un liderazgo adecuado	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Generar un sistema de recompensas para los empleados que lo merecen basado en criterios objetivos	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Implantar políticas de tele trabajo	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Involucrar a los empleados en la toma de decisiones rutinarias de la empresa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Tomar decisiones estratégico	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Trabajar en equipo	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]