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**Assessing HR analytics impact:  
a contingency theory of HR management perspective**

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**Chapter 1 – Introduction and Literature**  
**Review**

## 1.1 Introduction

How would you feel if, tomorrow, your boss were to fire you without providing adequate explanations, without showing indisputable data demonstrating the unequivocal necessity of terminating your employment, but only offering generic reasons? And conversely, how would it make you feel to know that the production bonus you received was assigned to you solely because of a rotation mechanism rather than based on actual performance? Would it still be gratifying? How would you feel to learn that your supervisor was promoted to that role not because of its actual capabilities but solely due to seniority, while there were other more qualified individuals in the company who could have taken its place? Would you still trust its decisions?

For a long time, this was the reality in many organizations, as human resources (HR) were not yet considered on par with others, such as financial resources. However, in recent decades, this situation has begun to change. The current economic context, increasingly competitive and uncertain, is characterized by complex issues that force organizations to make crucial decisions in order to make the most of their resources and maximize productivity (Dubey et al., 2023). Digitalization is driving major shifts in the workforce by automating numerous tasks, which reduces the overall number of workers needed and demands more specialized skills from the remaining employees. This trend has significantly altered work environments, reshaping how employees communicate, utilize information, perceive their careers, and what they expect from their employers (El-Khoury, 2017). Additionally, digitalization is revolutionizing the way organizations conceptualize, create, and distribute their products and services, leveraging digital technologies like virtual reality, smart mobile devices, the Internet of Things, and 3D printers (Fernandez & Gallardo-Gallardo, 2021). To take advantage of these new resources, in recent years many organizations have been increasingly leaning towards data-driven decision-making in various aspects of business (Awan et al., 2021) as well as the use of big data in daily activities (Wamba et al., 2020). Literature shows numerous examples of initiatives based on the use of big data, which have proven to be a dynamic tool capable of creating important knowledge for the company, creating value, improving performance, and giving competitive



advantage to companies over rivals (Chalutz Ben-Gal, 2019). Technology is enabling organizations to function in a more interconnected way, allowing them to gather insights swiftly and respond quickly and flexibly to constantly evolving demands. The support provided by artificial intelligence and data analysis is aiding businesses in making informed, data-driven decisions (DiClaudio, 2019).

According to Chalutz Ben-Gal (2019), although some organizations' HR departments are slower to adopt a data-driven approach, they are beginning to transform to leverage the opportunities these innovations present and address the increasing complexity of challenges they face. Digital transformation also provides HR professionals with a unique chance to shape corporate culture and enhance employee well-being and engagement, allowing them to significantly impact their organizations' evolution (Rimon, 2017). Many of these changes are driven by new technological advancements and the growing availability of HR-related data, a trend expected to continue and expand in the future (van den Heuvel & Bondarouk, 2017). In the first decade of the 2000s, advancements in software for automating HR management and development opened up new possibilities by providing quicker access to HR metrics data and enabling the integration of various data sources (Bassi, 2012). Today, with further digitalization, HR professionals have access to new sources of both structured and unstructured data, allowing for a more comprehensive analysis of the complex HR decision-making process. The potential for digital technologies to supply diverse and extensive data is vast, particularly in terms of workforce organization (Dahlbom et al., 2019). Organizations now possess a plethora of information on their workforce and performance, along with diverse external sources that, when integrated, can resemble big data capable of offering valuable insights for business-oriented decision-making, if approached with an open mindset and with the appropriate analytical tools (El-Khoury, 2017).

The shift to a data-driven approach has heavily impacted organizations' HR departments, which have undergone a significant transformation. Initially, these departments were primarily focused on administrative tasks (Lemmergaard, 2009), limiting their role to reactive and operational functions. However, as early as 2002, Boudreau and Ramstad argued that HR management should advance into a true autonomous decision science, comparable to other functions like marketing and

accounting. This transformation would enhance the analysis, improvement, and guidance of workforce-related decisions, regardless of whether these decisions are made within or outside the HR function. In today's fiercely competitive business landscape, it is clear that organizations need to make wise investments in their human capital to establish and sustain their competitive edge (Minbaeva, 2017). Additionally, the alignment between the HR strategies and the broader corporate strategy, considering the latter's objectives, is crucial (Paauwe & Boon, 2018; Ulrich, 2005). Consequently, as the business landscape has evolved, HR should transition into a more strategic and managerial entity (Jo et al., 2024). This transition has given rise to the concept of HR business partnership, where HR acts as a strategic collaborator with business leaders, playing a crucial role in achieving organizational objectives (McCracken et al., 2017; Ulrich & Dulebohn, 2015). This evolution will firmly integrate HR into the broader business strategy (Wach et al., 2022).

The transformation of HR functions is thus directly driven by the rapid changes happening within organizations, stemming from the combination of demographic shifts, globalization, and the continuous advancement of information technology. These functions are increasingly resorting to data also for initiatives that were traditionally based on intuition and the personal judgement of HR personnel (Kryscynski & Ulrich, 2015). The way in which the HR function will position itself within the framework of digital transformation will indicate this department's capacity to rise to the rank of a valuable business partner: "world-class HR departments", i.e., those capable of positioning themselves in the highest quartile of efficiency and effectiveness across several metrics, can lead their organizations' digital transformation efforts, while others are merely trying to figure out how to utilize what they simply perceive as tools to improve already existing processes (El-Khoury, 2017).

In order to face these new challenges and seize new opportunities, organizations' HR departments are increasingly relying on new tools. Among these, HR analytics, or the use of data, analysis, and systemic reasoning in relation to people involved and/or connected to the organization (van den Heuvel & Bondarouk, 2017), is an emerging discipline capable of enabling the HR department to fulfill the promise of

becoming a true strategic partner for organizations (Levenson, 2005). In fact, the use of HR analytics to understand the impact of HR practices and policies on organizational performance is a powerful tool available to the HR function to create value for the organization, as the member of the department can employ statistical techniques and experimental approaches to derive the causal relationship between HR practices and performance metrics such as customer satisfaction, revenue per employee, and ultimately, the profitability of specific business activities, allowing the HR function to increase its influence on business decisions and future corporate strategy (Lawler III et al., 2004). For this reason, there has been a growing interest in HR analytics in recent years among companies, consultants, and academics (Minbaeva, 2017), to the extent that a search on Google for the term now returns almost a billion results, compared to one and a half million ten years ago (Qamar & Samad, 2021).

According to DiClaudio (2019), we are currently in the most opportune moment for HR analytics to redefine HR management, transforming it into a key driver of improved value creation and business performance. This is made possible by advancements in artificial intelligence and increasingly sophisticated technological tools that allow for the anticipation of change, identifying it before it has manifested, creating reactive action plans, and adapting as needed to new working methods and market shifts. This trend is also evident in the evolution of cloud-based HR management systems, which now frequently include data visualization and analysis tools, enabling the integration of HR data with other organizational data for a comprehensive overview. All of this leads to the conclusion that, as the objective of HR analytics is to boost both organizational and individual performance, it is a tool that organizations should adopt, regardless of whether their top management perceive its necessity or not (Bassi, 2012).

## **1.2 Defining HR analytics**

According to Marler & Boudreau (2017), the term HR Analytics is relatively recent, making its first appearance in the academic literature dedicated to HR around 2003 / 2004. For this reason, and since the literature dedicated to the topic is still underdeveloped, the term has not yet spread uniformly, often being replaced by alternative wordings. In particular, the use of the term "Workforce Analytics"

preceded that of HR Analytics (Marler & Boudreau, 2017), while the term "People Analytics" saw significant popularity in the first half of the last decade, as it was used by Google (Shrivastava et al., 2018). The terms "Talent Analytics" and "HR Metrics" are not to be considered synonymous with HR Analytics, as they respectively indicate a particular use of HR Analytics and the metrics used within the framework of HR Analytics. Consequently, it is also problematic to identify a universally accepted definition since, being a discipline still in its infancy, the proposed definitions tend to reflect the academic background of the authors in delineating its scope of application (Falletta & Combs, 2021).

Levenson (2005) was among the first to address the phenomenon and to realize that it was increasingly necessary for HR to rely on analytics to identify which of the metrics and evaluation forms that were seeing great proliferation in those years were truly important and could help the HR department transform into a true strategic partner for the organization. Although he did not propose a formal definition of the phenomenon, Levenson stated that HR analytics should include statistics and research projects, identify meaningful questions and use suitable data to answer them, apply the scientific method to evaluate results, and translate all of this in a way that is meaningful for the business.

Bassi (2012) summarizes the prevailing debate in the first decade of this century by identifying two extremes of thought: for some, the term HR analytics exclusively referred to a process of systematically reporting a series of HR metrics, often including benchmarks related to the reference market; for others, the only processes that could be considered HR analytics were those referring to high-level predictive models, such as "what-if" scenarios that predicted the consequences of changes in company policies or market conditions. According to the author, this debate can be resolved by including both aspects in a single definition: "HR analytics is an evidence-based approach for making better decisions on the people side of the business; it consists of an array of tools and technologies, ranging from simple reporting of HR metrics all the way up to predictive modeling."

Patre (2016) expands the definition of HR analytics, referring to it as "a methodology for understanding and evaluating the causal relationship between HR practices and organizational performance outcomes (such as customer satisfaction,

sales or profits), and for providing legitimate and reliable foundations for human capital decisions for the purpose of influencing the business strategy and performance by applying of statistical techniques and experimental approaches based on metrics of efficiency, effectiveness, and impact."

Drawing on Davenport et al.'s (2010) definition of "analytics," and emphasizing that the "HR" component of the concept implies that analytics should relate to individuals who are more or less directly linked to the organization, while also referring to Ulrich & Dulebohn (2015) in the need for including rigorous tracking of HR investments and outcomes, van den Heuvel and Bondarouk (2017) instead define HR analytics as the systematic identification and quantification of drivers that connect HR performance with organizational outcomes, with the aim of improving and supporting decision-making. Consequently, HR analytics is seen as a process rather than just a tool capable of providing useful information and creating value.

Sharma and Sharma (2017) move in the same direction, stating that HR analytics is more than just the exclusive use of metrics and evaluation forms. It consists of various modeling tools such as behavioral modeling, predictive modeling, impact analysis, cost-benefit analysis, and return on investment (ROI) analysis, which are necessary for strategic decision-making.

Marler & Boudreau (2017) identify several similarities among the definitions proposed by various authors: the inclusion of more sophisticated analysis of HR data compared to HR metrics; the integration of data from various internal functions and external sources, not focusing solely on functional data; the use of IT to collect, handle, and report data; supporting HR decisions; linking HR decisions to business outcomes and organizational performance. Considering all these elements together, they define HR analytics as "a HR practice enabled by information technology that uses descriptive, visual, and statistical analysis of data related to HR processes, human capital, organizational performance, and external economic benchmarks to establish business impact and enable data-driven decision-making".

Tursunbayeva et al. (2018) revisit the definition proposed by Marler & Boudreau (2017), noting that companies such as Accenture, IBM, and QuestionPRO have started to include improving employee experience and satisfaction among the

objectives of HR analytics. They, therefore, propose the following definition: HR analytics is "an area of HR management practice, research and innovation concerned with the use of information technologies, descriptive and predictive data analytics and visualisation tools for generating actionable insights about workforce dynamics, human capital, and individual and team performance that can be used strategically to optimise organizational effectiveness, efficiency and outcomes, and improve employee experience".

Chalutz Ben-Gal (2019) proposes a definition of HR analytics focused on the ROI obtained by the organization through the use of HR analytics tools. This approach allows for obtaining in-depth organizational insights and supports decision-makers by providing them with an overview of the activity, thus helping them make better decisions.

Falletta and Combs (2021) note that, with few exceptions, the definitions that have emerged tend not to emphasize evidence-based practices enough (such as using the findings of scientific research in the adoption of HR practices), ethics (for example, during the collection and use of data and information related to HR), and the role of broader research and experimentation dedicated to HR as part of a comprehensive HR analytics program. Furthermore, concurring with Levenson and Fink (2017) in asserting that HR analytics should play a central role in strategy implementation and decision-making, they propose the following definition: "HR analytics is a proactive and systematic process for ethically gathering, analyzing, communicating and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives".

McCartney et al. (2021) focus their attention on HR analysts rather than on analytics, stating that regardless of whether it is considered a process or a practice, HR analytics can be seen as something technical, analytical, and data-driven, with a specific set of knowledge, skills, abilities, and other characteristics (KSAOs) required to successfully carry out the activity. However, there is still no unanimous consensus regarding the specific set of KSAOs required by HR analysts, and the debate seems to revolve around observational and anecdotal evidence rather than empirically supported competency models. This results in an imprecise description,

based on subjective interpretations by organizations according to their needs rather than objective assessments.

Fernandez & Gallardo-Gallardo (2021) note that most definitions describe HR analytics as a process of analysis or decision-making, while others define it as a method, and only one considers it an HR practice. However, all agree that it is data-driven, based on metrics, measurements, and models to support (strategic) decisions regarding human capital, although few provide details regarding the specific statistical analyses, techniques, or models required. They suggest, therefore, that the conclusion is that HR analytics aims to provide reliable foundations for decisions regarding HR that affect individual and organizational outcomes.

Margherita (2022) highlights four key aspects of HR analytics, which have developed progressively over time, influenced by technological advancements and organizations' growing recognition of the importance of HR analytics. These are: it represents a method of making decisions related to people that relies on evidence; it employs systematic approaches to analyze and visualize HR data; it addresses the requirements of executives and key decision-makers; it encompasses various processes and applications, potentially impacting a wide range of areas. He thus proposes the concept of “exponential” HR analytics, which harnesses the enhanced potentialities of new technologies to generate advanced reports, visualizations, and dashboards that integrate people-related metrics with business and process key performance indicators for a comprehensive view.

It seems that the premises set by Falletta and Combs (2021) regarding the lack of a universally accepted definition are confirmed. Table 1.1 aims to summarize the main features of the proposed definitions and identify their objectives.

**Table 1.1 - Definitions of HR analytics and objectives (chronological order).**

<b>Authors (year)</b>	<b>Definition</b>	<b>Objective</b>
<b>Levenson (2005)</b>	(HR analytics should) include statistics and research projects, identify meaningful questions and use suitable data to answer them, apply the scientific method to evaluate results, and translate all of this in a way that is meaningful for the business.	Highlight that the HR department must transform into a strategic partner for the organization.

<b>Bassi (2012)</b>	HR analytics is an evidence-based approach for making better decisions on the people side of the business; it consists of an array of tools and technologies, ranging from simple reporting of HR metrics all the way up to predictive modeling.	Overcome the dichotomy between metrics and complex predictive models.
<b>Patre (2016)</b>	(HR Analytics is) a methodology for understanding and evaluating the causal relationship between HR practices and organizational performance outcomes (such as customer satisfaction, sales, or profits), and for providing legitimate and reliable foundations for human capital decisions for the purpose of influencing the business strategy and performance by applying of statistical techniques and experimental approaches based on metrics of efficiency, effectiveness, and impact.	Propose a new approach to HR analytics.
<b>van den Heuvel &amp; Bondarouk (2017)</b>	HR analytics consists of the systematic identification and quantification of drivers that connect HR performance with organizational outcomes, with the aim of improving and supporting decision-making.	Precise that HR analytics is not just a tool but a process.
<b>Sharma &amp; Sharma (2017)</b>	HR analytics [...] consists of various modeling tools such as behavioral modeling, predictive modeling, impact analysis, cost-benefit analysis, and ROI analysis, which are necessary for strategic decision-making.	Strengthen the conception of HR analytics as a complex process.
<b>Marler &amp; Boudreau (2017)</b>	(HR analytics is) a HR practice enabled by information technology that uses descriptive, visual, and statistical analysis of data related to HR processes, human capital, organizational performance, and external economic benchmarks to establish business impact and enable data-driven decision-making.	Summarize the similarities of the previous definitions.



<b>Tursunbayeva et al. (2018)</b>	(HR analytics is) an area of HR management practice, research and innovation concerned with the use of information technologies, descriptive and predictive data analytics and visualisation tools for generating actionable insights about workforce dynamics, human capital, and individual and team performance that can be used strategically to optimise organizational effectiveness, efficiency and outcomes, and improve employee experience.	Align the definitions of HR analytics proposed in the scientific literature with those of the business world, including among the objectives of HR analytics the improvement of employee experience and satisfaction.
<b>Chalutz Ben-Gal (2018)</b>	(HR analytics) allows for obtaining in-depth organizational insights and supports decision-makers by providing them with an overview of the activity, thus helping them make better decisions.	Base the definition of HR analytics on ROI
<b>Falletta &amp; Combs (2021)</b>	HR analytics is a proactive and systematic process for ethically gathering, analyzing, communicating, and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives.	Better emphasize evidence-based practices.
<b>McCartney et al., (2021)</b>	HR analytics can be seen as something technical, analytical, and data-driven, with a specific set of knowledge, skills, abilities, and other characteristics required to successfully carry out the activity.	Focus more on analysts rather than on the actual analytics.
<b>Fernandez &amp; Gallardo – Gallardo (2021)</b>	HR analytics aims to provide reliable foundations for decisions regarding HR that affect individual and organizational outcomes.	Overcome the lack of details in the previous definitions regarding the specific statistical analyses, techniques, or models required.

<b>Margherita (2022)</b>	(HR analytics) represents a method of making decisions related to people that relies on evidence. It employs systematic approaches to analyze and visualize HR data, addresses the requirements of executives and key decision-makers, and encompasses various processes and applications, potentially impacting a wide range of areas.	Deconstruct the HR analytics construct to build a more comprehensive identification of enablers, applications and value creation drivers associated to HR analytics.
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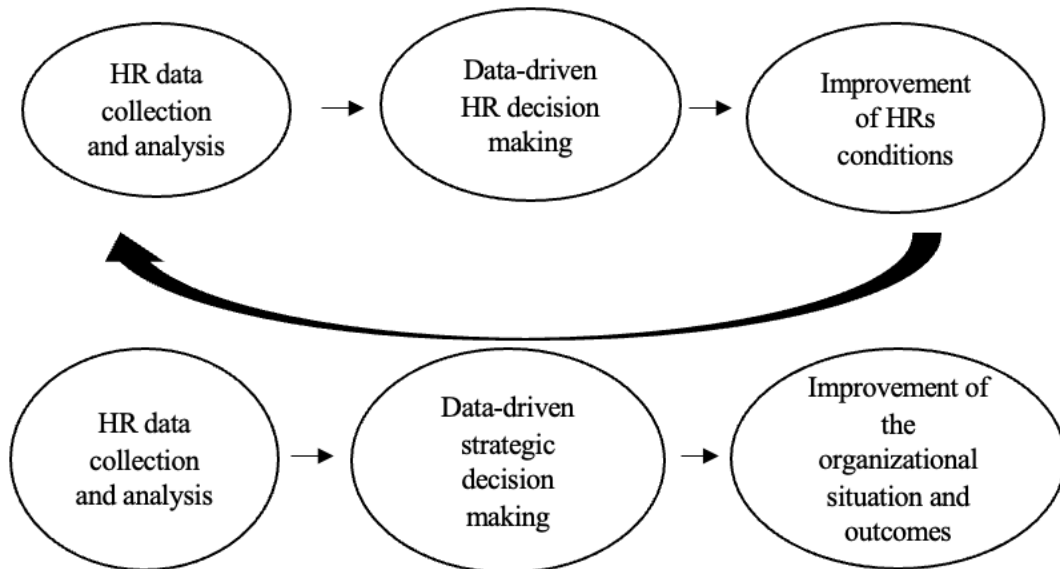
Source: Author's elaboration based on Levenson (2005), Bassi (2012), Patre (2016), van den Heuvel & Bondarouk (2017), Sharma & Sharma (2017), Marler & Boudreau (2017), Tursunbayeva et al. (2018), Chalutz Ben-Gal (2018), Falletta & Combs (2021), McCartney et al., (2021) Fernandez & Gallardo – Gallardo (2021), and Margherita (2022).

Let's try to identify the similarities among the proposed definitions. Firstly, there is substantial uniformity regarding the fact that HR analytics must be data-driven. Specifically, the word "data" is present in 5 out of the 12 definitions [Levenson (2005); Marler and Boudreau (2017); Tursunbayeva et al. (2018); McCartney et al. (2020); Margherita (2022)]. Even where the term "data" is not explicitly mentioned, synonyms can easily be identified, or approaches and procedures that are themselves data-driven are suggested: "evidence-based approach" (Bassi, 2012); "reliable and evidence-based foundations" (Patre, 2016); "systematic identification and quantification of drivers" (van den Heuvel & Bondarouk, 2017); "necessary analysis" (Sharma & Sharma, 2017); "in-depth organizational insights" (Chalutz Ben-Gal, 2018); "scientific evidence and analytical information" (Falletta & Combs, 2021); "reliable foundations" (Fernandez & Gallardo-Gallardo, 2021).

The consensus is confirmed, at least in part, regarding the objectives that HR analytics aims to achieve, namely improving decision-making concerning the organization's human capital. However, from the second half of the last decade, it is possible to observe how authors broaden the scope of influence of HR analytics, extending its effects not only to human capital management but also considering its impact on overall business strategy and performance. Therefore, although at first glance it may seem that not much has changed, by carefully analyzing the chronological evolution of the various proposed definitions, a significant paradigm shift can be identified: HR analytics is no longer merely a tool for analyzing internal

HR data to improve them in a self-referential cycle, but rather a complex process that, starting from the analysis of HR data, is capable of enhancing the entire process of strategic decision-making regarding business operations, consequently able to support, influence, and reshape corporate strategy, as illustrated in Figure 1.1.

**Figure 1.1 - The paradigm shift in the conception of HR analytics.**



Source: Author's elaboration.

### 1.3 The objectives of HR analytics

As happened for the definition of HR analytics, the concrete objectives pursued by organizations through the use of this tool have also been changing according to its evolution. With the aim of understanding the meaning that people professionally involved in research and analysis in the HR field attribute to HR analytics, S. Falletta (2014) conducted a survey on people from 220 companies included in the Fortune 1000 ranking, asking them to rank, in descending order of relevance, several phrases describing the objective of HR analytics. According to the respondents, the phrase that best describes the objective of HR analytics is:

"making better decisions related to human capital through the use of the best scientific evidence and organizational data available in the context of 'HR evidence-based.'"

Followed, in order, by:

- moving beyond descriptive HR metrics (lagging indicators that reflect past events) in favor of predictive ones (leading indicators that forecast future events);
- segmenting the workforce and employing statistical analysis and predictive modeling to recognize key drivers (factors and variables) and cause-effect relationships that boost or jeopardize the achievement of crucial business outcomes;
- utilizing advanced statistical analysis, predictive modeling procedures, and human capital investment analysis to predict and deduce "what-if" scenarios useful for decision-making;
- detecting, reporting, and benchmarking standard HR metrics;
- querying, reporting, and taking drill-down actions on ad hoc HR metrics and indicators through HR information systems and/or reporting tools such as scorecards and dashboards;
- operational research and scientific management methods for HRs optimization.

It is therefore clear that, according to the opinion of HR professionals, the main objective attributed to HR analytics in the first half of the past decade was to support the decision-making process related to HR management, increasingly basing it on scientific evidence rather than intuitions and opinions as historically occurred. In this sense, relying on traditional predictive HR metrics was no longer enough, but there was a need to exploit analytics techniques to develop metrics and predictive models that would allow a better understanding of business phenomena related to HR management and their connection with business outcomes.

Focusing on the benefits derived from the implementation of HR analytics in organizations, Patre (2016) moves in the same direction, stating that the most attractive aspect of data-driven decision-making is certainly the ability to predict future trends and potential opportunities and threats. Trends and data collected allow managers to make more informed and precise decisions about future developments. Consequently, HR analytics will make a significant contribution in:

- determining if current approaches are working: HR analytics allows HR executives to verify if current programs and tools are producing the desired

results. It can also be utilized to verify the effectiveness of talent management programs by providing a microscopic view of the criticalities that may be experienced in the future;

- identifying the hidden causes of problems: since it is hard to improve programs that are not achieving the desired results without recognizing their critical success factors, the use of future-oriented data analysis can uncover the latent causes underlying HR management issues;
- continuous improvement: the revelation of data related to suboptimal performance can help managers realize the presence of improvement opportunities, even if these are not detectable with a more superficial analysis. Using data effectively can significantly decrease process errors and incorrect decisions within the HR function, as it helps identify and address these issues proactively;
- accelerating talent decisions: by collecting and exposing data related to best practices, organizations can monitor talent management decisions more consistently and accurately across the organization;
- strategic relevance opportunities: by implementing HR analytics, the HR department can greatly contribute to the execution of the business plan by making forecasts, assessing risks, and preparing for likely future scenarios;
- justifying investments in human capital: using HR analytics techniques allows quantifying investments dedicated to employees in tangible outcomes for the benefit of shareholders, customers, and the workforce itself. Some specific areas of application include employee retention, employee engagement, talent acquisition, and performance management.

With the similar aim of exploring the state of the art in HR analytics, van den Heuvel and Bondarouk (2017) surveyed 20 HR analytics managers from 11 large Dutch companies operating in heterogeneous sectors. In the section dedicated to the use of HR analytics, the survey results can be summarized into three categories: the objectives of HR analytics, its current analytical focus, and its main application themes.

Regarding the first, respondents believe that the main objective should be the establishment of HR analytics within organizations, indicating a series of

underlying actions to be taken. First and foremost, it is necessary to provide added value to the organization by demonstrating that HR analytics-driven interventions produce measurable improvements. Secondly, this implies exploring how and under what circumstances HR analytics can be applied within organizations and integrated into daily business routines. It is necessary to evaluate what skills and competencies are required to perform HR analytics activities and how the HR analytics team should be structured in terms of the number of employees, necessary job profiles, and responsibilities. As the third point on the list, awareness needs to be created: respondents indicate how the concept of HR analytics is often unknown within organizations or considered an experimental branch of the HR department unable to attract the attention of managers, who continue to see it as something difficult to implement. It is therefore necessary to create awareness among HR department partners that HR analytics is useful not only for the HR department itself but for the entire organization, highlighting its purposes and value. The fourth aspect is the necessity to establish alliances, both within and outside the HR department. Within the department, the objective of alliances should be to increase collaboration between the activity areas of the function (training and development, rewards and benefits, recruitment, etc.), while outside explicit collaborations with more "connected" departments such as control and compliance are necessary. Finally, the last aspect required to start HR analytics activities is the establishment of foundations for conducting analyses. This could include collecting business cases to analyze, gaining access to data sources, and acquiring necessary analytical tools. Regarding the current analytical focus, respondents indicate that personnel engaged in HR analytics dedicate most of their time to calculating and reporting basic metrics, while analytics activities, which involve actually comparing variables and deriving insights, remain a smaller portion of the duty. Furthermore, these analyses mainly involve simple statistical activities like cross-tabulation. The emphasis tends to be on obtaining past information rather than exploring predictive insights: the focus remains on utilizing internal organizational data rather than sourcing additional data from external sources such as personal devices or social media. Finally, regarding the main application themes of HR analytics, while there seems to be unanimous agreement that HR analytics' goal is to enhance business

outcomes, several respondents have noted that current practices often limit its focus to HR-specific issues, only combining HR data without linking them to overall business performance. According to respondents, this happens because HR professionals primarily focus on their function, thus trying to solve specific HR issues rather than generic organizational issues. Moreover, business data is often difficult to collect or directly link to HR data. Finally, although various concrete areas of HR analytics application are mentioned (performance management, talent management, strategic resource planning, employee value proposition creation, management development), the main focus of HR analytics remains the calculation of traditional key performance indicators, once again confirming how the focus continues to be on reporting and metrics rather than on actual analytics activities.

The responses provided seem to depict a current situation that is not particularly rosy. However, the tone of the responses changes when the questions are posed not about the contemporary situation but with a future perspective, specifically 10 years after the interviews. Respondents believe that the future focus of HR analytics will be to encourage evidence-based decision-making in business. This implies a paradigm shift, moving towards being guided by information rather than mere perceptions. Similarly, the second objective will be to develop an evidence-based mindset, especially within the HR department, which is often considered a "soft profession" relying solely on past experiences and impressions. Conversely, the HR function must be able to build strong arguments based on models and numerical data in order to be taken seriously by disciplines characterized by a more quantitative orientation. The third objective will be to determine the drivers underlying HR-related business outcomes. This should occur as broadly as possible, for example with the expansion of HR analytics perspectives not only to permanent employees of the organization but also considering a more flexible workforce. The fourth objective will be to provide concrete evidence that HR analytics-driven interventions have led to measurable improvements. The fifth objective will be related to the transformation of existing business models: HR analytics will be able to ensure an agile and lean organizational structure based on the optimal combination of HR characteristics and strategic business goals, where roles and tasks will be adapted based on HR capabilities, skills, and characteristics, rather

than the other way around. Finally, the last objective, perhaps the most complex, will be the management of ever-increasing data volumes, as well as the management of the inherent privacy issues. It will therefore be necessary to determine which data to use, how to structure it, how to protect it, and how to use it effectively. Complying with privacy regulations and maintaining people's trust will pose an additional challenge.

Regarding the analytical focus, HR analytics will need to be based on predictive analysis, surpassing the current reactive approach. Integrating data from areas beyond HR, such as financial or marketing data, as well as from outside the company's boundaries, will be crucial, as it will simplify analytical processes and enable more advanced and complex analyses to address business and workforce issues. Standardizing measurements will also be necessary: this will not only define and clarify concepts and their consequences but also develop reliable and valid measurements for those concepts, aiming to facilitate the conduct of international and cross-cultural HR analytics activities. The analytical approach and tools used will also need to be standardized, as the maturity reached by HR analytics will enable automatic computations, automatic dashboards reporting cause-effect correlations between various phenomena, and access to toolkits that will facilitate data preparation and integration, as well as analysis and storytelling activities. Standardization will also provide support during training and skills development in the field of HR analytics.

Finally, when considering the application themes of HR analytics, these will include leadership, recruitment, succession planning, strategic workforce planning, flexibilization, virtual teams, e-HR management, talent management, professional integration, workforce health, compensation and benefits, diversity, and engagement. These themes will not be particularly different from current ones, but they will be much more complex, allowing the HR team to address organizational problems jointly with other business functions. Clearly, application themes and potential issues will depend on the type of organization. Some examples could be: the relationship between workforce strategic planning and revenue or productivity; finding the right balance between different types of contracts; the impact of new working methods, such as smart-working, on productivity; comparing the



performance of virtual teams and traditional ones; evaluating the effects of e-HR management tools; developing smart health, for example, calibrating workload for subjects most vulnerable to burnout.

Tursunbayeva et al. (2018) confirm the trend of HR analytics moving in this direction, indicating that the following thematic areas constitute the most common objectives of HR analytics: performance evaluation and development throughout employees' careers; hiring and onboarding of personnel; suitability of corporate culture; engagement; workforce planning; employee collaboration; diversity and inclusion; human capital risk and inter-organizational relationships. The emergence of these new themes testifies to the rapid development and diversification occurring in this area. A clear example is provided by the shift from emphasis on HR practices directed at individuals to those considering their interactions, affiliations, and group performance, including the use of data derived from social and organizational networks. In the future, this could lead to what is defined as "relationship analytics" replacing the traditional approach to organizational design, with positive implications for HRs and, ultimately, for business in general.

Finally, Chalutz Ben-Gal (2019) has applied an ROI-based approach not only to identify the objectives of using HR analytics in organizations but also to verify their implications and offer practical implementation tools. This approach proves to be particularly useful for comparing the various issues that may arise in the application of HR analytics, as well as for measuring the value created by various HR analytics projects, thus supporting the continuous improvement of organizations. The expected ROI has been classified into three levels, low, medium, and high, depending on the complexity of the data processing procedures. According to the author, these tasks consist of:

- Industry Analysis: The initial task of HR analytics is industry analysis, namely the analysis of fundamental HR metrics within the company's sector. This is achieved through the use of empirical research tools, i.e., descriptive analytics tools that utilize business intelligence and benchmarking procedures to analyze public data from consulting firms, demographics, and macroeconomics, and the expected ROI is generally low;

- **Workforce Planning:** Workforce planning is the second task of HR analytics and ensures the use of a continuous process to align the organization's priorities and needs with those of its workforce, ensuring compliance with regulatory, legislative, and production requirements, as well as short and long-term business goals. It is carried out through prolonged empirical analysis using various predictive analysis tools based on both internal and external organizational data. The expected ROI is generally high;
- **Job Analysis:** The third task of HR analytics involves job analysis, a process that identifies and determines the specific tasks, requirements, and impact of a particular job position, conducted through empirical research and predictive analysis tools. For example, it is used to evaluate the tasks of various positions and their impact on retention and satisfaction. The expected ROI is low;
- **Recruitment and Selection:** Talent acquisition and selection are among the most important tasks of HR analytics, conducted with empirical research and predictive analysis tools. Some of the main issues include talent classification methods based on available corporate resources, interview analysis, profiling of vacant roles, identification of business needs, and conducting logistic regressions or other parametric models capable of providing predictions on recruitment success probabilities, new hire satisfaction, and fit between the individual and the job position. The expected ROI is high;
- **Training and Development:** The fifth task of HR analytics is to support training and development activities, i.e., business activities aimed at improving individual and group performance. Both descriptive and predictive analysis techniques are used. Some specific areas of intervention include measuring workforce improvements and developing classification methods useful for improving training investments by job category. The expected ROI is generally medium;
- **Compensation and Benefits:** Another task of HR analytics is defining compensation and benefits. This is very important as it supports the achievement of the business strategy and could be tailored based on the organization's needs and goals, as well as available resources. Both descriptive analysis tools, such as scorecards or other methods based on key performance indicators and business intelligence, and predictive analysis tools, such as defining various compensation

scenarios, Monte Carlo simulation to evaluate various compensation plans, and regression analysis and interaction with other business phenomena are used. The expected ROI is medium;

- Performance Management: This task consists of a continuous communication process between a supervisor and an employee, conducted throughout the year to support the achievement of the organization's strategic objectives. It is performed through descriptive analysis such as defining various performance management scenarios through business intelligence and using dashboards or methods based on key performance indicators. The expected ROI is low;

- Talent Retention: The last task of HR analytics is to support talent retention through descriptive and predictive analysis. These include profiling key positions, classifying various talent retention scenarios, logistic regressions, anomaly detection, and attrition modeling among various workforce groups. The expected ROI is medium.

In summary, by analyzing the overall objectives of HR analytics proposed over the last decade by academics, it is possible to observe how, similar to what has occurred regarding the definition of HR analytics, the conception is expanding from considering the focus of this practice primarily on HR management to considering the effects that various practices, policies, and initiatives directed towards them have not only on individuals but also on their relationships, and ultimately how this reflects on company performance and strategy pursuit.

However, organizations are not always proving capable of meeting these expectations, failing to move beyond the previous conception of analytics based on descriptive analysis in favor of predictive analysis. While this evolution significantly increases the complexity of operations, it is essential for organizations to commit to this direction to fully leverage the opportunities offered by HR analytics. In particular, HR departments should take the lead of operations, cultivating the necessary capabilities internally to move beyond the traditional role of the department and emerge as pivotal strategic business partners for the whole organization.

## **1.4 Assessing HR analytics impact: the contingency theory of HR management**

The empirical literature dedicated to the quantitative assessment of the impact of HR analytics on organizational outcomes is still scarce, and the few existing studies utilized diverging theoretical lenses to motivate and support their hypotheses.

The first study to do so was that of Lawler III et al. (2004), which tried to assess the effectiveness of both HR metrics and analytics on heterogeneous HR practices. However, they did not distinguish between metrics and analytics, and the study was limited to the calculation of the percentage of HR executives who claimed these to be effective or very effective in their companies. Furthermore, the authors did not provide any theoretical lens to their study.

The next attempt to measure the impact of HR analytics was performed by Aral et al. (2012), which investigated the complementarities among human capital management (HCM) IT solutions, HR analytics, and performance pay in enhancing organizational performance, aiming to determine whether these can be effectively implemented as a three-way "system of practices" or if they must be introduced together to maximize their effectiveness. The findings indicate two key results: first, there is a significant mutual correlation between HCM, performance pay, and HR analytics practices, suggesting a demand for a comprehensive approach to HR management. Second, implementing these practices simultaneously as a tightly knit system of organizational incentives generates a disproportionate productivity premium compared to introducing one element in isolation. This study represents a unicum in the literature dedicated to HR analytics, as it is the only one which does not consider this tool as a simple antecedent to heterogeneous HR management outcomes, but as an instrument to be used along with other HR activities to enhance their effectiveness. They explain their results through the lens of the principal-agent model: when the principal limits the agent's opportunity to manipulate the compensation system by employing monitoring technologies effectively and assists the agent in comprehending and achieving crucial performance objectives through feedback, the implementation of performance-based pay can motivate employees to exert greater effort in their tasks. Operating in tandem, performance pay, HR

analytics strategies, and HCM technologies collaborate as an interconnected set of organizational methods that enhance overall firm performance.

Falletta (2014) used a similar approach to that of Lawler III et al. (2004), investigating the effectiveness rating of organizations in six core HR analytics activities, without adopting any theoretical lens.

Almost a decade later, Samson and Bhanugopan (2022) and McCartney and Fu (2022) were the first authors to test the direct impact of HR analytics on other organizational phenomena. Specifically, the former found HR analytics to be positively related to managerial decision-making, organizational performance, and market performance, the latter to organization evidence-based management capabilities and, consequently, on organizational performance. Samson and Bhanugopan (2022) draws upon three main theoretical frameworks: Resource-Based View (RBV) theory, Human Resource Accounting (HRA) theory, and Persuasion theory, specifically the Elaboration Likelihood Model (ELM). RBV suggests that resources and capabilities contribute to organizational performance and competitive advantage. HRA positions strategic human capital analytics as decision and persuasion support systems. ELM emphasizes the importance of managers being motivated and cognitively able to process information for effective engagement. Together, these theories suggest that strategic HR analytics operate as a socially complex decision and persuasion support system, providing dynamic capabilities and a source of sustained competitive advantage. On the contrary, McCartney and Fu (2022) employ evidence-based management theory (EBM) as their underlying framework. EBM integrates scientific facts, organizational knowledge, and stakeholder input for decision-making. HR analytics contributes to organizational insights by translating workforce data into valuable information. The study also integrates the resource-based view of the firm (RBV) and dynamic capabilities to propose a model where access to HR technology enables HR analytics, enhancing organizational performance. HR analytics is considered a valuable, rare, inimitable, and non-substitutable resource for organizations, meeting the criteria set by RBV and potentially generating a competitive advantage.

Zafar et al. (2023) found HR analytics to mediate the relationship between design thinking and training evaluation practices. Similarly to McCartney and Fu (2022),

the authors resort to the RBV perspective, sustaining that greater competency in digital technology can enhance firms' ability to incorporate cutting-edge technological solutions into their current HR management processes, making them more distinctive and difficult to replicate. By incorporating HR analytics into traditional HR management practices, HR professionals with a digital transformation mindset can enhance their ability to distinguish their HR processes. In this thesis, we depart from previous studies by adopting a slightly different perspective: HR analytics will not be considered as an antecedent to other organizational outcomes per se, but as a facilitator that enables the implementation of a data-driven approach based on the insight this tool is able to provide. Consequently, we will not try to assess HR analytics' direct impact on a plurality of organizational phenomena; instead, we will verify if the organizations who uses the insight derived from HR analytics, when relevant, are able to obtain better results than those that do not rely on this tool. This different perspective may be explained through the theoretical lenses of the contingency theory of HR management.

The contingency theory of HR management was developed in opposition to the universalistic perspective, which advocated the existence of so-called “best practices” that every organization should implement irrespective of its size, sector, or business strategy (Arthur, 1994; Delery & Doty, 1996). The universalistic perspective asserted the existence of “correct” HR practices able to guarantee better results than any others, and that should therefore be applied in every company. On the contrary, contingency theorists claim that, for HR strategies and policies to be effective, these should be consistent and adequately embedded within the specific context of the organization, considering both its internal characteristics as well as those of the environment it is integrated within (April Chang & Chun Huang, 2005; Delery & Doty, 1996). Consequently, in order for the HR strategy to reach its intended results, as well as to produce a positive impact on the overall organizational performance, HR practices need to reach the “best fit” with the organizations, from both an internal and an external perspective (Boxall & Purcell, 2000). External fit, also known as “vertical alignment”, operates under the premise that the selection of practices ought to be dictated by the competitive strategy (e.g. Schuler & Jackson, 1987), where a customary dichotomy exists between primarily

quality-driven or cost-driven strategies, necessitating distinct HR practices. Another way of considering the external fit is also referred to provide HR practices that match the different requirements of the stage of development in the company lifecycle (Harney, 2023). The inability to attain the external fit will ultimately result in less-than-optimal performance. On the contrary internal fit, also known as “horizontal alignment”, suggests that practices should align with strategic priorities (Wright & Snell, 1998), decisions regarding human capital (Lepak & Snell, 1999), or the organizational culture and associated imperatives (Bowen & Ostroff, 2004) so that they all convey the same message to employees and concur to reach the desired outcome (Harney, 2023).

Furthermore, contingency arguments are more intricate than universalistic arguments as they entail interactions rather than the straightforward linear relationships characteristic of the universalistic perspective (Drazin & de Ven, 1985; Schoonhoven, 1981; Venkatraman, 1989). In essence, contingency theories suggest that the connection between the pertinent independent variable and the dependent variable will vary across different levels of the critical contingency variable (Delery & Doty, 1996). Most studies focus on elucidating internal and external fit and devising strategies to achieve them, such as aligning HR practices with various organizational and environmental factors (April Chang & Chun Huang, 2005). In the field of Strategic HR Management, the organization's strategy is typically regarded as the most important contingency factor (Delery & Doty, 1996). The functional necessity of aligning HR management with strategy emerged as a pivotal factor distinguishing HR management from personnel management, while ongoing research now explores industry, company size, and environmental intensity as the moderating or boundary conditions influencing the HR management - performance connection (Harney, 2023). Consequently, a contingency perspective necessitates researchers to adopt a theory of firm strategy and then delineate how individual HR practices will interact with the firm's strategy to influence organizational performance. For instance, some scholars have endeavored to illustrate how specific HR practices align with different strategic positions and impact firm performance (Schuler & Jackson, 1987). Additionally, other researchers have explored the effects of factors like the local environment, union

dynamics, resource dependency and integration, administrative heritage, and competency (Beechler & Yang, 1994), executive controls (Snell & Youndt, 1995), and person-environment fit (Werbel & Demarie, 2001).

The contingency theory of HR management can also be applied with a more specific, intra-organizational perspective to provide an explanation of the different impacts that the same bundle of HR activities can produce on heterogeneous groups of employees (Clinton & Guest, 2013). In fact, similarly to their organizations, employees also “have different needs and respond in different ways to HR practices” (Kinnie et al., 2005 p.13). This viewpoint hinges on the premise that employers and employees possess divergent interests (Fox & Lefkowitz, 1974), thus reacting dissimilarly to HR initiatives, which may conventionally be perceived as advancing organizational rather than employee interests and outcomes. For example, according to Clinton and Guest, (2013) positions at varied organizational tiers entail distinct challenges, responsibilities, and requisites. In upper echelons of the hierarchy, individuals may be tasked with overseeing others or making decisions with significant ramifications, possibly necessitating tailored HR strategies. Conversely, lower-tier roles may offer limited complexity or autonomy, enabling HR practices to exert influence over outcomes. The diverse demands and limitations inherent in roles across organizational strata necessitate varied HR approaches, with the implementation likely yielding differing impacts.

The usage of HR analytics will allow organizations to tailor their HR strategies according to the specific needs of their organizations. In fact, this tool will provide decision-makers with insight based on the specific organizational context, which could be used to better align these practices with the specific requirements of the employees they will be addressed to (Ellmer & Reichel, 2021). Through the analysis of data pertaining to employee performance, engagement, turnover, and other relevant metrics, HR can customize strategies to address specific challenges and capitalize on opportunities within the organization (Shet et al., 2021). Predictive modeling techniques enable HR to forecast future trends and outcomes based on historical data, allowing for proactive interventions to prevent potential issues from escalating (Marler & Boudreau, 2017). For instance, predictive analytics may identify patterns indicating an increased risk of turnover among a certain



demographic group or in a particular department, prompting HR to implement retention strategies preemptively. Importantly, the benefits of HR analytics are not confined to the HR department alone. Cross-functional insights generated by HR analytics can inform decision-making in other areas of the organization, such as marketing, operations, and finance (Rasmussen & Ulrich, 2015). By leveraging data-driven insights, organizations can make evidence-based decisions that are aligned with the specific context and needs of the business, thereby maximizing the effectiveness of HR management activities and promoting overall organizational performance.

For all these reasons, we believe that, by leveraging on the insight provided by HR analytics, organizations will be able to adopt a data-driven approach to (but not necessarily limited to) HR management, allowing for the practical implementation of a contingent approach. The contingency theory of HR management thus explains why organizations that leverage on HR analytics may be able to design and implement more effective activities aimed at their HRs than organizations that do not rely on this tool. The four articles included in the thesis will thus share the common aim to address, from a quantitative point of view, the impact of an HR analytics enabled data-driven approach on the activities targeting the employees of organizations in light of the contingency theory of HR management. This approach will allow us to detach ourselves from previous empirical studies relying on the same theoretical lenses, as they were typically focused on verifying the difference between the universalistic and the contingency approach without considering any specific tool that may enable the practical shift from the former to the latter (Clinton & Guest, 2013; Tzabbar et al., 2017).

## **1.5 Research questions and overview of empirical chapters**

HR analytics, as a relatively recent practice, is often comprehended in a superficial way by companies, particularly regarding its potential benefits and its influence on business outcomes (Patre, 2016). Furthermore, the lack of confidence and confusion of HR personnel concerning HR analytics adoption are compounded by underdeveloped state of the academic literature on the subject. This literature presents significant discrepancies in approaches, definitions, results, and potential challenges that may arise during the adoption phase, hindering progress in the field

and the diffusion of universally accepted practices (Fernandez & Gallardo-Gallardo, 2021). There remains no consensus on the definition of HR analytics, as well as on the processes, skills, and abilities required for this tool to enhance HR activities, workforce decisions, and individual and organizational performance (Falletta & Combs, 2021). Despite a gradual increase in the number of publications on the topic since 2013 (Qamar & Samad, 2021), articles aiming to provide practical tools for implementing HR analytics within organizations remain scarce, and these studies provide decision-makers with limited scientific evidence regarding the adoption or implementation of HR analytics tools within the organization (Chalutz Ben-Gal, 2019). Additionally, only few companies (around 20%) have claimed to use HR analytics, so they can be considered early adopters (Marler & Boudreau, 2017). Marler and Boudreau (2017) highlight that, despite HR analytics being a "hot topic" among practitioners, their search for peer-reviewed articles in academic journals reveals an incredibly small amount of academic scientific research, mainly qualitative case studies. These studies rely on well-established managerial structures but typically at a very general level. Consequently, while these studies may answer some questions regarding the adoption of these practices, they are of little help to decision-makers hopeful of finding evidence to guide them in the process. According to the authors, this could indicate a typical adoption path of innovation, where both adoption activities and testimonials are scarce. Alternatively, it may indicate a path in which high-quality testimonials regarding emerging HR practices are few and not attributable to a unifying framework.

In summary, although more and more studies on HR analytics are being published, most of them adopted a theoretical approach, not taking into account empirical evidence (e.g., Levenson and Fink, 2017) or relying solely on the authors' own opinion and experience, not presenting a systematic approach (e.g., Andersen, 2017; Fernandez & Gallardo-Gallardo, 2021; Patre, 2016). The few exceptions that exist typically focused exclusively on analyzing the impact of HR analytics on organizational phenomena directly controlled by the HR department, despite the paradigm shift in the theoretical literature on the topic, which is advising the use of HR analytics also to improve the effectiveness of "not-strictly-HR-related" decision-making (e.g. Falletta & Combs, 2021). Furthermore, previous studies

typically focused on the measurement of the direct impact of HR analytics on organizational phenomena (e.g. Huang et al., 2023; McCartney & Fu, 2022). Despite this approach certainly yields valuable insights, it could be criticized as HR analytics per se may not be considered a proper antecedent to organizational phenomena. On the contrary, it likely functions as a facilitator, enhancing the effectiveness of existing initiatives, as well as aiding in the design and formulation of new ones. Therefore, it is worth investing not only the direct impact of HR analytics, but also that of a data-driven approach enabled by this tool, verifying if it is actually able to improve the effectiveness of activities based on the insight and data it is able to provide, and examining whether this enhanced effectiveness ultimately translates into improved organizational performance. This thesis thus endeavors to address the following research questions:

RQ1: Can a data-driven approach enabled by HR analytics improve the effectiveness of the activities directly controlled by the HR department?

RQ2: Can the reliance on the insight offered by HR analytics improve the effectiveness of activities performed outside the HR department?

RQ3: What is the ultimate impact of an HR analytics, data-driven approach on organizational performance?

The four articles included in this thesis aim to address the previously mentioned research questions through a quantitative lens. More specifically, the first article will investigate the moderating influence of an HR analytics, data-driven approach on the relationship between talent management activities and their individual (talent motivation and quality of hires) and organizational outcomes (talent retention). The focus of the article will thus be on initiatives directly implemented and controlled by the HR department, which will also perform the subsequent monitoring of their outcomes. This article will thus serve as an initial step in assessing the impact of HR analytics within the HR department framework.

Moreover, by incorporating the moderating effect of a data-driven strategy, this research implicitly considers the influence of both internal and external organizational dynamics on talent management efforts, as HR analytics insights are rooted in these dynamics. Traditional research has emphasized the cruciality of synchronizing talent management practices with the organizational environment

(Collings, 2014). For instance, Langenegger et al. (2011) demonstrated that aligning these practices with corporate strategy enhanced talent motivation, a finding corroborated by Kontoghiorghes (2016) in relation to motivation and retention. However, previous studies predominantly focused on achieving this alignment through intangible organizational attributes such as culture (Harsch & Festing, 2020). While crucial, managing these aspects in practical terms is arduous and time-consuming. Consequently, this study advances the literature by quantitatively examining the impact of a tangible organizational tool, HR analytics, in achieving alignment. The integration of HR analytics enables companies to base their HR, particularly talent management, initiatives on robust empirical foundations, furnishing insights and recommendations tailored to the specific organizational context (Ellmer & Reichel, 2021). This becomes increasingly critical in today's context, where external shocks such as the pandemic necessitate rapid and swift organizational adaptation.

The second study aims to explore the moderating effect of an HR analytics data-driven approach on the relationship between HR management activities and organizational creativity. Therefore, the article will take a step further, as it will investigate if HR analytics is able to improve the effect of HR management activities not only on employees' satisfaction with their companies, but also on a practical capability as organizational creativity. This expansion broadens the purview of HR analytics to encompass high-stake decisions, as research has shown that organizational creativity significantly predicts an organization's innovative capacity and, consequently, its competitiveness (Olszak & Kisielnicki, 2016).

In addition, the study delves deeper into the intricacies of factors influencing organizational creativity, addressing the ambiguity and conflicting findings in prior research (e.g. Nawaz et al., 2014; Zhang et al., 2015). As the study not only scrutinized conventional HR practices, but also explored an innovative approach driven by HR analytics data, it fills a critical void in empirical research regarding the impact of innovative HR management activities on creativity (Ikhida et al., 2022). Hence, it extends HR management literature by advocating for the positive influence of HR analytics on organizational outcomes, even within the unique realm of organizational creativity (De Saá-Pérez & Díaz-Díaz, 2010; Njoku & Ebie,

2015). Embedding HR management activities in insights derived from HR analytics not only addresses concerns about the efficacy of traditional HR management approaches in enhancing organizational creativity (De Saá-Pérez & Díaz-Díaz, 2010) but also facilitates the adoption of organization-wide innovation strategies, obviating the need for individual departments to devise their own tactics (Olszak & Kisielnicki, 2016).

The third study will investigate the moderating effect of an HR analytics data-driven approach on the relationship between social sustainable operations practices and employees' motivation and engagement, and subsequently, the effect of these factors on organizational retention. Therefore, this study addresses the second research question of this thesis, responding to the call of the literature to assess the impact of HR analytics also on organizational activities not directly managed by the HR department, such as the implementation of social sustainable operations practices. This research provides fresh insights into adopting a data-driven approach concerning social sustainable operations management. Despite the extensive use of digital technologies for environmental sustainability, the influence of these technologies on social sustainability has been largely overlooked in previous literature (Dao et al., 2011; Del Giudice et al., 2021; Longoni & Cagliano, 2016; Mani et al., 2020; Raut et al., 2019). While a few studies have shown a positive link between big data usage and overall sustainable business performance (Raut et al., 2019; Zhu & Yang, 2021), they focused solely on the direct impact of technology on sustainability. In contrast, our study investigates whether a data-driven strategy can enhance organizations' efforts to improve social sustainability, echoing the approach adopted by Del Giudice et al. (2021), with our findings supporting this assertion. This research marks a significant stride towards a more comprehensive consideration of sustainability apart from the environmental dimension, aligning with the long-standing call from academics, practitioners, and institutions, yet still an aspiration not fully realized (Feroz et al., 2021).

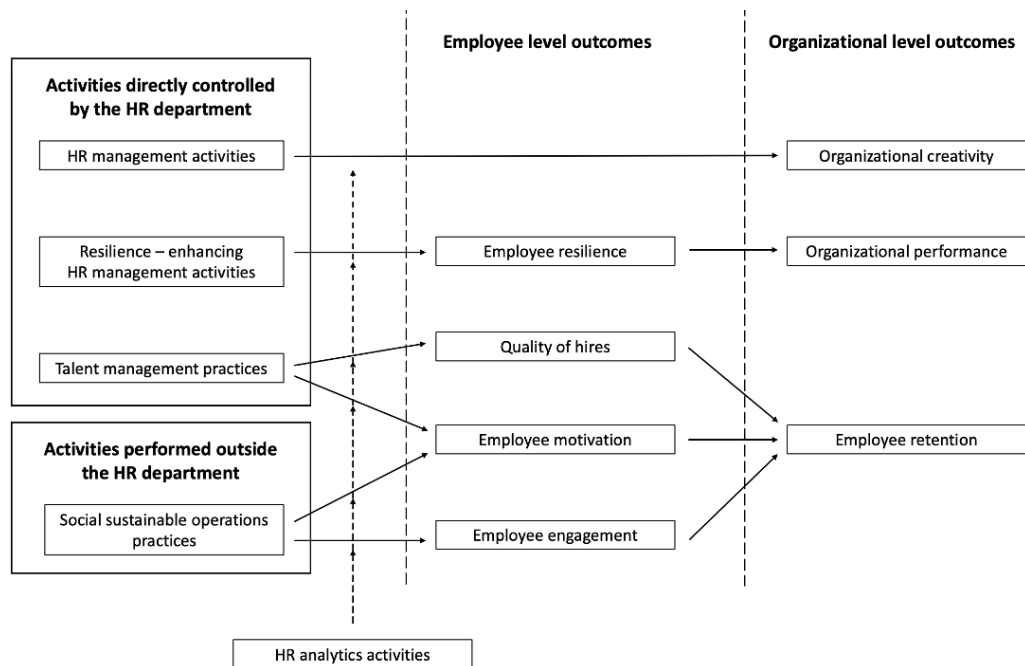
Finally, the fourth article seeks to explore the moderating effect of an HR analytics data-driven approach on the relationship between HR management practices and employee resilience, and the impact of this last on organizational innovation and financial performance. This study represents the culmination of our investigation,

assessing the ultimate impact of the HR analytics data-driven approach on organizational performance. In addition, while previous research often advocated for a more systematic approach to enhance the impact of HR management on employee resilience (Lengnick-Hall et al., 2011), no prior studies have endeavored to quantitatively measure the effectiveness of such an approach. Our study takes a step forward by empirically assessing the influence of HR analytics - a practical tool facilitating organizations to systematize HR management and imbue it with data-driven insights - on the correlation between HR management practices and employee resilience. Our analysis confirms that a systematic approach, enabled by HR analytics, not only positively affects employee resilience but also leads to broader organizational advantages, including improved innovation and financial performance. This finding holds particular significance in the small and medium enterprises (SMEs) context, where organizations are typically more vulnerable to the adverse effects of disruptive events (Allas et al., 2021).

In essence, the four studies encompassed in the thesis will demonstrate the capacity of HR analytics to improve the effectiveness of heterogeneous organizational initiatives. This holds significance not only from a theoretical point of view, as we will enlarge the plethora of empirical studies demonstrating the potential positive impact of HR analytics on initiatives originating both within and outside the HR department, but also from a practitioners' perspective. In fact, despite the growing reputation of HR analytics in recent years, it remains a somewhat mysterious topic for many companies. However, by demonstrating its potential to yield positive outcomes, we aim to inspire greater engagement with this tool among organizations, thereby fostering its wider adoption.

The overarching model of this dissertation is shown in Figure 1.2.

Figure 1.2 - Overarching research model.



Source: Author’s elaboration.

### 1.5.1 Overview of empirical data

In order to fulfil the aims of the dissertation and address the research questions that have been formulated, the four studies rely on data that were specifically collected for this purpose through self-administered online surveys.

The first three studies share a similar approach. First, they were designed to be completed by HR managers. In fact, despite the studies also included the measurement of some employee level outcomes of the activities under examination (such as employee motivation, engagement, and quality of hire), the analytical framework of the study was centered on the organizational level of examination, rather than the individual one. As a matter of fact, the unit of analysis for the thesis is intended to be the organization itself, exploring the differences existing between different companies. Specifically, the studies assess whether organizations that are relying on the insight provided by HR analytics are able to implement more effective activities compared to those that have not yet adopted this tool. The thesis is not aimed at focusing on the dynamics within companies, and neither on delving

into the experiences of individual employees. Given that the literature on HR analytics is still emerging, this organizational-level focus is common in empirical studies (e.g. McCartney & Fu, 2022). Researchers are first examining whether HR analytics can produce measurable impacts at the organizational level before conducting more granular analyses at the individual level. For this reason, HR managers were considered the most appropriate respondents, as they possess the knowledge and information necessary regarding HR analytics. Also, as senior organizational members, their perspectives can be considered representative of the fundamental aspects of the entire organization (Lyles & Schwenk, 1992). Also, the measurement, monitoring and/or management of the employee outcomes under examination are typically among the most critical responsibilities of HR managers (Van Beurden et al., 2022), further legitimizing their role as the ideal respondents for the surveys.

Three surveys were created on Foureyes and then distributed through the online platform prolific. This platform has been increasingly used in past years by academics (e.g. Jabeen et al., 2022) due to its dependability and ability to gather large datasets in relatively short frames. The three questionnaires were made available for respondents simultaneously for a total of 20 days, from December 20<sup>th</sup>, 2022, to January 8<sup>th</sup>, 2023. Since Prolific does not allow surveys to be directly targeted to HR managers, specific “Prescreen participants” criteria were applied to approximate the desired professional profile. These criteria included: Leadership/Position of power/Supervisory duties: Yes; Management experience: Yes; Decision-making responsibilities: People management. Additionally, participants were further screened in the actual questionnaire, where they were asked to confirm their actual employment as HR managers. Respondents who answered negatively were not permitted to proceed with the survey. Given the stringent sample requirements, only a small proportion of Prolific users were eligible to participate in the survey (5,266 of 218,743). This, combined with the fact that all three studies were conducted simultaneously, likely contributed to none of the surveys reaching the originally intended target of 300 responses. Study 1 received a total of 222 answers, while both study 2 and 3 reached a total of 281 respondents. Nevertheless, after removing the answers of the respondents who did



not fill out the entire surveys, of those who failed the attention check questions, and of those who provided consistent answers throughout the whole questionnaires, the final sample used to perform the analysis were composed of 219, 206 and 203 responses respectively.

Furthermore, at the time the study was conducted, Prolific did not yet offer the possibility of individually managing respondents for survey participation. As a result, it is possible that some respondents may have participated in more than one study. This potential overlap of respondents poses certain risks that may affect the validity and reliability of the findings. First, by being exposed to similar or related questions across the studies, participants may have developed response patterns or strategies, influenced by their familiarity with the research objectives, thus leading to potential biases. Repeated exposure may have also triggered recall effects, where respondents' answers are shaped by prior participation rather than reflecting their true attitudes or behaviors in each distinct study. Furthermore, survey fatigue is a possible concern, as participants who take part in multiple studies within a short timeframe may become less attentive or motivated, potentially compromising the quality of their responses.

Nevertheless, while the potential overlap of respondents across multiple studies may seem concerning, its impact may not be as significant as anticipated, due to both the peculiarities of the platform used and to the specific design of the research. First, Prolific employs robust randomization and stratification procedures, which mitigate the risk of systematic biases arising from repeated participation. Additionally, the fact that respondents engage with different research contexts and stimuli across the studies reduces the likelihood that prior exposure will substantially influence their subsequent responses (Strack, 1992). Moreover, statistical techniques such as the use of control variables or robustness checks, can account for any potential biases introduced by repeated participation (Hill et al., 2021). Finally, since the studies were aimed at ultimately assessing the impact of HR analytics on different outcomes, the influence of overlapping samples becomes even less problematic, as the potential carryover effects between studies are minimized (Winman et al., 2004).

Before the beginning of the actual surveys, the questionnaires included an

introductory page aiming at explaining the overall purpose of the three studies. Following this, the first question confirmed that participants were indeed HR managers. Subsequently, surveys takers were asked to indicate whether their organizations had been implementing HR analytics activities over the past 3 years. In order to prevent any conceptual misunderstanding related to the meaning of HR analytics, as well as to avoid that participants would affirm that their organizations were implementing HR analytics even if that was not the case, the following explanatory text was provided before the question:

*“Before answering the following question, we would like to clarify what is meant by "HR analytics" to ensure a shared understanding of the term.*

*HR analytics is a proactive and systematic process for ethically gathering, analyzing, communicating, and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives. It involves the use of data and advanced analytical techniques to make informed decisions about workforce management, improve HR practices, and align HR activities with broader business goals. Importantly, HR analytics goes beyond traditional HR metrics. For instance, while tracking basic HR data like turnover rates, employee engagement scores, or headcount are examples of HR metrics, these alone do not constitute HR analytics. HR analytics is about leveraging these data points, applying deeper analysis, and generating actionable insights that support strategic decision-making. The following are examples of what is considered and what is not considered “HR analytics”:*

***Examples of HR Analytics:***

- *Using data to predict employee turnover and proactively address retention issues by identifying factors influencing resignations.*
- *Analyzing the relationship between employee engagement survey results and organizational performance (e.g., productivity or profitability).*
- *Applying machine learning to identify patterns in recruitment data that predict the success of new hires.*

- *Conducting a detailed analysis of workforce demographics to forecast future talent needs and skill gaps, aligning them with the company's long-term strategy.*
- *Assessing the impact of training programs on employee performance through data-driven comparisons between trained and untrained employee groups.*

***Examples of What is Not HR Analytics:***

- *Simply tracking basic HR metrics like headcount, turnover rates, or absenteeism without analyzing the underlying causes or strategic implications.*
- *Collecting data on employee satisfaction through surveys but not performing any further analysis to uncover actionable insights.*
- *Using an HR dashboard to visualize metrics (e.g., diversity percentages) without conducting deeper analysis to support decision-making.*
- *Reporting on historical trends in recruitment without analyzing how these trends affect the organization's future talent strategy or business outcomes.*
- *Compiling a list of employee training completions without examining the link between training and subsequent improvements in performance or productivity.*

*Please note that whether your organization has or has not been implementing HR analytics will not affect your participation in this survey. We are interested in understanding differences between organizations that are currently using HR analytics and those that are not. Your honest response is valuable to our research.”*

In the fourth study, a slightly different approach was adopted. In fact, this study went beyond the scope of the previous ones by aiming to assess whether the maturity level of organizations with HR analytics influenced the effectiveness of their HRM practices, rather than focusing solely on the mere implementation of the tool. As a result, since the sample needed to consist exclusively of organizations

that were implementing HR analytics, the final portion of the aforementioned explanatory text was modified accordingly:

*“Please note that, since the purpose of this study is to assess the effectiveness of HR analytics practices, only organizations that have been implementing HR analytics activities for at least the past three years are eligible to participate. If your organization has not been using HR analytics for this period, you will not be able to proceed with the survey. We appreciate your understanding, and your honest response is essential to ensuring the accuracy of our research.”*

In addition, data were collected from two different respondents for each organization included in the study. Questions regarding the HRM practices adopted, the maturity level of HR analytics within organizations, and the employee resilience were answered by HR managers, while questions regarding the organizational performance were answered, at a later time, by general managers, chief executive officers, product managers, innovation managers, or chief innovation officers of the same companies. Data collection happened from December 18<sup>th</sup>, 2023, to January 15<sup>th</sup>, 2024. A two waves survey strategy was adopted. In the first, HR managers answered the questions regarding HR analytics and employee resilience. On the second, the same respondents answered the questions regarding the HRM practices, while the other managers involved answered the questions related to organizational performance.

A total of 450 responses were collected. After excluding incomplete surveys, respondents who failed attention-check questions, and those who provided consistent answers throughout the whole questionnaires, a final sample of 411 surveys was used to perform the analysis.

## **Chapter 2 – No more war (for talent): The impact of HR analytics on talent management activities**

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## 2.1 Introduction

Although the attraction, development, and retention of talent are now widely acknowledged as one of the most crucial issues for organizations to improve several outcomes such as their competitiveness or resilience (Battisti et al., 2023; Gallardo-Gallardo et al., 2020; Lee et al., 2022), the rapid changes happening at the demographic and technological level are having a disruptive effect on traditional talent management practices. In fact, these seem not to be suitable anymore for the needs of workers and organizations (Claus, 2019), a situation further exacerbated by the COVID-19 pandemic (Ayoko et al., 2021). For example, according to the 2023 LinkedIn Global Talent Trends report, the hiring rates of the leading global economies have declined over the past year, whilst internal mobility has been trending upward in several industries (Kitto, 2023). Despite this, employees are still considering leaving their company as a better option for their career than looking for an internal move (Keller & Dlugos, 2023). This had some consequences for the way organizations compete. In fact, they moved beyond the traditional war for talent, a lose-lose situation where companies stole their best employees from each other (Taamneh et al., 2021), to a new competition regarding the engagement and the retention of valuable employees by providing them with stimulating working experiences (Claus, 2019). So, talent management focus shifted from the organizational to the individual level (Festing & Schäfer, 2014), considering talent management's positive impact not only on organizational performance, but also on individual outcomes.

Meanwhile, digital transformation had a disruptive effect that deeply affected and modified the HR role (Mazánek et al., 2017). In fact, many HR activities were affected by technological changes, with effects also on talents, which requires always more real-time data to find out what issues are most relevant for employees right now (Claus, 2019). In this rapidly evolving landscape, artificial intelligence is emerging as a pivotal force, as it offers the promise of improving not only the decision-making process within the HR realm, but also its efficiency and innovation levels (Tambe et al., 2019). More specifically, the incorporation of the potentialities of artificial intelligence within the talent management activities of organizations can help them attract and retain top talents while fostering a productive and engaged

workforce, as it will allow them to adopt a more strategic and data-driven approach (Albert, 2019). In this sense, HR analytics, which is defined as the use of data, analysis, and systemic reasoning in relation to the people involved and/or connected to the organization (van den Heuvel & Bondarouk, 2017), can offer its contribution. In fact, it allows to thoroughly analyze the whole HR decision-making process (Dahlbom et al., 2019) and to determine the causal relationship between HR practices and performance metrics (Lawler III et al., 2004). Nevertheless, despite the transformative potential of digital technologies within the realm of HR, it is worth noting that the current coverage of HR-related literature in terms of digital transformation remains relatively limited (Jedynak et al., 2021). While digital transformation has undoubtedly disrupted HR functions and processes (Mazánek et al., 2017), the full spectrum of its potential impact is yet to be realized. Many HR activities have been touched by technological advancements, particularly in the quest for real-time data to address immediate employee concerns (Claus, 2019). Thus, practitioners feel more than ever the need for effective answers regarding practical talent management issues. However, despite more and more studies tried to shed light on this topic (Luna-Arocas & Danvila-del-Valle, 2021), most of these focus their attention on the organizational level, concentrating on the effect of talent management on organizational performance, neglecting the individual level (Festing & Schäfer, 2014; Sparrow, 2019). This is quite an important gap as, on the contrary, organizations are designing their talent management strategies by focusing firstly on the individual level, successively considering the impact of their initiatives also for organizational level outcomes such as talent retention (Festing & Schäfer, 2014). Furthermore, the role played by both the internal and external organizational context has mostly not been considered by previous studies (Gallardo-Gallardo et al., 2020), a situation which gets even more worrying when taking into account the recent exogenous shocks like the pandemic situation, which pushed organizations to change and adapt almost instantly (Claus et al., 2022). , HR analytics may play a crucial role in filling the highlighted gaps. In fact, it may enable organizations to make talent management a data-driven process, differently from its classical conception (Gurusinghe et al., 2021). This will allow to carefully weigh talent management activities on the company's internal and external context,

making it possible to meet the specific needs of individuals (Marler & Boudreau, 2017). By doing so, talent management will truly become a source of competitive advantage. This is in line with the contingency theory (Harney, 2016), which states that HR management activities will increase their effectiveness as they will increase their consistency with the characteristics of the organizations and of its context, in opposition to a best practices, “one-size-fits-all” approach (McGrandle, 2016). Consequently, according to this theory, the effectiveness of talent management activities will be contingent upon aligning them with the specific characteristics and context of organizations (Huang, 2001). In fact, different companies may have varying critical positions depending on their industry, strategy, and market dynamics (Collings & Mellahi, 2009), may have to adapt their talent acquisition strategies according to the different cultures, industries or workforce demographics of the context where they operate (Sahay, 2014), and may have to align their talent development activities to their strategy or design them to address the specific gaps of their employees (Dalal & Akdere, 2018). HR analytics may thus help better identify the critical positions with the highest impact on the organization by analyzing historical performance data (Rasmussen & Ulrich, 2015), may provide insights into the most effective recruitment channels, candidate profiles, and hiring process (Lam & Hawkes, 2017), and may guide the creation of personalized development plans for employees by assessing the skills and competencies which are needed the most (Schreuder & Noorman, 2019). Consequently, this may improve the effectiveness of talent management activities, with positive effects on their individual level outcomes as talent motivation, as employees will perceive that their organizations are doing their best to provide them with the most appropriate activities to support their growth (Huang et al., 2023), and the quality of hire, as these activities will be designed to answer to the specific requirements of the organizations (Walford-Wright & Scott-Jackson, 2018).

In line with what has been stated until now, the objective of this study is to investigate the relationship between talent management activities and its individual (talent motivation and quality of hire) and organizational outcomes (talent retention), also taking into account the moderating effect of HR analytics. Specifically, this will be done by answering the two following research questions:



Q1: What is the effect of talent management activities on individual and organizational outcomes?

Q2: Can the adoption of an HR analytics data-driven approach improve the effectiveness of talent management activities?

This approach will allow us to contribute to talent management literature by considering the impact of talent management activities also on individual outcomes (Sparrow, 2019). Furthermore, the inclusion of HR analytics will allow us to consider both the effect of the internal and external organizational context (Gallardo-Gallardo et al., 2020). Thirdly, we will contribute to HR analytics-related literature by enlarging the scarce number of empirical studies on the topic (McCartney & Fu, 2022). The study will also be very useful for practitioners, as it will help them properly design their talent management strategies, making the best of their investments.

The subsequent sections of this paper are organized as follows: firstly, the literature review and hypotheses section will provide a concise overview of recent research in talent management and HR analytics, delineate the six hypotheses examined in this study, and introduce the research model. Secondly, the research methodology section will elucidate the data collection process and offer a comprehensive explanation of the survey measures employed. Thirdly, the research results will be presented, offering a detailed analysis and substantiating each of the hypotheses under investigation. Finally, the paper will conclude with a discussion of its theoretical contributions to talent management and HR analytics research streams, managerial implications, limitations, and suggestions for future research.

## **2.2 Literature review and hypotheses**

### **2.2.1 Talent management activities impact on individual outcomes**

Talent management has emerged as a critical strategic function within organizations, aiming to attract, develop, and retain high-performing employees who possess the necessary skills and competencies to drive organizational success (Sivathanu & Pillai, 2020). This has helped to raise interest in the topic even among academics, so much so that it is often mentioned as one of the hot topics in the field of management by several reviews and bibliometric analyses (e.g. Caputo et al.,

2022). Effective talent management practices contribute to enhancing employee motivation, engagement, and overall job satisfaction (Gruman & Saks, 2011). The COVID-19 pandemic has significantly impacted talent management strategies, forcing organizations to adapt and reassess their approach to managing talent in a rapidly changing environment (Aguinis & Burgi-Tian, 2021). This situation has brought unprecedented challenges for organizations across various industries, leading to disruptions in business operations and significant shifts in work dynamics (Ayoko et al., 2021). Their employees were directly impacted too, as they had to experience subitaneous changes regarding their workplaces and working schedules, as well as had to interface with new technologies to communicate and collaborate with their colleagues and managers (Schäfer et al., 2023). This led to a steep rise in the use of flexible work arrangements, with both positive and negative effects on employees and on their organizations (Stamm et al., 2023). Remote work, social distancing measures, and economic uncertainties have compelled organizations to reevaluate their talent management strategies to accommodate the changing needs and expectations of employees (Kravariti et al., 2022). Talent management activities may be crucial to foster the cognitive and behavioral changes needed for employees to cope with the aforementioned organizational transformation (Kallmuenzer et al., 2023).

Despite being common to much of the globe, this situation had quite a huge impact on Europe, damaging an already precarious balance. In fact, according to the European Commission (De Keersmaecker & Favalli, 2023), over the past few years Europe has been affected by a significant reduction of its working-age population, which has diminished by at least 3.5 million people between 2015 and 2020. More worryingly, this trend is projected to continue until at least 2050, with an expected further reduction of 35 million young workers. This, along with other criticalities as the low share of university and higher-education graduates and the reduction in the mobility of the population between 15 and 39 years old, has caused what has been defined as the “talent development trap”, a situation which, if neglected, may jeopardize the European prosperity in the long run. In fact, several regions are already being afflicted by structural hurdles including inefficiencies in their labor markets, education and training systems, adult learning programs,

underperformance in innovation, public governance, and business development, as well as limited access to services. According to recent McKinsey research (Berubé et al., 2022), the situation has not improved with the resolution of the pandemic. On the contrary, the turbulent conflict in Ukraine, escalating inflation, and increasing concerns about potential hiring freezes and layoffs have established a challenging set of circumstances for businesses, which are experiencing difficulties in hiring new people with the necessary skills while having to deal with an increasing number of resignations. As a matter of fact, one third of the participants in the survey declared that they intended to leave their companies in the next three to six months, while the vacancy rate has almost doubled since June 2020.

In this scenario, talent management activities have gained even more prominence as they can help organizations to maintain the level of motivation of their talents and the quality of hires (Pandita, 2022). According to previous literature, these objectives can be reached by three main talent management activities: talent development, identification of critical positions and talent acquisition (Mujtaba et al., 2022).

Firstly, when organizations invest in the development of their employees, providing them with opportunities for learning, growth, and skill enhancement, it fosters a sense of value and purpose among individuals (Chen et al., 2021). By offering training programs, coaching, mentoring, and career advancement opportunities, talent development initiatives demonstrate that the organization recognizes and values the potential and capabilities of its employees (Nicolás-Agustín et al., 2024). Consequently, employees are more likely to feel motivated and engaged, as they perceive their organization's commitment to their professional growth and advancement (Do & Shipton, 2019).

Secondly, the identification of critical positions within the organization, clearly defining the roles and qualifications necessary for them, can provide employees with a roadmap for career progression (Järvi & Khoreva, 2020). When employees understand the skills, competencies, and experiences required to advance within the organization, it enhances their motivation to acquire and develop those capabilities (Jayaraman et al., 2018). The identification of critical positions also allows organizations to tailor talent management activities, such as training and succession

planning, to specific roles, ensuring a strategic focus on nurturing talent for key positions (Collings & Mellahi, 2009). This strategic approach signals to employees that their contributions are essential to the organization's success, further enhancing their motivation and commitment (Sparrow & Makram, 2015).

Thirdly, a strategic and proactive talent acquisition strategy ensures that the organization attracts candidates with the desired skills, competencies, and cultural fit, contributing to a high-performing and motivated workforce (Rehman et al., 2022). When employees witness the organization's commitment to selecting and hiring the best talent, it reinforces their belief in the organization's vision, mission, and values. The presence of talented individuals within the organization fosters a sense of healthy competition and raises the bar for performance, motivating existing employees to continuously improve and excel in their roles (Ulrich & Lawler, 2013).

By considering everything that has been stated, we formulate the following hypothesis:

H1: Talent management activities are positively related to talent motivation.

Moreover, providing proper development activities can help increase the quality of hires from both an internal and an external perspective (Cooke et al., 2022): for the former, they can help new recruits insert themselves smoothly into the organizational mechanisms, filling potential skills or knowledge gap or improving their capabilities; for the latter, they can create a pipeline of skilled and capable individuals who possess the competencies necessary for success within the organization. By investing in the development of internal talent, organizations can reduce reliance on external hires and ensure a higher quality of candidates for key positions (Kaliannan et al., 2023).

Additionally, by identifying critical positions and their corresponding qualifications, organizations can enhance the quality of hires by aligning their recruitment and selection processes with the specific requirements of these roles (Collings & Mellahi, 2009). This targeted approach ensures that candidates who possess the necessary skills and competencies are selected, thereby improving the overall quality of hires (Al Ariss et al., 2014).

Finally, an effective talent acquisition strategy enhances the quality of hires by

enabling organizations to identify and select candidates who align with the organization's values, culture, and long-term objectives (Mukul & Saini, 2021). By recruiting individuals who are a good fit for the organization, the likelihood of successful onboarding, engagement, and retention increases, resulting in higher-quality hires (Swider et al., 2015).

Hence, we formulate the following hypothesis:

H2: Talent management activities are positively related to the quality of hires.

### **2.2.2 The moderating effect of HR analytics**

HR analytics has gained increasing attention as a strategic tool that organizations employ to leverage data and analytics for evidence-based decision-making in HR management (McCartney & Fu, 2022). It is defined as «a proactive and systematic process for ethically gathering, analyzing, communicating and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives» (Falletta & Combs, 2021, p.54). HR analytics involves the collection, analysis, and interpretation of data to gain insights into various HR processes and practices (van den Heuvel & Bondarouk, 2017). It can thus be considered as a useful tool for organizations to deal with the innovations and changes that are contributing to reshaping the workplace as we know it, bringing with them both potential benefits as well as increasingly complex challenges (Kraus et al., 2023).

Coming more in details into the objective of this paper, HR analytics implementation can positively impact organizations by providing data-driven insights that enable evidence-based decision-making and the optimization of talent management practices (Marler & Boudreau, 2017). By analyzing data related to employee performance, engagement, turnover, and talent acquisition, among other factors, organizations can identify patterns and trends to make informed decisions to optimize talent management strategies (Gurusinghe et al., 2021). HR analytics enables organizations to assess the effectiveness of their talent management activities, identify areas for improvement, and make informed adjustments to optimize talent outcomes (Russell & Bennett, 2015). This is in line with the contingency theory applied to HR management, which posits that HR management

practices produce better effects when tailored to the specific organizational environment (Harney, 2016). More in detail, according to this theory organizations must align their HR practices with the unique characteristics, needs, and challenges of their context (Harney, 2016). In the case of HR analytics implementation, organizations can tailor their talent management activities based on the insights and evidence derived from data analysis (Gurusinghe et al., 2021). By adopting a data-driven approach and customizing talent management practices to the specific needs and dynamics of the organization, the positive effects of these practices on talent motivation and the quality of hires can be maximized (McIver et al., 2018).

Firstly, by leveraging HR analytics, organizations can gain insights into the impact of talent management activities on employee motivation. Analytics can help identify which talent management practices are most effective in motivating employees, allowing organizations to focus their resources on activities that have the greatest positive impact (Huang et al., 2023). HR analytics can also help identify potential gaps or areas of improvement in talent management practices, enabling organizations to refine their strategies to enhance talent motivation (Sivathanu & Pillai, 2020). Also, HR analytics may help in designing acquisition strategies able to improve the degree of fitness between new hires and organizational culture which, according to previous studies, has a strong influence on talent motivation (Gurusinghe et al., 2021). Using the insights derived from HR analytics as the starting point to design personalized talent development strategies may also improve talent motivation, as they will have the perception that their organizations try to consider and respect their individualities, not considering them simply as replaceable parts of the organizational mechanism (Davenport et al., 2010). Finally, the usage of HR analytics may reduce the chances of allocating talents to organizational positions not fitting with them, a contingency that strongly impacts their motivation (Schuler, 2015).

We can thus make the following hypothesis:

H3: HR analytics implementation positively moderates the relationship between talent management activities and talent motivation.

Secondly, HR analytics implementation can positively moderate the relationship between talent management activities and the quality of hires. By utilizing

analytics, organizations can analyze recruitment and selection data, performance data, and employee feedback to identify the key factors associated with high-quality hires (Lam & Hawkes, 2017). These may then be used as a starting point to design talent development activities, with potential positive benefits on their effectiveness (Shet & Nair, 2022). Analytics can assist in identifying the characteristics, skills, and competencies of successful hires, enabling organizations to refine their talent acquisition strategies (Baesens et al., 2018). Finally, organizations may also implement HR analytics to audit the history of a specific position to better individuate the most suitable talents possessing the needed competencies, with potential benefit to their performance, thus improving the quality of hires measures (Ghobakhloo, 2020).

To resume, by tailoring talent management activities to align with the insights derived from HR analytics, organizations can enhance the effectiveness of their talent management practices and improve the overall quality of hires (Lam & Hawkes, 2017), thus leading to the formulation of the following hypothesis:

H4: HR analytics implementation positively moderates the relationship between talent management activities and the quality of hires.

### **2.2.3 From individual to organizational outcomes**

Talent management activities are vital for organizations to attract, develop, and retain high-performing employees who contribute to the achievement of organizational goals (Chatterjee et al., 2023). While talent management has been widely recognized for its positive impact on broader organizational outcomes, it is equally important to explore its influence on individual outcomes, such as talent motivation and the quality of hires (Festing & Schäfer, 2014). By recognizing the interplay between talent management activities, individual outcomes, and organizational outcomes, organizations can develop comprehensive talent management strategies to align these aspects with the overall goals and objectives of the company, driving both individual and organizational success (Sparrow, 2019). In particular, by fostering talent motivation and ensuring the quality of hires, organizations can enhance talent retention.

A motivated workforce not only contributes to higher productivity and performance

but also exhibits greater loyalty to the organization (Salanova et al., 2005). When employees are motivated, they exhibit higher job satisfaction and commitment to their roles (Ciobanu et al., 2019). Such positive attitudes and behaviors contribute to increased levels of talent retention (Di Prima et al., 2023). Individuals who are motivated by factors such as growth opportunities, recognition, and a supportive work environment are more likely to stay with the organization, reducing turnover rates (Lee et al., 2022). In fact, the resulting sensation of personal accomplishment is expected to positively influence the talent's willingness to remain with its organization (Kontoghiorghes, 2016). In confirmation of this, Galletta et al. (2011) found that motivated talents developed a sense of identification and attachment toward their company which ultimately increased their retention levels. Similar results were obtained by Thatcher et al. (2006). According to De Sousa Sabbagha et al. (2018), this may be due to the fact that motivated employees are not prompted to look for another job, thus increasing their retention levels.

Hence, we make the following hypothesis:

H5: Talent motivation is positively related to talent retention.

Similarly, hiring high-quality candidates who fit well with the organization's culture and requirements ensures that these individuals are more likely to remain with the organization over the long term (Moore & Hanson, 2022). When organizations make strategic efforts to attract and select high-quality candidates, it sets the foundation for long-term talent retention. Employees who possess the right capabilities and align well with the organization's values and goals are more likely to thrive within the organizational context and demonstrate commitment to their roles (Keller et al., 2020). As a result, organizations experience higher levels of talent retention, due to the fact that these talents are less likely to seek new opportunities as they should not experience such a pushing job-related frustration (Ramlall, 2004). Also, high-quality hires typically present leadership potential, and may thus serve as role models and mentors to other employees, helping them overcome their difficulties, potentially creating a virtuous cycle that will eventually increase talent retention (Brant et al., 2008). Similarly, they usually fit well with the teams where they are inserted, with potential positive effects on team morale, which

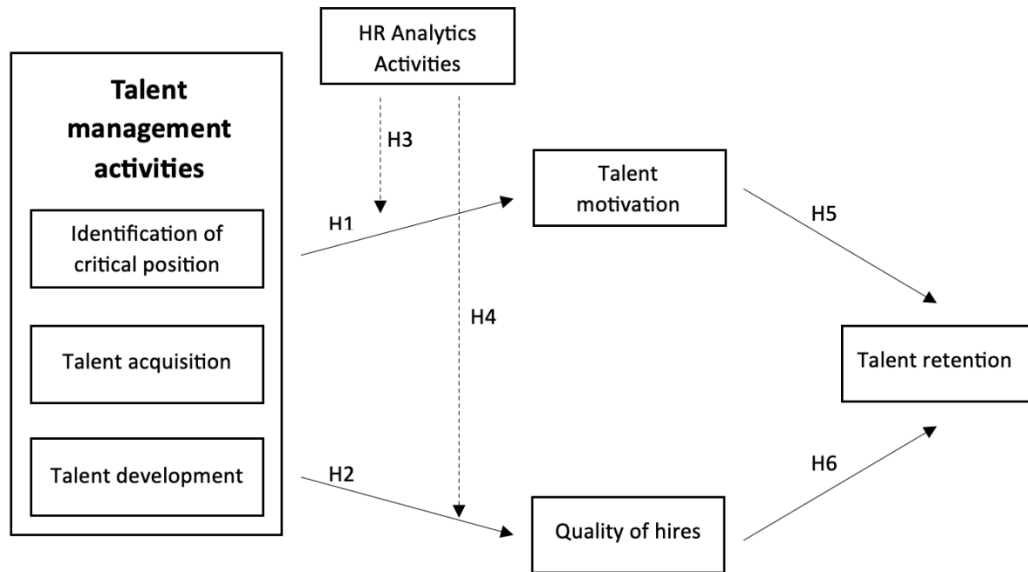


is another predictor of higher retention (Wallis & Kennedy, 2013).  
 We thus formulate our last hypothesis:

H6: The quality of hires is positively related to talent retention.

Our model and hypothesis are summarized in Figure 2.1.

**Figure 2.1 – Research model and hypotheses.**



Source: Authors' elaboration.

## 2.3 Research methodology

### 2.3.1 Data collection and participants' profile

We developed a self-administered, online survey intended to be completed by HR managers, as they are the organizational figures who are more likely to possess the information needed for the study (McCartney & Fu, 2022). Participants were informed about the confidentiality and anonymity of their responses, emphasizing that the data would be used solely for scientific purposes. To ensure data quality, attention check and reverse-coded questions were included, following the recommendations of Abbey and Meloy (2017).

Face and content validity of the measurement scales have been assessed by reviewing the questionnaires with members of the Italian Association of Human Resource Directors (AIDP), which revealed the need to rephrase some of the reverse-coded questions to enhance clarity. The survey was administered using the

"Prolific" online platform, which has gained popularity among academics and practitioners due to its reliability and ability to recruit a large number of participants within a short period (e.g. Jabeen *et al.*, 2022). Data collection took place from December 20th, 2022, to January 8th, 2023. The "Balanced sample" option was chosen for study distribution, and participants were prescreened based on criteria such as holding a leadership position, management experience, and decision-making responsibilities related to people management. Furthermore, participants were screened within the actual questionnaire to confirm their organizational role as HR managers.

A total of 222 respondents completed the questionnaire. However, after removing incomplete surveys, those that failed attention check questions, and responses that exhibited consistent answers throughout the entire questionnaire, the final analysis was performed on a sample of 219 respondents.

The final sample consisted of 145 (66%) private companies and 74 (34%) public companies. The majority of companies represented the health services (16%) and public offices sectors (15%), followed by education (9%), banking and insurance (7%), food service and tourism (7%), industrial production (6%), information technology (5%), agriculture, food processing, and food supply chain (4%), constructions (4%), transportations (4%), and logistics (4%). The remaining companies were from sectors such as communications, consultancy, entertainment, legal, non-profit, real estate, retail, services, distribution, and utilities. Most of the companies were from the United Kingdom (68%), followed by Poland and Portugal (7% each), Italy (5%), Ireland (3%), the Netherlands, Greece, Spain, and France (2% each). The remaining companies were located in Germany, Hungary, Austria, Estonia and Latvia. The majority of firms had more than 250 employees (40%). 22% of them had between 50 and 249 employees, 26% between 10 and 49, and 12% less than 10 employees. The majority of them (48%) had revenue of less than 2 million euros, 24% between 2 and 9.9 million, 14% between 10 and 49.9 million, and another 14% higher than 50 million euros. 50% of the companies had average age of employees between 30 and 39 years old, 31% between 40 and 49 years old, and 15% younger than 30 years old. Only 4% of them presented an average age higher than 50 years. 55% of respondents were female and 45% male. 20% of them

were less than 30 years old, 39% between 30 and 39, 22% between 40 and 49, and 19% over than 50 years old.

### **2.3.2 Measurements**

To ensure validity and reliability, all items in the questionnaire were adapted from previously validated studies (Fink, 2003; Groves et al., 2013; Martin, 2005). Each variable was assessed using a multi-item structure, measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), as recommended by Groves *et al.* (2013) and Peter (1979), with the exception of HR analytics, which was considered as a dummy variable, and quality of hire, which was measured based on the actual evaluation received by companies' employees. Our study comprised a total of 21 items.

*Talent management activities* was our dependent variable. It was measured by using a total of 9 items belonging to 3 main dimensions, namely identification of critical position, talent acquisition and talent development, all taken by Mujtaba et al. (2022).

*Talent motivation* was our first mediator on the relationship between talent management activities and employee retention. It was measured by 7 items taken by Marsden and Richardson (1994).

*Quality of hire* was our second mediator on the relationship between talent management activities and talent retention. It was measured as the percentage of new hires who received a positive score on their first performance evaluation (Lawler III et al., 2004).

*HR analytics* was employed as a moderator in the relationships between talent management activities and talent motivation, as well as between talent management activities and the quality of hire. It was treated as a dummy variable, taking on a value of 1 if the organization had implemented HR analytics activities at least three years prior to the questionnaire administration, and a value of 0 if such implementation had not occurred.

*Talent retention* was our independent variable. It was assessed by 3 items from Mujtaba *et al.* (2022).

The entire questionnaire is provided in the appendix.

### **2.3.3 Data analysis method**

The data organization and processing in this study were conducted using IBM SPSS Statistics v.28 software. This software was utilized for various purposes, starting with deriving descriptive statistics and examining correlations among variables. Additionally, it was employed to ensure normal distribution of data, address multicollinearity concerns, and identify potential common method bias. The measurement model's validity and reliability were assessed, and hypothesis testing was performed using SPSS AMOS v.28. To assess multiple statistical relationships in a simultaneous way and validate the model, the SEM technique was employed, which aligns with similar approaches used in previous studies (e.g. Chatterjee et al., 2022; McCartney & Fu, 2022). For theory testing and confirmation in deductive studies, a covariance-based structural equation modeling (CB-SEM) technique was selected, as recommended by Dash and Paul (2021) and Hair Jr et al. (2017).

## **2.4 Results**

### **2.4.1 Normality, common method variance, and multicollinearity**

Prior to conducting the confirmatory factor analysis (CFA), an assessment of data normality was performed. The skewness and kurtosis values for each item were evaluated, and it was found that all values fell within the recommended range of -2 to +2 (George & Mallery, 2018), indicating that the data exhibited a normal distribution. To ensure the absence of measurement errors, a common factor was introduced to account for potential influences of standard method bias. The application of Harman's single-factor technique resulted in a sum of squared variance percentage of 45.643%, which is below the commonly accepted threshold (Harman, 1976; Podsakoff et al., 2003). Thus, it can be concluded that the study did not encounter measurement issues associated with common method variance. Additionally, precautions were taken to address potential overfitting problems and ensure the reliability of the model parameter estimates by examining the variance inflation factors (VIFs) for signs of multicollinearity. With all VIF values below 2 and tolerances greater than 0.10 (Alin, 2010; Tandon et al., 2021), it can be determined that there was no evidence of multicollinearity in the data.

#### 2.4.2 Measurement validation: validity and reliability

Considering that all variables utilized in this study were derived from established and accepted constructs in the theoretical framework (Kline, 2016), a confirmatory factor analysis (CFA) was conducted to evaluate the validity and reliability of the measurement model. The results of the CFA indicated a satisfactory model fit, as evidenced by the following indices: PCMIN/DF = 1.575, CFI = .965 (greater than .92), TLI = .957, and RMSEA = .051. To assess convergent and discriminant validity, several measures were examined, including factor loadings, average variance extracted (AVE), correlation values among factors, and descriptive statistics. Additionally, the reliability of the measurement means was evaluated through the observation of the composite reliability (CR) value. Table 2.1 presents the results, demonstrating satisfactory factor loadings for the scale items of each construct, with individual item loadings exceeding .35 (Hair et al., 1995). Moreover, both AVE and CR surpassed the commonly accepted thresholds of .5 and .7, respectively (Fink, 2003; Groves et al., 2013; Zikmund & Babin, 2016).

**Table 2.1 – Factor analysis for convergent validity and reliability.**

Construct	Item	Standardized Factor Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)
Talent Acquisition	TACQ1	.475	.587	.809
	TACQ2	.602		
	TACQ3	.683		
Identification of Critical Positions	IDCP1	.668	.607	.822
	IDCP2	.623		
	IDCP3	.530		
Talent Development	TDEV1	.673	.582	.806
	TDEV2	.497		
	TDEV3	.577		
Employee Motivation	MOTI1	.596	.563	.900
	MOTI2	.514		

	MOTI3	.638		
	MOTI4	.646		
	MOTI5	.641		
	MOTI6	.510		
	MOTI7	.396		
Employee Retention	RETE1	.734	.727	.889
	RETE2	.673		
	RETE3	.774		

Source: Authors' elaboration.

The results presented in Table 2.2 indicate the extent to which a measure deviates from another measure that is conceptually unrelated to its underlying construct. The square roots of AVE (highlighted in bold in the table) are higher than the correlation coefficients between latent constructs and observed factors. This finding demonstrates that all constructs and their respective variables satisfy the criteria for discriminant validity. Moreover, all correlation coefficients reported are statistically significant at the .01 level (2-tailed). Therefore, the confirmatory factor analysis (CFA) provides confirmation of the appropriateness of the measurement instrument and the reliability of the collected information.

Table 2.2 – Mean, standard deviation, and correlations for discriminant validity.

Constr.	Mean	Std. Deviation	TDEV	RETE	IDCP	TACQ	MOTI
TDEV	3.744	.724	<b>.763</b>				
RETE	3.694	.933	.695	<b>.853</b>			
IDCP	3.881	.657	.743	.669	<b>.779</b>		
TACQ	3.371	.838	.687	.656	.567	<b>.766</b>	
MOTI	3.625	.691	.563	.655	.582	.487	<b>.750</b>

Source: Authors' elaboration.

### 2.4.3 Hypotheses testing and structural model

The hypotheses were examined using structural equation modeling (SEM). To evaluate the moderating impact of HR analytics, two distinct groups were formed in SPSS AMOS based on the variable "HR analytics" as the grouping criterion. The first group consisted of companies (137 respondents) that had implemented HR analytics activities within the previous 3 years (dummy value = 1), while the second group comprised companies (82 respondents) that had not implemented such activities (dummy value = 0). In line with the large majority of previous studies (e.g. Latukha, 2014), a significance level of 5% was required to reject the null hypothesis. However, as several of our results reached a significance level of 1%, we have decided to indicate when this has happened, in line with McCartney and Fu (2022).

Our first hypothesis suggested that talent management activities were positively related to the motivation of new hires. Our analysis confirmed this to be true ( $\beta = .609$ ;  $p < 0.001$ ). More in detail, we found that the identification of critical positions was the dimension with the highest correlation with motivation ( $\beta = .354$ ;  $p < 0.001$ ), followed by talent development ( $\beta = .222$ ;  $p < 0.05$ ) and talent acquisition ( $\beta = .141$ ;  $p < 0.05$ ). The analysis also confirmed our second hypothesis, i.e., that talent management activities are positively related to the quality of hires ( $\beta = .542$ ;  $p < 0.001$ ). Also in this case, the identification of critical positions was the dimension showing the highest impact ( $\beta = .241$ ;  $p < 0.05$ ), followed by talent development ( $\beta = .209$ ;  $p < 0.05$ ) and talent acquisition ( $\beta = .166$ ;  $p < 0.05$ ).

Our third hypothesis suggested that HR analytics would have positively moderated the positive relationship between talent management activities and the motivation of new hires. Our results also found this to be true. In fact, the organizations that have been implementing HR analytics in the past three years showed a higher correlation and a better significance ( $\beta = .684$ ;  $p < 0.001$ ) than those that did not ( $\beta = .460$ ;  $p < 0.01$ ). In a very similar way, our fourth hypothesis implied a positive moderation of HR analytics on the positive relationship between talent management activities and the quality of hires. This hypothesis was also confirmed by the analysis, as the relationship was stronger and more significant for companies that implemented HR analytics activities ( $\beta = .617$ ;  $p < 0.001$ ) than for the companies

that did not ( $\beta = .576; p < 0.05$ ).

According to our fifth hypothesis, the motivation of new hires should have been positively related to employee retention. Our analysis confirmed this assumption ( $\beta = .386; p < 0.001$ ). They also confirmed our last hypothesis to be true. In fact, we demonstrated that the quality of hires is positively related to employee retention ( $\beta = 1.624; p < 0.001$ ).

Despite this kind of analysis being beyond the scope of our hypotheses, for completeness' sake we also decided to better explain the indirect effects of the three talent management activities that we considered on talent retention. We thus found that the identification of critical positions had the highest indirect effect on talent retention ( $\beta = .535$ ), followed by talent development ( $\beta = .427$ ) and talent acquisition ( $\beta = .324$ ), thus mirroring the results that we obtained when testing our first two hypotheses.

Finally, we examined the potential moderating influence of three control variables on the relationship between the aforementioned talent management activities and the motivation of new hires, as well as the quality of hires. These control variables included firm size, measured as the logarithm of sales (Singh & El-Kassar, 2019), the number of employees within the organization (Do et al., 2018; Heffernan et al., 2016), and firm ownership, indicated as a binary variable (0 for private companies and 1 for public companies) (Do et al., 2018; Heffernan et al., 2016). However, none of these variables exhibited a significant effect.

Table 2.3 summarizes the results of the hypotheses testing.

**Table 2.3 – Results of hypotheses testing.**

Hypothesis	Path	Estimate ( $\beta$ )	Significance	Result
H1	TAMA $\rightarrow$ MOTI	.609	***	Supported
H2	TAMA $\rightarrow$ NEWH	.542	***	Supported
H3	(HR ANALYTICS: YES) TAMA $\rightarrow$ MOTI > (HR ANALYTICS: NO) TAMA $\rightarrow$ MOTI	.684 / .460	*** / .001	Supported



H4	(HR ANALYTICS: YES) TAMA → NEWH (HR ANALYTICS: NO) TAMA → NEWH >(HR	.617 / .576	*** / .05	Supported
H5	MOTI → RETE	.386	***	Supported
H6	NEWH → RETE	1.624	**	Supported

Source: Authors' elaboration.

## 2.5 Discussion

The aim of this research was to investigate from an empirical point of view the impact of talent management activities on both individual and organizational outcomes, by also taking into account the impact of an HR analytics data-driven approach guiding their implementation. More precisely, our results showed that talent management activities are able to produce a positive effect on individual outcomes, such as talent motivation and quality of new hires, and that the implementation of HR analytics by organizations may strengthen this relationship. Furthermore, they also demonstrated that the positive influence on individual outcomes is furtherly reflected also on an organizational outcome such as talent retention.

### 2.5.1 Theoretical contributions

Our research offers several theoretical contributions. First, despite the positive impact that talent management activities are able to produce on talent motivation, quality of hires, and talent retention is well recognized in the literature, the interest of practitioners has shifted from the organizational to the individual level. However, most studies on the topic still approached it the “old fashioned” way (Festing & Schäfer, 2014; Sparrow, 2019). For example, in a study involving 138 Swiss companies, Langenegger *et al.* (2011) found that talent management practices were able to increase talent motivation and the quality of their work. However, their research was more focused on investigating if different talent management approaches were able to produce different outcomes from an organizational point of view, i.e., if the aims and scopes of the talent management systems were ultimately able to influence their success. Furthermore, they admitted that the

generalizability of their results was limited, due to the non-random sampling design and the relatively small sample size, thus advocating for further research on the topic. A similar recommendation was provided by Kontoghiorghes (2016) in a study on 897 automotive supply chain employees of a full-service supply chain management company operating in the southwestern United States. In fact, the author was able to demonstrate that talent motivation was ultimately able to positively influence talent retention. However, she admitted being unable to tell if the results of the study were valid despite the talent management approach adopted by the company and despite the sector in which they were operating, as she just focused on the manufacturing and telecommunications industries. More recently, Pandita and Ray (2018) suggested talent management positive impact on talent retention. However, owing to the fact that the paper was conceptual, they recommended empirically testing their assumption. Consequently, our results not only confirm the ones of previous studies, but also represent a step forward in terms of generalizability, as we did not focus on a specific industry or on a specific talent management approach. Furthermore, we contributed to filling the gap that exists between the practitioners' interest and the traditional academic perspective by investigating the impact of talent management activities on two individual outcomes, such as talent motivation and quality of hires, considering only subsequently the impact of these last on an organizational outcome as talent retention. By doing so, we made a step forward towards the often advocated, yet still under-considered, new approach of academic research to take the cue not only from research gaps that have been identified from previous literature, but also from the actual organizational world (Alvesson & Sandberg, 2011).

Secondly, the inclusion of the moderating effect of HR analytics allowed us to also take into account the impact of both the internal and external organizational context when dealing with talent management. In fact, previous research on the topic typically advocated the alignment between talent management practices and the organizational context (Collings, 2014). In this sense, Langenegger *et al.* (2011) found that the alignment between these practices and corporate strategy improved talent motivation. Similarly, Kontoghiorghes (2016) found this to be true for both talent motivation and retention. However, previous studies on the topic typically

focused on reaching this alignment through “soft” organizational characteristics such as, for example, organizational culture (Harsch & Festing, 2020). Despite these aspects being crucial, they are, in real terms, very difficult and slow to manage. Consequently, our study takes a step forward by empirically testing from a quantitative point of view the effect of a “hard” organizational tool as HR analytics to reach this alignment. The implementation of HR analytics allows companies to ground their HR or, more specifically within the context of this research, their talent management activities on a solid empirical basis, as it is able to provide insight and suggestions based on the specific organizational context (Ellmer & Reichel, 2021). This is as important as ever in the contemporary context, where exogenous shocks such as the pandemic are forcing organizations to change and adapt very quickly.

Thirdly, our study offers further empirical grounding to the contingency theory applied to HR management, demonstrating its validity also in relation to a relatively new tool such as HR analytics. It also represents a step forward towards the empirical confirmation of the positive potential benefits of HR analytics, as most of the previous research on the topic adopted a theoretical perspective (McCartney & Fu, 2022). The same can be stated regarding the impact of HR analytics on talent management: several authors (e.g. Gurusinghe *et al.*, 2021; Mayo, 2018) advocated its potential positive impact but, to the best of our knowledge, our study is the first one to approach this issue from an empirical point of view.

### **2.5.2 Managerial implications**

Our work will also have important implications for managers and practitioners. First, the demonstration of the positive impact of talent management on both individual and organizational level outcomes will help practitioners orient their HR investments, favoring those talent management activities that have been demonstrated to have a positive impact not only from an organizational point of view, but also from the employee perspective. In particular, we strongly believe that managers should reflect on the role played by employee motivation, which is playing an increasingly crucial role when dealing with organizational continuity. It was already clear that new generations get motivated in a very different way than their predecessors. However, the pandemic situation seems to have boosted this

difference even more, as it forcedly pushed the experimentation of new ways of working which seems to have definitively modified the perception of younger employees towards their work habits. Consequently, having a better comprehension of how to motivate talents can help reduce the voluntary turnover rate, mitigating the risk of losing valuable employees who, in the long run, may have potentially become the apex organizational figures. In this sense, for practitioners it may be of particular interest the fact that, among the talent management activities that we analyzed, the identification of critical positions has emerged as the one having the highest impact on employee retention both directly and indirectly, followed by talent development and talent acquisition. Consequently, practitioners should reflect very carefully when deciding where to collocate new hires, as allocating them to the wrong position may ultimately lead to the loss of these talents. To avoid this situation, organizations may, for example, design job rotation strategies, thus allowing new hires to experience different organizational areas and settings before deciding together which is the best option for both them and their companies.

In this context, HR analytics may play a very important role. As the external world becomes always more chaotic, this may be reflected also in the internal organizational environment. In this scenario, talents need to feel that their companies do not perceive them simply as gears of the firm mechanism, but as unique individuals with specific characteristics, skills, dreams, and ambitions. HR analytics can help design a personalized career path for each talent, giving everyone the opportunity to express their own potential fully. Contrary to what one may instinctively think, this tool can give organizations the opportunity to take a step forward toward a human-centric approach, definitely consigning the one-fits-all talent (or, more generally, HR) management approach to the past.

### **2.5.3 Limitations and future lines of research**

Despite its contributions and implications, this work is not exempt from limitations. First, given the objective of our study, we just relied on a quantitative approach. However, for future studies it may be interesting to also investigate this topic from a qualitative point of view. This may give them the opportunity to understand the reasons behind the rise in talent motivation in response to certain talent management activities. In order to do so, they would, of course, need to overcome

another limitation of our study, i.e., the fact that we only surveyed HR managers, as they would need to include organizations' talents too. By doing so, it will also be possible to verify if some discrepancies exist between the perception of HR managers regarding the motivation of the talents of their organization and the actual opinion of the talents themselves.

The adoption of a multilevel approach may also offer interesting findings regarding the HR analytics side of our model. Indeed, the fact of considering the HR managers' perspective only is a common limitation of the studies on the topic. However, its benefits may potentially regard other organizational figures, such as managers from other departments, line managers, the top management or, trivially, the employees. Their opinions may consequently help in providing a more complete understanding of this phenomenon.

Finally, it could be worth replicating our study also in different geographical contexts. In fact, a different cultural context may originate variations in which of the different talent management activities are able to motivate talents. This can be very interesting, for example, for organizations operating on a multinational scale, which may have the need to adapt their talent management activities according to the different cultural contexts where they operate. Similarly, it may be useful to replicate this study with a larger sample in order to try to solve some minor methodological issues, such as the low loading values of some of our individual items, which were anyhow included in the analysis as they were within the minimum threshold. However, higher levels may be reached by reaching a larger sample, thus increasing the robustness of the measurements.

## **2.6 Conclusions**

Managing talented employees has always been one of the most difficult tasks for organizations. Some people say that it is like driving sports cars: if you are a good driver, they will bring you further and faster, but it is easy (and expensive) to crash. The pandemic situation has further complicated this situation, but it also unveiled that a new way of working is not only possible, but it may also improve organizational outcomes. HR analytics may be a useful tool for organizations to navigate this uncertain environment, supporting HRs during the decision-making

process, enabling them to consider the individuality of each talent in a data-driven way.

## **Appendix: The questionnaire**

### Talent management activities

In the next section you will be asked to answer questions regarding the talent management activities implemented by the company you work for.

Please indicate the percentage of new hires who received a positive score on their first performance evaluation in the last 3 years.

Indicate to what extent do you agree with the statements.

IDCP1: The company you work for identifies key positions in line with the strategic goals of the organization.

IDCP2: In the company you work for, the capabilities of key positions are identified in line with the requirements of the current and upcoming projects.

IDCP3: The company you work for develops an inventory of available skills and/or employees to match the requirement of key positions.

TACQ1: The company you work uses an employer brand to attract potential talent of the market to fill the important positions.

TACQ2: The sustainability practices of the company you work for support to acquire high performers.

TACQ3: The professional and/or social network of the company you work for supports to hire the best talent of the market.

TDEV1: Competency training of the company you work for helps to acquire a specific skill set to meet current and future job requirements.

TDEV2: Challenging assignments of the company you work for discourage its employees to think beyond the box [Reverse-coded].

TDEV3: In the company you work for, mentorship supports the employees in performing their tasks with excellence.

### Talent management outcomes

In this section we will ask you questions about the motivation, quality and retention of the talents of the company you work for.

In the last three years, the talents of the company you work for...

MOTI1: Improved the quality of their work.

MOTI2: Gave sustained high performance.

MOTI3: Improved their priorities at work.

MOTI4: Show less initiative [Reverse-coded].

MOTI5: Express themselves with greater clarity.

MOTI6: Are more effective in dealing with the public.

MOTI7: Improved their sensitivity towards colleagues.

Indicate to what extent do you agree with the following statements.

RETE1: The company you work for provides career development opportunities to retain key employees.

RETE2: Managerial support of the company you work for inspires its employees to continue their job.

RETE3: The conducive environment of the company you work for motivates talented employees to stay a shorter period [Reverse-coded].

## **Chapter 3 – Help me help you: how HR analytics forecasts foster organizational creativity**

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### 3.1 Introduction

When alluding to high stake decisions in organizations, previous literature typically referred to “hard” organizational aspects such as mergers and acquisitions (Zakaria & Genç, 2017) or the products offered by the company (Argouslidis et al., 2014). However, creativity is increasingly regarded as a possible source of organizational effectiveness and competitive advantage (Olszak & Kisielnicki, 2016). As a matter of fact, in the last two decades, several institutions have explicitly recognized the crucial role of creativity. For example, according to UNESCO creativity is crucial to promote diversity and sustainability (Sancristóbal, 2022), while the Council of the European Union recognizes creativity as one of the core issues to promote growth in the future, and should thus be fostered through proper investing and empowering (Council of the European Union, 2009). Similarly, creativity has been among the top priorities of several organizations, such as Google or Kickstarter, who actively promote their employees’ creativity as a powerful driver of innovation (Hough, 2017). The COVID-19 pandemic has contributed to further exacerbating its crucial role, as organizations that were able to answer creatively to it were, in some cases, able to take advantage of new opportunities arising from that peculiar situation (Thukral, 2021). As organizational creativity comes from the members of the organization (Chaubey & Sahoo, 2019), the effectiveness of innovation strategies largely depends on the HR policy that a firm adopts (Do et al., 2018). It is also for this reason that HR-related decisions are increasingly deemed as high stake decisions, as poor choices may be very hard to reverse due to the severe consequences that they may originate, which may seriously impact organizations’ both tangible (e.g. financial) and intangible (e.g. time, knowledge) resources (Kunreuther et al., 2002).

Specifically, previous research identified some HR activities as antecedents of organizational creativity, such as employee training (Chaubey & Sahoo, 2019; Nawaz et al., 2014), employee rewards and incentives (Chaubey & Sahoo, 2019), organizational knowledge sharing (Trong Tuan, 2020) and recruitment and selection (Jiang et al., 2012). However, to maintain their effectiveness level, HR practices need to follow the organizational trend toward an always more data-driven decision-making process (Holsapple et al., 2014) and to be aligned with the overall

strategy (Minbaeva, 2017), pointing out the attention on big data analytics related to people in the organizations. Consequently, organizations are increasingly relying on HR Analytics, defined as «a proactive and systematic process for ethically gathering, analyzing, communicating and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives» (Falletta & Combs, 2021, p.54). Its use can enable the creation of new information and predictions that can inform and guide the decision-making processes (Neirotti et al., 2021), enabling the improvement of firms' efficacy and efficiency through the forecasting of several organizational outcomes, such as safety, productivity, profits, risk orientation and quality of managerial decisions (van der Togt & Rasmussen, 2017). By doing so, HR analytics can help HR practices to better reach their intended results (Minbaeva, 2017). Through the usage of advanced statistical analysis, predictive modeling procedures and analysis of human capital investments able to forecast and extrapolate "what-if" scenarios (Falletta & Combs, 2021), HR analytics activities have a strong potential for fostering employee training (Chalutz Ben-Gal, 2019; van den Heuvel & Bondarouk, 2017), for better-aligning compensations to organizational strategies (Chalutz Ben-Gal, 2019; van den Heuvel & Bondarouk, 2017), for improving organizational knowledge sharing (van den Heuvel & Bondarouk, 2017), and to improve recruitment and selection (Chalutz Ben-Gal, 2019; McCartney et al., 2021).

The usage of HR analytics to improve the effectiveness of HRM practices is in line with the Contingency Theory applied to HRM (Harney, 2016), which states that HRM has to be coherent with other relevant aspects of the organization and of the external environment to be effective. HR analytics may be a suitable tool to perform this task, as it can provide the needed information seamlessly and, for the most advanced solutions, in real-time (Chalutz Ben-Gal, 2019). It thus allows organizations to take a step forward towards a data-driven decision-making approach also when it comes to the management of their human resources, providing punctual insights that can be used to tailor their HRM strategies to their specific needs, overcoming the still widespread one-size-fits-all approach (Ellmer & Reichel, 2021). In substance, HR analytics allows the shifting of HR departments' decision-making from mere instinct to a data-driven approach,

balancing intuition, experience, and beliefs with concrete evidence and proof (Ratnam & Devi, 2024).

However, existing literature shows some gaps. First, several theoretical studies highlighted the possibility of improving high stake decision-making regarding organizations' workforce by relying on HR analytics' forecasting (e.g., Falletta and Combs, 2021; Tursunbayeva et al., 2018). Despite this, empirical research on the subject is still scarce and focused solely on the direct impact of HR analytics on overall organizational performance (e.g., McCartney and Fu, 2022). Second, previous research regarding organizational creativity's antecedents produced mixed findings (e.g. Nawaz et al., 2014; Zhang et al., 2015). According to some authors, this is because traditional HR management activities cannot enhance organizational creativity, as they would not foster the needed employees' autonomy (De Saá-Pérez and Díaz-Díaz, 2010). However, research regarding innovative HRM activities' effect on creativity is still scattered (e.g. Ikhide et al., 2022). For example, the debate concerning Electronic HRM is growing, but empirical evidence supporting its effect on organizational performance, and particularly on creativity, is still insufficient (Njoku & Ebie, 2015). A very similar argument can be made for innovation-focused HR policies: whilst their role in fostering creativity has previously been recognized, the combined effect of the two constructs has been understudied (Do, Budhwar, & Patel, 2018). Third, despite previous research testing the premises of the contingency theory applied to HRM can be found, it typically just focuses on assessing the differences between this and the universalistic approach (e.g. Clinton & Guest, 2013; Tzabbar et al., 2017), not considering the impact of specific tools which may be used by organizations to practically adopt this contingent approach.

Consequently, the objective of this study is to investigate from an empirical point of view the effect that an HR analytics data-driven approach guiding the HRM practices implemented by organizations has on organizational creativity. Specifically, we will investigate the impact of four HR practices, namely employee training, employee rewards and incentives, organizational knowledge sharing, and recruitment and selection on organizational creativity. Interestingly, by drawing on the contingency theory applied to HRM we will further assess the moderating effect

of HR analytics on the relationship between the aforementioned HR practices and organizational creativity. Our study will thus contribute, first, to the literature stream regarding big data analytics impact on high stake decisions, as we will address the need for empirical studies on the topic, enhancing the few existing research by not only considering the direct impact of such technology on overall organizational performance (McCartney & Fu, 2022) but, rather, investigating the impact of the adoption of a data-driven approach allowed by these solutions. Second, our study will contribute to organizational creativity literature by clarifying the mixed findings regarding its antecedents (e.g. Nawaz et al., 2014; Zhang et al., 2015) and by enlarging the scarce body of literature regarding the impact that innovative HRM approaches may produce (Ikhida et al., 2022). Such an approach will also contribute to HRM literature by demonstrating the potentialities of HR analytics to improve the effectiveness of HR activities also in such a peculiar context as organizational creativity (Njoku & Ebie, 2015). Last, our study will also contribute to the literature stream regarding the contingency theory applied to HRM, by providing additional empirical demonstration that the impact of HR practices may be enhanced by tailoring them to the specific organizational context (Harney, 2016), specifically considering the impact of a tool that may allow for the actual implementation of such a contingency approach, as HR analytics.

## **3.2 Literature review**

### **3.2.1 Creativity in organizational studies: the human resource management perspective**

Amabile (1988, p.126) defined organizational creativity as «the production of novel and useful ideas by an individual or small group of individuals working together». More completely, Woodman et al. (1993, p.293) defined it as «the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system». Now more than ever, organizational creativity is rising as one of the most actively developing research areas (Olszak & Kisielnicki, 2016), as possessing a higher level of creativity helps companies to be more aware of changes in their environment, increasing their ability to adapt (Muñoz-Pascual & Galende, 2017) and thrive in volatile conditions (Njoku & Ebie,

2015). Organizational creativity became even more crucial during the COVID-19 pandemic, as it emerged as one of the most important organizational characteristics when dealing with crises (Thukral, 2021).

Yet, fostering organizational creativity may be challenging for firms (Shipton et al., 2017). In fact, according to Gupta and Banerjee (2016), organizational creativity is a multidimensional construct: it is not constituted of a single dimension, it rather is a conglomeration of several factors needed to maximize the creativity of the employees. Furthermore, organizational creativity does not concern exclusively creative individuals, but it can be considered an organizational competence that may be enhanced or obstructed by organizational mechanisms (Cirella et al., 2016). It is thus essential for companies to frame supportive HRM systems able to promote and support organizational creativity systematically (Song et al., 2019). This may be done by establishing creativity-oriented HRM systems, i.e. a set of HR practices aimed at effectively supporting organizational creativity by allowing employees to generate new and useful ideas (Song et al., 2019).

The ever-increasing importance of the role of creativity has thus elevated the HR function to an even more central position than before. Indeed, organizational creativity is a strong predictor of organizations' innovative capabilities and, as a result, has a strong impact on creating and maintaining competitive advantage (Olszak & Kisielnicki, 2016). Since, in turn, HR practices are capable of producing a great influence on organizational creativity, HR-related decisions can in effect be considered high stake decisions. In fact, the possibility of a wrong decision can produce serious impacts that, if not corrected promptly, can arrive to undermine the overall business balance (Kunreuther et al., 2002).

### **3.2.2 Analytics and technology in Human Resource Management: a data-driven strategy to foster organizational creativity**

Scholars have identified several HR practices acting as antecedents of organizational creativity, such as—employee training, employee rewards and incentives, organizational knowledge sharing, and recruitment and selection (Chaubey & Sahoo, 2019; Nawaz et al., 2014). However, traditional HR practices risk not to be enough anymore to foster organizational creativity (Do et al., 2018). In fact, digitization has brought huge changes in the workforce, which has often

been reduced due to the automation of many tasks, while the remaining ones require increasingly specialized staff (El-Khoury, 2017; Nicolás-Agustín et al., 2024). Workplaces have also been impacted by the phenomenon (Bresciani, Ferraris, et al., 2021), which has completely transformed the way employees interact with each other, the information they use to perform their jobs, their attitudes toward their careers, and their expectations towards their employers (Bresciani, Ferraris, et al., 2021; El-Khoury, 2017).

To face these complex challenges, HR departments are increasingly relying on data to conduct activities that traditionally were carried out based solely on the intuitions and feelings of the staff member responsible for them (Chalutz Ben-Gal, 2019), thus following the growing trend within organizations towards making decisions based on data (Holsapple et al., 2014). In this regard, the integration of big data into daily operations has become increasingly prevalent (Rialti et al., 2019), demonstrating their effectiveness as dynamic tools capable of generating valuable business insights, enhancing performance, and providing a competitive edge over rivals (Chalutz Ben-Gal, 2019). The advent of technology has further facilitated this trend, allowing organizations to operate in a more interconnected manner (Rialti et al., 2019). This, in turn, enables quicker responses to evolving requirements. Artificial intelligence and data analytics, as aids in this process, empower businesses to base their decisions on factual, data-supported insights (Huang et al., 2023).

In this context, HR analytics has proven itself to be a powerful means at the disposal of HR functions to create value for the organization, deriving the causal relationships existing between HR practices and performance metrics (Bahuguna et al., 2023). In the past decade, several private organizations such as Google or Shell, as well as public institutions such as the European Central Bank, promoted the use of HR analytics to improve the effectiveness of heterogeneous HRM activities (European Central Bank, 2023; Lam & Hawkes, 2017; Shrivastava et al., 2018). Leveraging HR analytics to gain insights into the influence of HR practices and policies on an organization's performance is a potent tool within the purview of the HR function (McCartney & Fu, 2022). In the past years, the utilization framework of this tool has largely enriched, shifting from a “reactive” benchmarking approach

oriented towards the implementation of best practices to a predictive approach able to provide actual guidance to decision-makers, empowering HR professionals to contribute substantial value to the organization (Rasmussen et al., 2024). This allowed for wider adoption of HR analytics also beyond the traditional sectors that typically implemented this tool (the financial and technology industry) (Andersen, 2017), as the health services sector (Cavanagh et al., 2024). Furthermore, its scope has been broadened also to activities not directly controlled by the HR department but that can still rely on insight regarding the workforce to increase their effectiveness, as social sustainable operations (Di Prima et al., 2023). The progress in the analytical approach of this tool is therefore reshaping traditional HR activities, emphasizing the imperative for HR professionals to adjust to these evolution and gain a deeper comprehension of new technological solutions to effectively utilize them for enhancing both HR and wider organizational outcomes (Yoon et al., 2024). By harnessing statistical methodologies and experimental approaches, it becomes feasible to unearth the causal relationships connecting HR practices to vital performance indicators, such as customer satisfaction, employee turnover rates, and, ultimately, the profitability of specific business operations (Fernandez, 2019). The utilization of HR analytics not only provides a deeper understanding of these linkages but also amplifies the influence of the HR department on strategic business decisions and future corporate strategies (Falletta & Combs, 2021). In essence, it equips HR professionals with data-driven insights that can steer the organization towards enhanced performance, greater competitiveness, and improved overall outcomes.

As HR analytics has been successfully implemented to improve different HR practices, such as workforce planning, job analysis, and talent management activities (Chalutz Ben-Gal, 2019; Di Prima et al., 2024), we do believe that it can be useful to improve the effectiveness of the four HR practices identified as antecedents of organizational creativity. This is in line with the contingency theory applied to HRM, which states that, for HR practices to be effective, they have to be consistent with the organizations' internal and external context (Beugelsdijk, 2008; Dastmalchian et al., 2020). This theory accentuates the significance of considering specific conditions that influence the relationship between HR practices and their

outcomes, underscoring the vital role of contextual factors in the design of HRM practices (Blom et al., 2021). These factors encompass the organization's culture, structure, and strategic orientation, as well as external variables like industry characteristics and environmental conditions (Jackson et al., 2014). HRM practices that exhibit a strong alignment with these factors are more likely to yield positive outcomes, including enhanced employee performance and overall organizational success (Delery & Doty, 1996). In essence, the application of contingency theory to HRM underscores the imperative for HRM practices to exhibit flexibility and adaptability, allowing them to seamlessly align with the unique circumstances of the organization. Such alignment is pivotal for achieving positive and favorable outcomes (Kim & Ployhart, 2018). More specifically, in this study we will apply the intra-organizational perspective of the contingency theory applied to HRM, thus emphasizing the alignment of HRM practices with the specific needs of the heterogeneous people to whom they may be addressed (Clinton & Guest, 2013). In fact, according to the specificity of their needs, employees may respond quite differently to the same bundle of HR practices (Kinnie et al., 2005), either because they have varying interests, or because they hold different organizational positions with their own liabilities or distinct skills and requisites needed. HR analytics has the potential to seamlessly integrate and optimize HRM activities, enabling the alignment of HR and business strategy so that the efforts of the employees can better contribute to the success of the organization (Njoku & Ebie, 2015). In fact, through HR analytics organizations can obtain insight and information regarding both their internal and external context, which can later be used to design HR activities specifically relevant to that context, which could also ultimately lead to personalized HRM (Huang et al., 2023). In substance, the insight derived from HR analytics will be fundamental to reaching the alignment between HRM practices and the specific needs of the employees to whom they will be addressed, potentially maximizing their effectiveness (Ellmer & Reichel, 2021), besides establishing a strong link between analysis outcomes, the overall business model and wider organizational performance (Lee & Lee, 2024).



### **3.3 Hypotheses development**

#### **3.3.1 Employee training and organizational creativity**

When employees are given empowerment and training, they feel a sense of consideration which makes them willing to repay the organization, and this engagement originates creativity (Nawaz et al., 2014). Consequently, firms have to create and promote a creative culture and climate, with proper training modules designed to nurture organizational creativity (Gupta & Banerjee, 2016). In fact, having the perception that their firms care for their training may help employees develop their knowledge, skills, and motivation to become more qualified and motivated to innovate (Do & Shipton, 2019), as the sense of consideration may create employee engagement, eventually enhancing their creativity (Nawaz et al., 2014). Furthermore, this process helps orient employees' behaviors and attitudes, adjusting them to organizational goals (van Esch et al., 2018). However, some studies suggest that certain training practices can adversely impact organizational creativity. Salas et al. (2012) highlight the differential effectiveness of training programs, suggesting that without proper design and delivery, training might not foster an environment conducive to creativity. Moreover, training that heavily focuses on rigid procedures and rules might limit employees' willingness to think outside the box or take risks (Brucks & Huang, 2020). For example, standardized training that does not consider individual learning styles can lead to disengagement or frustration, stifling creative potential (Kuo & Tien, 2022).

Thus, recent literature continues to emphasize the need for tailored, flexible, and contextually relevant training programs to ensure they augment, rather than hinder, organizational creativity. Consequently, we make the following hypothesis:

H1: Employee training is positively related to organizational creativity.

#### **3.3.2 Employee rewards and incentives and organizational creativity**

According to Chaubey and Sahoo (2019), providing employees with rewards and incentives may be the most suitable method to enhance their creativity, as they may stimulate and motivate individuals. In fact, the expectation that creativity will be rewarded pushes employees to adopt more creative behaviors and to look for innovative ways to convey their creative instincts, broadening their duties and

interests (Muñoz-Pascual & Galende, 2017). Moreover, the reward and recognition of their creative behaviors motivates employees to face more challenging tasks: receiving appreciation, acknowledgment from their superiors, and monetary rewards increase employees' confidence, enthusiasm, and propensity toward their job (Botelho, 2020). However, organizations have to plan and design their reward systems in a way that fits the actual requirements and needs of their workforce. In fact, according to the specific work environment, several problems may arise. For example, according to Beugelsdijk (2008), organizations have to be particularly careful when individual rewards are established, as they may obtain the opposite effect to that intended: in fact, they may decrease the inclination of the employees toward the resolution of organizational problems, undermining the necessary feeling of “we-ness” at the base of knowledge exchange. According to Zhang et al. (2015), the establishment of employee rewards and incentive systems may enhance employees' self-determination and competence and, consequently, their intrinsic motivation and creativity, only when they trust their managers. In fact, when this does not happen, employees do not have the perception that they will be judged fairly, but they think their evaluations will be compromised by the biases of their managers.

To summarize, as creative processes may be risky and uncertain, they should be encouraged by effective appraising and rewarding systems (Lin, 2011). In fact, these may increase employees' trust and self-realization, which are the main reasons for employees to enhance their creativity (Muñoz-Pascual & Galende, 2017). Consequently, we make the following hypothesis:

H2: Employee rewards and incentives are positively related to organizational creativity.

### **3.3.3 Organizational knowledge sharing and organizational creativity**

Several studies demonstrate that the quantity and quality of information to which employees are exposed are fundamental for their creativity (Chaubey & Sahoo, 2019). In fact, through the sharing of their knowledge, employees may develop updated knowledge, divergent thinking, and other-oriented values, thus increasing their possibility to deliver creative solutions that contribute to the continuous

improvement of the organization (Trong Tuan, 2020). To encourage employees' creativity, information should be transferred seamlessly through the whole organization (Chatterjee et al., 2023).

According to Trong Tuan (2020), the relationship between HR practices and knowledge sharing finds its theoretical explanation in the psychological safety perspective, as these practices increase employees' feelings of safety when engaging in knowledge sharing. Consequently, a supportive work environment is crucial to improve employees' performance, particularly when it comes to their creativity (Do et al., 2018). In fact, when the organization is able to satisfy the psychological needs of its employees, this perception of safety is likely to increase their intrinsic motivation to experiment with new ideas and find new solutions to solve problems, enhancing employees' contribution to the overall organizational innovation and success (Luo et al., 2021).

Managers should thus provide employees with the right conditions to foster creativity through knowledge sharing, not only tacitly but also in an explicit way, through the creation of a knowledge repository, brainstorming sessions, and the introduction of open offices (Muñoz-Pascual & Galende, 2017). We consequently make the following hypothesis:

H3: Organizational knowledge sharing is positively related to organizational creativity.

#### **3.3.4 Recruitment and selection and organizational creativity**

According to Hunter et al. (2012), recruitment and selection practices are the foundation of building a creative workforce. Organizations that use rigorous recruitment and selection processes are more likely to identify individuals with the necessary skills, knowledge, and experiences required for creative work (Zhou et al., 2019). By selecting the best candidates, organizations can improve their chances of having a more creative workforce (Jiang et al., 2012). Additionally, organizations that use selection methods such as competency-based interviewing or assessment centers can identify candidates who possess specific skills that are essential for creative work, such as problem-solving (Royston & Reiter-Palmon, 2019), critical thinking (Eggers et al., 2017), and risk-taking (Dewett, 2007).

Furthermore, recruitment and selection practices can also promote a culture of creativity within an organization (Martins et al., 2004). When organizations prioritize creativity in their recruitment and selection practices, they signal to potential employees that creativity is a valued trait within the organization. This, in turn, can attract individuals who are more likely to generate creative solutions and ideas. By promoting a culture of creativity through recruitment and selection practices, organizations can also encourage current employees to develop and utilize their creativity (Asad Sadi & Al-Dubaisi, 2008).

In summary, a talented and well-selected workforce is essential for promoting creativity within an organization (Jiang et al., 2012). Consequently, we make the following hypothesis:

H4: Recruitment and selection are positively related to organizational creativity.

### **3.3.5 HR analytics role in the relationship between employee training and creativity**

Managers have to thoughtfully monitor the (creativity) training of their employees to guarantee its quality and ability to enable better performance (Chaubey & Sahoo, 2019). HR analytics can supply the needed information and insights seamlessly, allowing the adoption of an integrated approach able to improve the efficacy and effectiveness of the training activity (Njoku & Ebie, 2015). In fact, through descriptive and predictive analysis techniques, HR analytics may enhance the measurement of the improvement of the workforce and develop classification methods that can increase the training investments' return (Chalutz Ben-Gal, 2019). HR analytics can gauge the immediate and long-term effectiveness of training programs by tracking metrics linked to creative output (Zafar et al., 2023). Such an analytical approach offers an opportunity for continuous feedback and iterative improvements to training content, delivery methods, and even follow-up practices. The adoption of this data-driven approach will allow firms to identify and foresee their creative needs, and consequently to build the needed skills and capabilities (Olszak & Kisielnicki, 2016), enhancing their employees' domain-relevant knowledge, skills, and capacity (Do & Shipton, 2019). According to Nawaz et al. (2014), this will enhance the engagement of the employees, leading to better

outcomes in terms of creativity. In fact, this will persuade them to engage in continuous learning (Njoku & Ebie, 2015), as they will better perceive the support of their senior managers, providing them with a system of training to fit the specific organizational environment (Olszak & Kisielnicki, 2016). HR analytics can also identify specific gaps in employee skillsets, ensuring training is focused on the areas that will yield the greatest creative dividends (Thakral et al., 2023). Instead of broad, one-size-fits-all training modules, analytics can guide the creation of personalized training programs catering to individual needs, thereby fostering an environment where employees are more likely to engage creatively with their tasks (Zafar et al., 2023). Finally, HR analytics can provide insights into the broader organizational culture and its receptivity to creative ideas. By understanding the factors that influence the adoption and flourishing of creative initiatives, training can be further optimized to nurture not just individual creativity, but also a collective organizational environment that champions and integrates these creative endeavors (Tursunbayeva et al., 2018). Based on what has been stated, we make the following hypothesis:

H5: The implementation of HR analytics activities positively moderates the positive relationship between employee training and organizational creativity.

### **3.3.6 HR analytics role in the relationship between employee rewards and incentives and creativity**

As stated before, HR practices aimed at the implementation of rewards and incentives systems may also obtain the opposite effect to that intended, hindering organizational creativity instead of boosting it (Beugelsdijk, 2008). To avoid this situation, organizations may resort to HR analytics to establish suitable rewards and incentive systems (van den Heuvel & Bondarouk, 2017). HR analytics provide firms with descriptive analysis tools, based on the analysis of the key performance indicators of the firm through the use of business intelligence, and with predictive analysis tools, as the definition of various compensation scenarios, which can be evaluated through the use of Monte Carlo simulations, regression and interaction analysis with other business phenomena (Chalutz Ben-Gal, 2019). HR analytics may also be used to establish rewards personalized to the individual needs and

preferences of individuals, which has been demonstrated to be one of the most successful approaches to boosting the effectiveness of rewards and incentive systems (Lahiri & Schwartz, 2018). However, for this kind of systems to function properly, data must be collected regularly and employee performance has to be monitored both at the individual and organizational level (Huang et al., 2023). HR analytics may simplify and speed up the process by automatizing the collection and analysis of the necessary data, further aggregating them to provide new and useful insights to improve the effectiveness of rewards and incentives systems (Bechter et al., 2022). Based on this, we make the following hypothesis:

H6: The implementation of HR analytics activities positively moderates the positive relationship between employee rewards and incentives and organizational creativity.

### **3.3.7 HR analytics role in the relationship between organizational knowledge sharing and creativity**

As stated before, organizational creativity is influenced by organizational knowledge sharing (Muñoz-Pascual & Galende, 2017). In particular, communication plays a crucial role (Lin, 2011): the more the employees of the organization interact with each other, the more the consequent cross-insemination of perspectives enhances not only their knowledge sharing but also their interpersonal competencies as empathy and coaching abilities (van Esch et al., 2018). Consequently, organizations need to implement HR practices to facilitate contact and collaboration among their employees, thus promoting knowledge transfer (De Saá-Pérez & Díaz-Díaz, 2010). In fact, according to Muñoz-Pascual and Galende (2017), it is not enough to enforce knowledge management practices, but firms should provide the right context for knowledge sharing to happen spontaneously, as the perception of a creativity climate is a crucial precursor for employees to show initiative (Heffernan et al., 2016).

HR analytics may thus offer its contribution to the design of organizational knowledge sharing mechanisms able to foster organizational creativity. For example, it may support the creation and sharing with the employees of a database of the current organizational knowledge, which may improve their inclination

toward creativity (Chaubey & Sahoo, 2019). HR analytics may in fact provide employees with real-time information from their colleagues, consequently reducing several creativity obstacles, such as distraction, conflict, and communication centralization (Lin, 2011). By tracking the flow of knowledge and its subsequent impact on creative processes, HR analytics can discern which informational exchanges have the most profound influence on innovation (Tursunbayeva et al., 2018). This insight facilitates the tailoring of knowledge sharing platforms and interventions to amplify these impactful exchanges (Zhou et al., 2023). Additionally, predictive analytics can forecast potential creativity hotspots within an organization based on historical knowledge sharing patterns, allowing proactive facilitation of collaborative efforts in these areas (Kashive & Khanna, 2022). Feedback loops generated through HR analytics can also continually refine the knowledge sharing process, ensuring that the most relevant and up-to-date information is consistently circulated and applied in creative endeavors (Bahuguna et al., 2023).

We consequently make the following hypothesis:

H7: The implementation of HR analytics activities positively moderates the positive relationship between organizational knowledge sharing and organizational creativity.

### **3.3.8 HR analytics role in the relationship between recruitment and selection and creativity**

Recruitment and selection are critical for building a creative workforce (Hunter et al., 2012), but the effectiveness of these practices could be enhanced by the use of HR analytics. In fact, it can provide organizations with valuable insights into their recruitment and selection processes, allowing them to make data-driven decisions that enhance their ability to build a creative workforce (Chalutz Ben-Gal, 2019).

First, HR analytics can help organizations identify the most effective recruitment and selection practices for identifying creative individuals (Fernandez, 2019). By leveraging data from recruitment and selection processes, organizations can identify patterns and trends that indicate which selection methods are most effective for identifying creative individuals (McCartney et al., 2021). For example, HR

analytics can be used to identify which interview questions or assessments are most effective in predicting creativity. Also, by tracking the performance and outcomes of hires over time, organizations can assess the effectiveness of their recruitment and selection practices in identifying and hiring individuals who contribute to organizational creativity (Ore & Sposato, 2022). By doing so, organizations can increase their chances of selecting individuals who are best suited for creative work: if data indicates that creativity levels are not improving, organizations can use this information to make data-driven decisions and adjust their recruitment and selection practices accordingly.

Second, HR analytics can also provide insights into the characteristics of candidates who are more likely to generate innovative and creative solutions (McCartney et al., 2021). By analyzing data on past hires who have contributed to organizational creativity, organizations can identify the skills, experiences, and personal attributes that are most predictive of creativity (Chalutz Ben-Gal, 2019). This can help inform the selection criteria and interview questions used in the recruitment and selection process, improving the accuracy of candidate selection.

In summary, by using HR analytics insight to inform recruitment and selection practices, organizations can identify the most effective selection methods, improve the accuracy of selection decisions, and create a feedback loop that continuously improves the effectiveness of these practices in promoting creativity (van den Heuvel & Bondarouk, 2017).

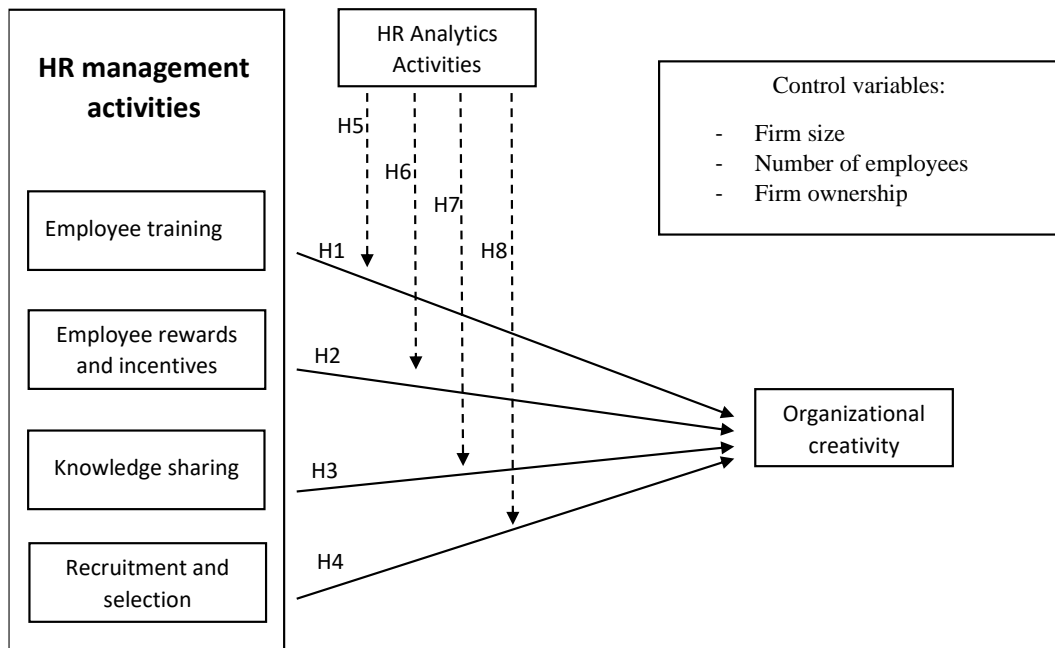
We thus make the following hypothesis:

H8: The implementation of HR analytics activities positively moderates the positive relationship between recruitment and selection and organizational creativity.

Our model and hypotheses are summarized in Figure 3.1.



**Figure 3.1 – Research model and hypotheses.**



**Source: Authors' elaboration.**

### 3.4 Methodology

#### 3.4.1 Data collection and participants' profile

We developed a self-administered, online survey intended to be completed by HR managers, as they are the organizational figures who are more likely to possess the information needed for the study (McCartney & Fu, 2022). In fact, the analytical framework of our study is centered on the organizational level of examination. The primary objective of our study was to uncover the presence of certain phenomena and the disparities that exist between companies, rather than focusing on the dynamics within individual companies. Specifically, we aimed to investigate the broad impact of HR practices on organizational creativity and explore the role of HR analytics in shaping this relationship, without delving into the experiences of individual employees. Consequently, the unit of analysis for this study is the organization itself. To achieve this, we gathered data from individual respondents who are highly knowledgeable about their respective companies. Previous research has indicated that the cognitive perspectives of senior organizational members, such as Chief Executive Officers and HR directors, can be considered representative of the fundamental aspects of the entire organization (Lyles & Schwenk, 1992), also

when considering the effect of HR practices on innovativeness and/or creativity (e.g. Ritala et al., 2020). Thus, we believe that our chosen measurement approach allows us to test our hypotheses within the context of this study, despite acknowledging its inherent limitations. However, potential biases are dealt with in detail in paragraph 5.1.

The online platform “Prolific” was then used to deliver the questionnaire. This platform is growing in popularity among both academics and practitioners (e.g. Jabeen et al., 2022), due to its reliability and the possibility of recruiting many participants in a short time. Data were collected from December 20<sup>th</sup>, 2022, to January 8<sup>th</sup>, 2023. In terms of Study distribution, the “Balanced sample” option was chosen. “Prescreen participants” criteria were: Leadership/Position of power/Supervisory duties: Yes; Management experience: Yes; Decision-making responsibilities: People management. Participants were then further screened in the actual questionnaire by directly asking if they were working as HR managers.

A total of 281 respondents took part in the questionnaire. However, as we removed the answers of the respondents who did not fill the entire survey, of those who failed the attention check questions, and of those who provided consistent answers throughout the whole questionnaire, the final sample used to perform the analysis was composed of 206 responses.

The final sample was composed of 141 (68%) private companies and 65 (32%) public companies. Most companies (64%) were from the United Kingdom, followed by Portugal and Poland (8% each), Italy (5%), Spain and Ireland (3% each), and Greece and the Netherlands (2% each). The other organizations were from Austria, Czech Republic, Estonia, France, Germany, Hungary and Latvia. Regarding, instead, companies sectors, the majority of them were from health services or public offices sectors (15% each), followed by companies in education (8%), banking and insurance (7%), food service and tourism (7%), industrial production (6%), information technology (5%), agriculture, food processing and food supply chain (4%), constructions (4%), distribution (4%) and logistics (4%) sectors. The remaining ones were from communications, consultancy, entertainment, legal, non for profit, real estate, retail, services, transportation, and utility sectors. Coming to companies’ dimensions, most of them (38%) had more

than 250 employees, 13% had less than 10 employees, 29% between 10 and 49 employees, and 20% between 50 and 249 employees. Finally, almost half of our sample (49%) had revenues lower than 2 million euros, 24% between 2 and 9.9 million, 13% between 10 and 49.9 million, and 14% higher than 50 million.

### **3.4.2 Measurements**

To assure the validity and reliability of the research, all items included in the questionnaire were adapted from previously validated studies (Fink, 2003; Groves et al., 2013; Martin, 2005). Moreover, a multi-item structure was used to assess each variable, which were measured by a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (Groves et al., 2013; Peter, 1979). HR analytics was the only exception, as it was measured as a dummy variable.

*Employee rewards and incentives* represented our first independent variable. It was assessed by 3 items taken from Heffernan et al. (2016). *Employee training* was our second independent variable. It was measured by using 5 items from Botelho (2020). *Recruitment and selection* was our third independent variable. It was measured by a total of 3 items from Mujtaba et al. (2022). *Knowledge sharing* was our fourth independent variable. It was assessed by 7 items all taken by Yang and Chen (2007). *Organizational creativity* was our dependent variable. It was measured by a total of 12 items taken by Zhang (2010). *HR analytics* was used as a moderator of the relationship between our four independent variables and the dependent variable. It was considered as a dummy variable, having a value of 1 if the company was implementing HR analytics activities, and having on the contrary value 0.

## **3.5 Results**

### **3.5.1 Normality, common method variance, and multicollinearity**

Before running the confirmatory factor analysis (CFA), we assessed the normality of the data. Skewness and kurtosis values are within the thresholds of  $-2/+2$  (George & Mallery, 2018) for all but three items, which are still within the thresholds of  $-7/+7$  indicated by Hair et al. (1995) and Byrne (2016). We can thus state that data are normally distributed.

Secondly, we tried to limit potential bias in our study. In fact, the utilization of self-

reported measures raised the potential for common method variance to introduce bias into the results. Common method bias (CMB) becomes a significant concern when survey respondents are tasked with evaluating items that pertain to both independent and dependent variables. To mitigate this potential bias, we followed established practices in the field, as indicated by prior research (e.g. Minbaeva et al., 2012; Vaccaro et al., 2012), and implemented several measures to minimize its influence. First, we informed participants about the anonymity and confidentiality of their answers, which will exclusively be used for scientific reasons (Minbaeva et al., 2012). To ensure the goodness of the answers, we inserted attention check and reverse-coded questions (Abbey & Meloy, 2017). Furthermore, we engaged with industry experts to enhance the clarity and succinctness of the scale items, ensuring that the survey maintained its brevity and used grammatically correct language (MacKenzie & Podsakoff, 2012). In particular, a pilot test was conducted with members of the Italian Association of Human Resource Directors (AIDP), which highlighted the need to rephrase reverse-coded questions to increase their clarity. The survey's focus on experienced respondents evaluating tangible constructs served to further diminish the likelihood of common method bias (CMB), as exemplified in previous studies (Rindfleisch et al., 2008).

To conduct a more comprehensive evaluation, we then produced a common factor loading all variables to further verify the presence of any influence of standard method bias, to avoid measurement errors. Harman's single factor gave a sum of the squared percentage of variance of 37.910%, thus below the threshold value commonly accepted (Harman, 1976; Podsakoff et al., 2003). We can consequently state that no measurement issues related to common method variance are detectable in the study. Our analyses also unveiled strong evidence of discriminant validity, as detailed in section 5.2 below. This robust discriminant validity serves to further mitigate concerns related to CMB, as indicated in prior research (Ahammad et al., 2017).

Finally, to avoid overfitting issues and difficulties related to the model parameters' estimates reliability, we checked the linear relation among independent variables. In particular, we assessed the variance inflation factors (VIFs) to check for multicollinearity effect. The data did not present any multicollinearity effect, as all

values are lower than 3, with a tolerance higher than 0.10 (Alin, 2010; Tandon et al., 2021).

### 3.5.2 Measurement validation: validity and reliability

We performed a CFA to determine the validity and reliability of the measurement model, since all included variables were taken from constructs already established and accepted in theory (Kline, 2016). The results show a satisfying model fit (PCMIN/DF = 1,559; CFI = .937 (>.92); TLI = .929; RMSEA = .052).

Factor loading, average variance extracted (AVE), factor correlation values, and their descriptive statistics were used to assess the construct's convergent and discriminant validity. The composite reliability (CR) values were observed to test the reliability of our measurement means. Table 3.1 shows that, since the individual items of each scale have a measurement model factor loading higher than .35 (Hair et al., 1995), scale items load satisfactorily onto each construct, with AVE and CR also above the commonly used threshold (.5 and .7 respectively) (Fink, 2003; Groves et al., 2013; Zikmund & Babin, 2016).

**Table 3.1 - Factor analysis for convergent validity and reliability.**

Construct	Item	Standardized Factor Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)
Employee training	TRAI1	.389	.502	.832
	TRAI2	.358		
	TRAI3	.481		
	TRAI4	.578		
	TRAI5	.703		
Employee rewards and incentives	REWA1	.467	.507	.754
	REWA2	.462		
	REWA3	.589		
Organizational knowledge sharing	KNSH1	.421	.505	.877
	KNSH2	.507		
	KNSH 3	.473		
	KNSH4	.471		
	KNSH5	.536		
	KNSH6	.489		
	KNSH7	.640		
	RECR1	.403	.584	.806

Recruitment and selection	RECR2	.719	.705	.877
	RECR3	.629		
Organizational creativity	CREA1	.408		
	CREA2	.501		
	CREA3	.602		
	CREA4	.550		
	CREA5	.610		
	CREA6	.575		
	CREA7	.565		
	CREA8	.426		
	CREA9	.500		
	CREA10	.688		
	CREA11	.703		
CREA12	.608			

Source: Authors' elaboration.

Table 3.2 shows the degree to which a measure diverges from another one whose underlying construct is conceptually unrelated to it. All the constructs and the related variables meet discriminant validity standards, as the square roots of AVE (in bold in Table 3.2) are higher than the latent construct's correlation coefficients for any observed factor. All correlation outputs are significant at the .01 level (2-tailed). Consequently, the CFA confirms the adequacy of the measuring instrument and the trustworthiness of the information collected.

**Table 3.2 - Mean, standard deviation, and correlations for discriminant validity.**

Constr.	Mean	Std. Deviation	RECR	TRAI	REWA	KNSH	CREA
RECR	3.409	.836	<b>.764</b>				
TRAI	3.561	.831	.544	<b>.708</b>			
REWA	3.220	1.011	.536	.559	<b>.712</b>		
KNSH	3.796	.661	.361	.583	.514	<b>.711</b>	
CREA	3.821	.671	.488	.623	.495	.529	<b>.749</b>

Source: Authors' elaboration.

To further check the robustness of our model, we also use the Heterotrait-monotrait ratio of correlations (HTMT) proposed by Henseler et al. (2015) and based on the multitrait-multimethod matrix. Specifically, the HTMT assesses the correlations within latent variables comparing them with the correlation between latent variables, thus evaluating the extent to which constructs that are expected to be different from each other are, indeed, empirically different in a given dataset. We can assert that this happens also in our dataset, since all values are below the commonly accepted threshold of 0.85 (Henseler et al., 2015), as shown in Table 3.3.

**Table 3.3 - Values for HTMT.**

Constructs	HTMT values
REWA→TRAI	.441
KNSH→TRAI	.511
KNSH→REWA	.429
RECR→TRAI	.460
RECR→REWA	.416
RECR→KNSH	.351
CREA→TRAI	.555
CREA→REWA	.422
CREA→KNSH	.497
CREA→RECR	.432

**Source: Authors' elaboration.**

### **3.5.3 Hypotheses testing and structural model**

SEM was used to test the hypotheses. HR analytics moderating effect was assessed by creating two different groups in SPSS AMOS, using the variable “HR analytics” as the grouping variable. The first included 116 companies (56%) that implemented HR analytics activities in the past three years (dummy value = 1), whilst the second was composed of 90 companies (44%) that did not (dummy value = 2). Generally, for SEM, a common rule of thumb is to include a minimum of 200 cases (Hair et al., 1995). However, for multigroup analysis, things become more complicated, as the sample has to be divided into smaller subgroups. Consequently, usually 5 to 20 cases per parameter to be estimated are used, depending on the complexity of the model (Hair, 2019). As our model consists of 5 parameters, both our groups stay within this range. Also, the two groups should be of comparative size, as having a significantly smaller group than the other can lead to issues regarding parameter

estimation, thus jeopardizing the robustness of the results (Hair, 2019). Also in this case our sample complies with the requirements.

The results of our analysis confirmed the positive effect of employee training, organizational knowledge sharing, and recruitment and selection on organizational creativity. On the contrary, they showed employee rewards and incentives slightly positive effect, but without statistical significance.

Similarly, regarding the impact of HR analytics, our results confirmed that this tool may positively moderate the relationships between employee training, organizational knowledge sharing, and recruitment and selection and organizational creativity, as companies that implemented HR analytics presented higher correlation and stronger statistical significance than those that did not. However, this result was not reached regarding HR analytics moderation on the relationship between employee rewards and incentives and organizational creativity, as neither of the two groups of organizations reached statistical significance.

Finally, we tested the potential moderating effect of three control variables on the relationship between the aforementioned HR practices and organizational creativity, namely firm size (measured as the logarithm of sales) (Singh & El-Kassar, 2019), the number of employees of the organization (Do et al., 2018; Heffernan et al., 2016) and firm ownership (measured as a dummy variable, having a value of 0 for private companies and value 1 for public companies) (Do et al., 2018; Heffernan et al., 2016). None of the three produced a significant effect.

The results of our hypotheses testing are presented in Table 3.4.

**Table 3.4 - Results of hypotheses testing.**

Hypothesis	Path	Estimate ( $\beta$ )	Significance	Result
H1	TRAI $\rightarrow$ CREA	.147	***	Supported
H2	REWA $\rightarrow$ CREA	.043	NS	Not Supported
H3	KNSH $\rightarrow$ CREA	.183	.001	Supported
H4	RECR $\rightarrow$ CREA	.130	.01	Supported



H5	(HR ANALYTICS: YES) TRAI → CREA > (HR ANALYTICS: NO) TRAI → CREA	.183 / .074	.001 / NS	Supported
H6	(HR ANALYTICS: YES) REWA → CREA > (HR ANALYTICS: NO) REWA → CREA	-.030 / .160	NS / NS	Not Supported
H7	(HR ANALYTICS: YES) KNSH → CREA > (HR ANALYTICS: NO) KNSH → CREA	.255 / .142	.01 / .1	Supported
H8	(HR ANALYTICS: YES) RECR → CREA > (HR ANALYTICS: NO) RECR → CREA	.192 / .090	.05 / .1	Supported

Source: Authors' elaboration.

### 3.6 Discussion

For what concerns the relationship between the highlighted HR practices and organizational creativity, the results of our analysis offer an important contribution to moving away from the ambiguity that somehow characterized previous research on the topic. In fact, some previous studies were skeptical about the roles of training (e.g. Kuo & Tien, 2022), rewards and incentives (e.g. Zhang et al., 2015), or knowledge sharing (e.g. Muñoz-Pascual & Galende, 2017) in fostering organizational creativity, as several conditions should be respected for this to happen. Despite this, our results confirmed that providing employees with proper training, creating the right conditions to foster organizational knowledge sharing, and properly managing recruitment and selection activities produce a positive effect on organizational creativity. This is in line with the most recent studies on the topic. Chaubey et al. (2022) found that providing employees with proper training will foster their ability to solve their job-related issues more creatively. The general positive effects of training on organizational creativity were also confirmed by the meta-analytic review on the topic by Sio and Lortie-Forgues (2024). However, they criticized most of the studies included in the analysis for their numerous methodological shortcomings. The relationship between knowledge sharing and creativity has also been largely demonstrated. Nevertheless, most studies on the topic focused on employee creativity (e.g. Devi, 2024; Kim et al., 2021; Nguyen et

al., 2024). However, the positive relationship is also demonstrated by the minority of studies that focused on the organizational level of creativity, such as Li et al. (2022). Finally, regarding recruitment and selection, Song (2018) found that the establishment of a standardized evaluation framework dedicated to its detection in new hires was actually able to ultimately improve organizational creativity. Adopting an environmental sustainability perspective, Ogbeibu et al. (2020) demonstrated that green recruitment and selection policies were positively related to organizational green creativity.

Despite this, the analysis did not support our second hypothesis, i.e., we were not able to demonstrate that providing employees with rewards and incentive systems would produce a positive effect on organizational creativity. However, this result is not totally surprising. In fact, some previous scholars (Yoon et al., 2015) already refused the beneficial impact of tangible rewards on organizational creativity, as they may be perceived as an externally imposed constraint (Amabile et al., 2018). According to Malik and Butt (2017), the studies regarding the negative impact of extrinsic rewards on creativity can be grouped into a “cognitive perspective” which, over the decades, has built on several theories, such as the over-justification hypothesis (Lepper et al., 1973), cognitive evaluation theory (Deci, 1971), and intrinsic motivation theory (Amabile et al., 2018).

In this sense, one of the most famous studies that has been conducted on the topic dates back to 1962 and was conducted by Sam Glucksberg. The study investigated the effect of rewards and incentives on creativity using a candle experiment. Participants were randomly assigned to either an experimental group, where they were told that they would receive a monetary reward for completing the task quickly and accurately, or a control group, which was not given any incentive. The results of the study showed that, despite the experimental group completed the task faster than the control group, they were less creative in their solutions, thus suggesting that rewards and incentives have a negative effect on creativity.

For what concerns our HR analytics-related hypotheses, the results of the analysis were similar to the ones obtained for previous hypotheses. In fact, they confirmed the positive moderating effect of HR analytics on the positive relationships between employee training, organizational knowledge sharing, and recruitment and

selection and organizational creativity. To the best of our knowledge, no previous studies on the topic were conducted. The only comparable one is that of Li et al. (2022), which found that the artificial intelligence capabilities of companies were positively related to organizational creativity and that this relationship was moderated by organizational knowledge sharing. On the contrary, our analysis was not able to demonstrate HR analytics' positive impact on the relationship between employee rewards and incentives and organizational creativity. However, this was probably due to the results obtained for hypothesis 2. In fact, HR analytics must not be considered as a *deus ex machina* able to autonomously solve HRM problems. On the contrary, to maximize its potential benefits, it has to be considered as a strategic tool at the disposal of the HR function to improve the efficacy and effectiveness of its initiatives (Tursunbayeva et al., 2018). In any case, we believe that the results of our study offer several theoretical contributions.

### **3.6.1 Theoretical contributions**

First, our study contributes to research regarding big data analytics impact in high stake decisions forecasting. In fact, although several studies highlighted the possibility of improving high stake decision-making regarding organizations' workforce by relying on HR analytics' forecasting (e.g., Falletta & Combs, 2021; Tursunbayeva et al., 2018), empirical research on the subject was still scarce (e.g., McCartney & Fu, 2022). However, our results demonstrated that, by relying on the insight and previsions obtained by HR analytics, organizations can improve the effectiveness of their HR-related decisions, thus increasing their beneficial impact on organizational creativity and reducing the risk of making a wrong decision. As these can actually be considered high stake decisions, as organizational creativity has been demonstrated to be a strong predictor of an organization's innovative capabilities and, consequently, of its competitiveness, our study thus offers an important contribution in addressing the need for empirical studies on the topic. Furthermore, we took a step forward from previous studies, which typically considered only the direct influence of HR analytics on overall organizational performance (e.g., McCartney & Fu, 2022).

Secondly, we contributed to creativity-related literature by shedding additional light on the antecedents of organizational creativity, as previous studies were still

ambiguous and offered mixed findings (e.g. Nawaz et al., 2014; Zhang et al., 2015). Furthermore, we not only considered the HR practices that had been identified by previous literature, but we also focused on an innovative, HR analytics data-driven approach. By doing so, we addressed the call for empirical research regarding innovative HRM activities' effect on creativity (Ikhide et al., 2022). By doing so, we also contributed to HRM literature by further suggesting HR analytics positive impact on organizational outcomes, even in a peculiar context as organizational creativity (De Saá-Pérez & Díaz-Díaz, 2010; Njoku & Ebie, 2015). The grounding of HRM activities on the insight obtained from HR analytics will not only respond to concerns regarding the effectiveness of traditional HRM activities in increasing organizational creativity (De Saá-Pérez & Díaz-Díaz, 2010), but it will also pave the way towards widespread adoption of organization-wide innovation policies, overcoming the need of departments to formulate their own strategies (Olszak & Kisielnicki, 2016).

Moreover, we contributed to the contingency theory applied to HRM by further enlarging the body of empirical literature demonstrating that HR practices have a stronger impact on organizational outcomes if tailored to the organizational context (Harney, 2016). Moreover, we further enhanced previous studies on the topic, which typically focused only on testing the impact of a contingency-based approach and on verifying the difference between this and the universalistic approach (e.g. Clinton & Guest, 2013; Tzabbar et al., 2017), by empirically testing the impact of a specific tool which may allow organizations to practically adopt this contingent approach. In this sense, HR analytics activities will play a crucial role, as they will provide the needed information seamlessly and in real-time (Chalutz Ben-Gal, 2019), enabling the alignment of HR and business strategy so that the efforts of the employees can better contribute to the success of the organization (Njoku & Ebie, 2015).

### **3.6.2 Managerial implications**

Our study will provide useful insight to practitioners to effectively boost creativity in their organizations. First, by clarifying which HR management activities can produce the highest impact on organizational creativity, we will allow them to better design their strategies by just focusing on the few practices that are really able to

produce a positive effect. In particular, we suggest practitioners avoid the creation of incentive systems to reward the creativity of their employees, as our results demonstrated this to hinder, rather than foster, organizational creativity. By doing so, their situation will also be improved from a financial point of view, as the money that is saved can be reinvested in more effective activities, thus increasing their beneficial effects and, consequently, the ultimate return to the company.

In addition, the implementation of HR analytics will allow organizations to further capitalize on their HR investments, obtaining the best possible outcome in terms of organizational creativity and reducing the risk of making wrong high stake decisions. In fact, HR analytics will allow them to establish comprehensive system solutions and management practices aimed at encouraging creativity, tailored to their specific organizational environment. By doing so, they will also avoid the risks entailed by having each department formulate its own creativity strategy, as they may result in incoherent, if not explicitly opposite, strategies. This does not mean that a unique strategy will be created, forcing all departments to comply with it. On the contrary, HR analytics will allow organizations to formulate ad-hoc strategies able to cope with the uniqueness of each division, while also assuring the coordination and coherence among them. Ultimately, the most advanced HR analytics tools may also be used to personalize the HR practices even at the individual level. All this will reduce the risk of companies making wrong high stake decisions, such as designing and implementing ineffective, if not counterproductive, HR practices.

Furthermore, the demonstration of the potential positive impact of HR analytics also on such a peculiar organizational outcome as creativity has the potential to further increase the adoption of this practice. In fact, although its reputation has constantly been growing in the past years, it still remains quite a mysterious topic for most organizations. Furthermore, the implementation of this tool may be sometimes challenging for organizations. However, by increasing the pool of empirical literature demonstrating its positive benefit, we hope to inspire more and more companies to adopt this kind of solution.

### **3.6.3 Limitations and future lines of research**

Despite its important contributions, this study also presents some limitations. First, our study only concentrated on the contrast between organizations that have incorporated HR analytics practices and those that have not, as we examined the moderating impact of HR analytics implementation. Further research could examine if the maturity level of organizations that employ HR analytics may cause any variations. In fact, different levels of HR analytics maturity may entail a different approach when coming to the strategy that companies may adopt when trying to foster their employees' creativity. For example, organizations that were able to implement state-of-the-art HR analytics may reach a higher level of personalization of their HR practices, which may ultimately reach the individual level. In this sense, McCartney and Fu (2022) proposed three dimensions to assess the level of HR analytics maturity within organizations: the quality of their data, their analytical expertise, and their strategic ability to take action. Furthermore, future studies may try to assess whether HR analytics insight may be useful to enhance the impact of activities aimed at fostering organizational creativity also not directly controlled by the HR department. In fact, despite previous theoretical studies on the topic suggesting that HR analytics may be used to foster the effectiveness of wider organizational activities also beyond the HR realm, empirical research on the topic is still scarce (e.g. Di Prima et al., 2023). Also, future studies may verify whether coupling the usage of HR analytics with new technological tools or techniques, such as natural language processing (Guo et al., 2024) and/or artificial intelligence (Chang & Ke, 2024), may further enhance its effectiveness. Artificial intelligence, in particular, may be useful in using the insight derived from HR analytics to develop personalized strategies to foster creativity also at the individual level (Huang et al., 2023).

Secondly, we considered rewards and incentives from a holistic point of view, not distinguishing between intrinsic and extrinsic incentive systems, and/or tangible and intangible rewards. It may be interesting to verify if some differences exist between those both regarding the relationship with organizational creativity, as found for example by Yoon et al. (2015), and also regarding the potential moderating effect of HR analytics.

Furthermore, our sample was composed exclusively of HR managers. Despite this being a common approach for studies investigating HR analytics (Falletta & Combs, 2021), it could be interesting to replicate our study by also involving other organizational stakeholders, such as employees or managers from other departments. By doing so, future studies could focus not only on general organizational creativity but also consider this feature from an individual point of view. Furthermore, despite all efforts being made to avoid common method variance issues, the replication of our study with the adoption of a multilevel approach may further diminish the risk of producing biased results. The inclusion of different perspectives may also help in providing a more complete overview of the perception of HR analytics outside the HR department, as the insight derived from this tool may be useful for several organizational figures besides HR managers.

Lastly, future research could replicate this study also in different contexts, as our sample was only composed of HR managers from European organizations, with a majority of organizations from the United Kingdom. The responses may thus have been affected by cultural factors, for example regarding the role of rewards and incentives in fostering (or, more precisely, hindering) organizational creativity. Future research on the topic should then verify if our results are generalizable even in different cultural, political, and geographical contexts.

### **3.7 Conclusions**

In the coming years, businesses are going to face more and more turbulent times, as they will have to deal with always more complex and unpredictable challenges. In this context, HR-related decisions will be more and more deemed as high stake decisions, which could produce both very beneficial outcomes or large financial losses very costly to reverse. Similarly, organizations will need to find more and more creative solutions that could help them overcome the unexpected issues that they may need to face. We believe that this study may represent an important starting point to further explore the relationship between HRM and organizational creativity including a relatively recent, but very promising tool, such as HR analytics, which has the potential to further strengthen this relationship, helping organizations to succeed even in this turbulent time.

## **Appendix: The questionnaire**

### Employee training, rewards and incentives, knowledge sharing and recruitment and selection

In the next section we will investigate the training and rewards & incentives that your employees receive, their attitude towards knowledge sharing and the recruitment and selection activities implemented by the company you work for.

Indicate to what extent do you agree with the following statements.

TRAI1: Employees have few opportunities of continuous training [Reverse-coded].

TRAI2: We have feedback processes available for employees, for example, multirater assessment systems.

TRAI3: We have communities of professional practices (informal groups bringing together employees of similar areas of interest).

TRAI4: Employees have received training on change management.

TRAI5: Employees have been trained on methods and techniques of creativity / innovation.

Currently your employees...

REWA1: Receive compensation partially contingent on individual merit or performance.

REWA2: Are paid primarily on the basis of a skill or knowledge-based pay system.

REWA3: Are paid a premium wage in order to attract or retain them.

Indicate to what extent do you agree with the following statements.

KNSH1: Organizational employees share business proposals and reports with each other.

KNSH2: Organizational employees share business manuals, models, and methodologies with each other.

KNSH3: Organizational employees share each other's success and failure stories.



KNSH4: Organizational employees share business knowledge gained from news, magazines, and journals.

KNSH5: Organizational employees share know-how from work experiences with each other.

KNSH6: Organizational employees share each other's know-where and know-whom.

KNSH7: Organizational employees share expertise obtained from education and training.

RECR1: The company you work for uses an employer brand to attract potential talent of the market to fill the important positions.

RECR2: The sustainability practices of the company you work for support to acquire high performers.

RECR3: The professional and/or social network of the company you work for supports to hire the best talent of the market.

#### Organizational creativity

In the following section you will be asked questions about the creativity of the employees of your organization.

Currently your employees...

CREA1: Suggest new ways to achieve goals or objectives.

CREA2: Come up with new and practical ideas to improve performance.

CREA3: Search out new technologies, processes, techniques, and/or product ideas.

CREA4: Suggest new ways to increase quality.

CREA5: Are a good source of creative ideas.

CREA6: Promote and champion ideas to others.

CREA7: Exhibit creativity on the job when given the opportunity to.

CREA8: Develop adequate plans and schedules for the implementation of new ideas.

CREA9: Often have new and innovative ideas.

CREA10: Come up with creative solutions to problems.

CREA11: Rarely have a fresh approach to problems [Reverse-coded].

CREA12: Suggest new ways of performing working tasks.

**Chapter 4 – How to survive social crises? An  
HR analytics data-driven approach to  
improve social sustainable operations  
effectiveness**

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## 4.1 Introduction

After a long period of sustained economic growth, the concern about wealth disparity and natural resource depletion has escalated in the last few decades (Dao et al., 2011). Furthermore, recent events like the COVID-19 pandemic and the somehow consequent global political instability have contributed to further exacerbating this already precarious situation, worsening poverty and inequality conditions worldwide (Bapuji et al., 2020).

According to Carroll (2021), the consequences of this crisis may be larger than any previous global emergency, with considerable and persistent repercussions on organizations' managerial practices, as this time firms have no prior pattern to help them overcome this situation (Norris et al., 2020). In fact, this circumstance has originated scenarios that were practically impossible to predict, such as the almost simultaneous paralysis of worldwide production or the global shipping container shortage. This led to the necessity for a reconsideration of organizational strategies both in developed and emerging countries (Battisti *et al.*, 2022), as the magnitude and unpredictability of this event are forcing companies to reconsider their decision-making processes (Norris et al., 2020). In fact, the pandemic had a huge impact not only on the economy, but also from a social point of view (Nirino et al., 2022). Consequently, organizations have been forced to concentrate more on their social responsibility (He & Harris, 2020), thus increasing the relevance of social sustainable practices (Guaita Martínez et al., 2021).

The call for companies' sustainability is nothing new (e.g. Jabbour and Santos, 2008). However, the COVID-19 pandemic situation has further highlighted the alternate destinies that are being experienced by the three components of sustainability, i.e., economic, environmental, and social sustainability (Raut et al., 2019). In fact, whilst the first two have largely been considered both by academics and practitioners (Massaroni et al., 2015), the same cannot be stated for social sustainability (Mani et al., 2016). In particular, most companies disregarded social sustainable operations practices, which are practices aimed at improving employees' working conditions, health, and safety (Gimenez et al., 2012). These are particularly relevant as they may influence HR benefits, namely 'the mechanisms through which a workforce contributing to the firm's goals and

strategy is developed' (Longoni & Cagliano, 2016, p.1728). This is particularly true for employee motivation and engagement, which several studies have demonstrated to be positively related to employee retention (e.g. Lee et al., 2022).

This situation originates from the fact that organizations usually do not involve the HR department when managing their sustainable operations, as this is often isolated from other departments due to externalization (Bissola & Imperatori, 2014) or to its scant strategic influence (Dahlbom et al., 2019). Furthermore, it is still widely believed that HR managers ground their choices on gut feelings and impressions (Chalutz Ben-Gal, 2019; van den Heuvel & Bondarouk, 2017), despite the organizational trend to increasingly adopt data-driven decision-making processes (Holsapple et al., 2014). But, actually, this is a false myth, as HR departments are also increasingly adopting a data-driven approach and increasingly relying on new digital technologies (Chalutz Ben-Gal, 2019; DiClaudio, 2019; Minbaeva, 2017). Among them, HR analytics is considered one of the most promising. Falletta and Combs (2021, p. 54) defined it as 'a proactive and systematic process for ethically gathering, analyzing, communicating and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives'. This is particularly relevant as, according to recent literature, some HR activities – including communication, training and development, hiring and selection, and reward systems – can improve the implementation of social sustainable activities within organizations (Langwell & Heaton, 2016). Since, according to previous research, all these activities can be enhanced on the basis of HR analytics (Chalutz Ben-Gal, 2019; Falletta & Combs, 2021; Tursunbayeva et al., 2018; van den Heuvel & Bondarouk, 2017), it is reasonable to assume that HR analytics may enable the adoption of a more data-driven approach in relation to SSOP.

However, some research gaps can be found. First, the most important and easily identifiable is that the interest of practitioners and academics has mostly focused on environmental sustainability, neglecting more social aspects (Mani *et al.*, 2016), as previously stated. Second, even if the relationship between digital transformation and environmental sustainability is always more studied (Bresciani, Huarng, et al., 2021) and organizations are increasingly using digital technologies such as big data analytics and the Internet of Things to cope with environmental sustainability, the

adoption of a data-driven approach in relation to SSOP management has often been considered as relevant but, in real terms, almost totally neglected in the literature (Dao et al., 2011; Del Giudice et al., 2021; Feroz et al., 2021; Longoni & Cagliano, 2016; Mani et al., 2020; Massaroni et al., 2015; Raut et al., 2019). In fact, the impact of digital transformation in other related sustainability fields – apart from the environmental one – has to be further explored in order to identify a common research agenda (Feroz et al., 2021). Last, many researchers have highlighted the necessity of a more holistic understanding of the consequences of the use of big data in the decision-making process (e.g., Del Giudice et al., 2021). Although several research found a positive association between organizational performance and big data analytics, only a few papers examined big data analytics' potential contribution to sustainable operations management (Raut et al., 2019). This is due to the fact that it is still difficult for organizations to acquire big data related to their sustainable practices, particularly for those concerning their supply chain partners (Singh & El-Kassar, 2019).

To fill the highlighted gaps, the objective of this study is to answer the two following research questions:

Q1: What is the effect of SSOP on the employees of organizations?

Q2: Can the adoption of an HR analytics data-driven approach improve SSOP effectiveness?

In order to answer them, we will investigate from an empirical point of view the impact that SSOP have on HR benefits, namely employees' motivation and engagement and, consequently, the effect of these last on organizational retention. Furthermore, and more interestingly, we will assess the moderating effect of HR analytics on the relationship between SSOP and HR benefits.

The adoption of a multidisciplinary perspective, taking into account both sustainable operation management and HR management literature, will allow us to offer our contribution to both streams of literature. For the former, it will permit us to focus on the social side of sustainability, differentiating this from most previous studies (e.g. Amrutha and Geetha, 2020); for the latter, it will enable us to further expand the HR analytics field of action beyond the HR department's boundaries, offering its contribution also when it comes to a hot topic like sustainability. This

will also be interesting for practitioners, as we will inform them of the positive effect that an HR analytics data-driven approach can have on their employees.

## **4.2 Literature review and hypotheses development**

### **4.2.1 Social sustainable operations practices and HR benefits**

The last decades have not been easy for companies as, due to increasingly dynamic market conditions, they have had to rethink their strategies to handle their resources in a more sustainable way (Singh & El-Kassar, 2019). Moreover, customers are always more attentive toward sustainability-related topics, which have consequently become crucial (and challenging) elements that companies are now compelled to consider when dealing with customer attraction, satisfaction, and retention strategies (Longoni & Cagliano, 2016). Recent events have drawn further attention to this issue. In fact, the COVID-19 pandemic has also impacted the business management realm (Battisti et al., 2022), as organizations are being asked to link their objectives to sustainability, social responsibility, and corporate ethics with an even stronger emphasis.

The interest regarding companies' sustainability is not a recent phenomenon. As early as 15 years ago, Jabbour and Santos (2008) reported the need for a paradigm of development where economic, social, and environmental sustainability had to be equally considered. Indeed, these sustainability components can be considered crucial organizational aspects (Raut et al., 2019) that transcend organizational borders, demonstrating the importance of sustainable activities throughout the whole supply chain (Mani et al., 2016).

However, an important research gap can be identified: whilst the first two components of sustainability have been thoroughly investigated, the same cannot be said for social sustainability (Mani et al., 2016). For Carter and Rogers (2008), this is due to the fact that the most widespread definition of sustainability, i.e. the one proposed by the Brundtland Commission (World Commission on Environment and Development, 1987), is rather extensive, making it difficult for organizations to comprehend and concretely apply it. In fact, it defines sustainability as 'development that meets the needs of the present without compromising the ability of future generations to meet their needs'. Later, Mani et al. (2016, p.43) defined

corporate sustainability as ‘meeting the needs of today’s direct and indirect stakeholders without compromising its ability to meet the needs of future stakeholders’. Consequently, according to them, it is very important for organizations to also focus on the social side of sustainability, as it may enable companies to effectively manage the social matters related to their operations in a way that allows their long-term survival.

On the contrary, the predominant focus on environmental sustainability led researchers and practitioners to neglect more people-related sustainability matters. This is an important issue from a social point of view, as the adoption of socially sustainable activities can reduce employees’ agitations and improve suppliers’ ability to meet customers’ demands (Mani et al., 2016). Specifically, it may be useful for organizations to implement SSOP, namely those activities aimed at the improvement of employees’ working conditions, health, and safety (Gimenez et al., 2012). In fact, their implementation may be crucial to improve the so-called HR benefits, i.e. ‘the mechanisms through which a workforce contributing to the firm’s goals and strategy is developed’ (Longoni and Cagliano 2016, p.1728).

In particular, SSOP have a strong potential to improve employees’ motivation, defined as the ‘willingness to exert high levels of effort toward organizational goals, conditioned by the effort’s ability to satisfy some individual need’ (Robbins, 1993). As the implementation of SSOP will improve employees’ working conditions, this will give them the possibility to maximize their effort toward organizational goals, as they will know that their organizations have made every effort to provide them with the best possible working environment. Thus, employees will have the awareness that their efforts will result not only in a positive output for their employers, but also in a positive outcome for them. This has become even more crucial with the COVID-19 crisis, which clearly highlighted the importance of protecting workers, especially those more exposed to risks (Carroll, 2021). Consequently, we posit the following hypothesis:

H1: The adoption of social sustainable operations practices is positively related to employee motivation.



Furthermore, the adoption of SSOP may help organizations increase their employees' engagement. Mowday *et al.* (2013, p.43) defined it as 'the relative strength of an individual's identification with and involvement in a particular organization'. As early as 2003, Hendrick sustained that the improvement of employees' working conditions through SSOP could not only reduce the absenteeism rate and improve the production quality, but also eliminate, or at least reduce, those issues that usually negatively impact employees' work satisfaction and commitment, as they are thought to improve the social environment where the employees perform their tasks. By doing so, they increase employees' confidence and cooperation, boosting their involvement in the organization and promoting an atmosphere of trust (Roca-Puig, 2019), finally improving employees' engagement. We thus make the following hypothesis:

H2: The adoption of social sustainable operations practices is positively related to employee engagement.

#### **4.2.2 The moderating effect of HR analytics on the relationship between social sustainable operations practices and employee motivation and engagement**

According to several authors (e.g. Bissola and Imperatori, 2014; Dahlbom *et al.*, 2019), the social aspect of sustainability has been neglected due to the lack of involvement of the HR department when dealing with sustainable operations. The HR department has been deemed as the most relevant when dealing with social organizational sustainability (Pfeffer, 2010), as a mutual dependence relationship exists between the most urgent social issues and organizations' HR strategies (Ehnert *et al.*, 2016). Thus, a mutually influential relationship can be established between society's and organizations' social dimension (Roca-Puig, 2019).

The recent social shocks also highlighted the necessity for organizations to manage their HR in a more sustainable way from a social point of view (Parng *et al.*, 2021). Phenomena like the so-called 'great resignation' or the unexpected boost to remote working have placed further emphasis on the importance of implementing SSOP to safeguard and increase employees' well-being (Aviso *et al.*, 2019). According to the contingency theory (Harney, 2016), the efficacy of organizational operations aimed

at improving employees' working conditions is influenced by their degree of fitness with the main organizational features and with the context where the organization operates. Furthermore, according to this theory, the key to the success of these operations lies in being able to align these activities with the overall strategy of the organization (Wood, 1999). Consequently, companies that effectively coordinate their HR management activities with their business strategy are more likely to achieve better performance compared to those that do not (Huang, 2001). In fact, firms that effectively combine business strategies and HR management strategies are typically better equipped to manage resources efficiently, reducing operational costs and responding effectively to environmental constraints and opportunities (Schuler & Jackson, 1987). The strategic fit between business and HR management strategies, therefore, becomes a powerful tool to enhance overall organizational performance (Katou & Budhwar, 2010). This notion of fit refers to the close linkage between HR management and business strategies to retain and motivate employees, ensuring that their behaviors align with the organization's objectives (Delery & Doty, 1996). All this makes contingency theory one of the most suitable approaches for addressing HR management issues, as it helps to shed light on the variations in motivating, engaging, and retaining employees based on their individual needs (McGrandle, 2016). For instance, some employees find satisfaction in non-monetary rewards such as meaningful work or a sense of self-worth, making financial incentives less influential in comparison to organizations where pay is the primary motivator (Yao et al., 2022).

Thus, to increase SSOP effectiveness, these have to be tailored to the specific environmental factors the company is facing and to the overall organizational strategy (Balkin & Gomez-Mejia, 1987; Harney, 2016). In order to do so, previous research suggested that it may be useful for organizations to adopt a data-driven approach to guide them during the adoption and implementation of SSOP (Raut et al., 2019). In fact, several new technologies have been demonstrated to improve the impact of corporate initiatives aimed at improving organizational sustainability, such as the Internet of Things or the usage of big data analytics (Feroz et al., 2021). Despite this, a significant research gap can be found: whilst more and more research has been conducted regarding the impact of digital transformation and new digital

technologies on the environmental side of organizational sustainability (Bresciani, Huarng, et al., 2021), the same cannot be stated for its social dimension. In fact, despite several researches having highlighted the need for adopting a data-driven approach to improve the effectiveness of SSOP, empirical research on the topic has mostly been neglected (e.g. Del Giudice *et al.*, 2021).

HR analytics could consequently improve SSOP effectiveness. In fact, its use can allow the adoption of a data-driven decision-making process, as it can provide real-time insights regarding several HR-related phenomena (Rasmussen & Ulrich, 2015), thus maximizing SSOP impact on HR benefits. Through the analysis of the insight derived from HR analytics, organizations can implement SSOP directly related to actual employees' priorities and necessities, thus tailoring these activities to employees' concrete necessities (Falletta & Combs, 2021). Also, through the analysis of the actual outcomes of SSOP, HR analytics can help in identifying both the areas where these activities are producing the highest impact or, on the contrary, the areas where they are not being able to reach the desired effect, thus allowing for their reinforcement and/or improvement (Levenson & Fink, 2017). This may be very important in the long run, as this data-driven approach will enable organizations to maintain the alignment between the overall organizational strategy and their SSOP, thus maximizing the impact of the latter, according to the contingency theory (Harney, 2016). We consequently posit the following hypotheses:

H3: HR analytics implementation positively moderates the positive relationship between social sustainable operations practices and employee motivation;

H4: HR analytics implementation positively moderates the positive relationship between social sustainable operations practices and employee engagement.

#### **4.2.3 HR benefits and employee retention**

Employee retention strategies aim to ward off employees from abandoning their companies (Rombaut & Guerry, 2020). Retaining competent employees is extremely important for any organization (Carmeli & Weisberg, 2006), given the huge direct costs originating from voluntary turnover (Aguinis et al., 2012) and the loss of job-related knowledge and skills (Ramlall, 2004). Issues related to employee

retention are nothing new. However, this criticality has been further increased by the pandemic situation, in particular for younger employees (Lee et al., 2022). Several researches demonstrated the positive effect of employees' motivation and engagement on their retention. Mak and Sockel (2001) found a high, positive correlation between motivation and retention. The same result was obtained by Ramlall (2004) on employees from the banking sector. More recently, Lee *et al.* (2022) found that this happened despite employees' age and their company's sector. Coming to employee engagement, Mak and Sockel (2001) identified its lack as one of the main reasons leading to lower retention. Markos and Sridevi (2010) found that employee empowerment had a positive effect on their engagement and, consequently, on their retention. Lee *et al.* (2022) found that organizations with less engaged employees presented higher turnover rates.

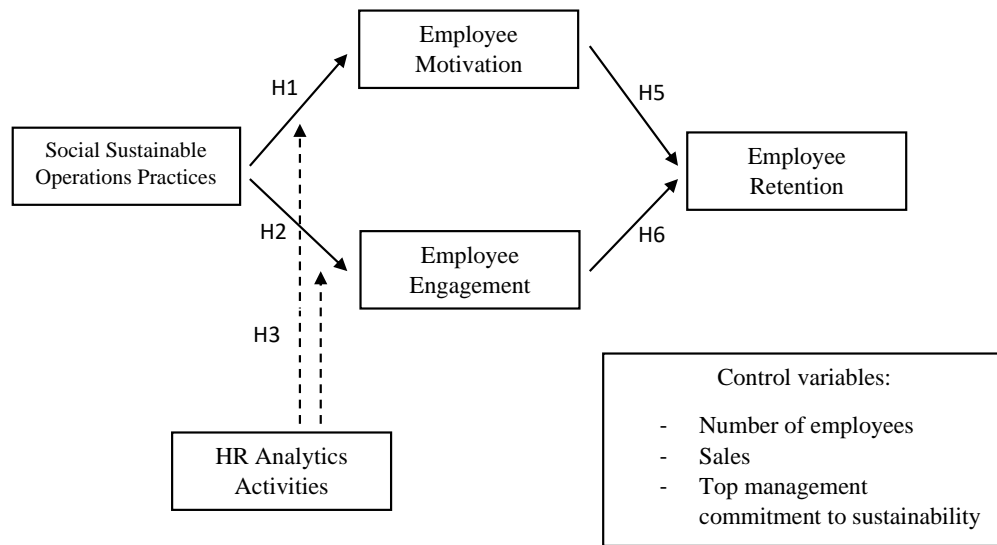
To sum up, the creation of a supportive working environment can produce a positive impact on employee retention (Kundu & Lata, 2017). The increase in employees' motivation and engagement will create an atmosphere of confidence and cooperation that will lay the foundation for social sustainability in the long term (Roca-Puig, 2019). Consequently, through SSOP, organizations will respond to their employees' physical and psychological needs, generating a feeling of safety and belonging that will positively impact their retention (Sayyadi Tooranloo et al., 2017). We consequently formulate the following hypotheses:

H5: Employee motivation is positively related to employee retention;

H6: Employee engagement is positively related to employee retention.

Our model and hypotheses are summarized in Figure 4.1.

**Figure 4.1 – Research model and hypotheses.**



Source: Authors' elaboration.

## 4.3 Research methodology

### 4.3.1 Data collection and participants' profile

An online survey to be self-administered was developed. It was intended to be completed by HR managers, as they are the ones possessing all the information needed for the study. We selected European organizations that have been implementing SSOP for at least 3 years (Longoni & Cagliano, 2016). Participants were informed that their answers would be anonymous, confidential, and used exclusively for scientific research. Attention check and reverse-coded questions were inserted to ensure the answers' reliability.

The survey was pilot-tested with HR managers from the Italian Association of Human Resource Directors (AIDP). After pilot testing, reverse-coded questions were rephrased to increase their clarity.

The questionnaire was delivered through the online platform 'Prolific', which is being increasingly used by both academics and practitioners (e.g. Jabeen *et al.*, 2022) because of its reliability and ability to recruit a large number of participants in a short time. A total of 281 responses were received. After removing incomplete questionnaires, questionnaires with failed attention checks, and responses that provided consistent answers throughout the questionnaires, only 203 responses were finally used for performing the analysis.

The final sample was composed of 130 (64%) private organizations and 73 (36%) public organizations. Most organizations were from the health services (16%) and public offices (15%) sectors, followed by banking and insurance (8%), industrial production (7%), education and food service & tourism (6% each), logistics (5%), constructions and information technology (4% each). The remaining companies were from agriculture, communications, consultancy, distribution, entertainment, legal, not for profit, real estate, retail, services, transportations, and utilities sectors.

### **4.3.2 Measurements**

To improve the study's validity and reliability, the questionnaire was developed by adapting items previously validated from other studies (Fink, 2003; Groves et al., 2013; Martin, 2005). Furthermore, each variable was assessed through a multi-item structure, with items measured by a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (Groves et al., 2013; Peter, 1979), apart from HR analytics, which was measured as a dummy variable. All the other variables are of the reflective type, i.e., they represent underlying constructs, which are assessed in an indirect way through several observable indicators, with each one of them measuring a different characteristic of the same underlying concept.

*Social sustainable operations practices* represented our dependent variable. It was measured by 12 items belonging to 4 main dimensions: safety, equity, health & welfare, and human rights. All items were taken by Mani *et al.* (2020).

*Employee motivation* was our first mediator on the relationship between SSOP and employee retention. It was assessed by 7 items taken from Marsden and Richardson (1994).

*Employee engagement* was our second mediator on the relationship between SSOP and employee retention. It was measured by 3 items taken from Mujtaba *et al.* (2022).

*HR analytics* was used as a moderator of the relationships between SSOP and employee motivation and engagement. It was considered as a dummy variable, taking value 1 if the company was implementing HR analytics activities, and value 0 otherwise.

*Employee retention* was our independent variable. It was measured by 3 items all taken from Mujtaba *et al.* (2022).

*Control variables:* To improve the study's validity and reliability, based on previous literature we checked for the moderating effect of three control variables on the relationship between SSOP and employee motivation and engagement. First, we tested the size of the company (measured as the logarithm of sales) (Gimenez et al., 2012; Longoni & Cagliano, 2016), as larger firms may have access to more resources during the implementation of SSOP, thus potentially improving their effectiveness. Secondly, we checked the top management commitment to sustainability (Longoni & Cagliano, 2016; Singh & El-Kassar, 2019), as the explicit support of top managers may be an important helpful hand in facilitating the diffusion and the acceptance of SSOP at all organizational levels, thus boosting their impact. Finally, we controlled the potential impact of the number of employees in the organization (Akhtar et al., 2019). In fact, this could have either improved or worsened SSOP effectiveness. On the one hand, organizations with more employees can typically leverage more resources, similar to what was stated for company size. On the other hand, the higher the number of employees, the higher the complexity of designing and managing SSOP that are effective for the entire workforce.

#### **4.3.3 Data analysis method**

IBM SPSS Statistics v.28 software was used to organize and process the data. It was used to derive descriptive statistics and correlation among variables and to verify that data were normally distributed, that multicollinearity was not an issue and to detect common method bias. Validity and reliability assessment of the measurement model and hypotheses testing were conducted through SPSS AMOS v.28. The SEM technique was used to simultaneously assess multiple statistical relationships through visualization and model validation, similar to previous studies (e.g. Chatterjee et al., 2022; McCartney & Fu, 2022). A covariance-based structural equation modelling (CB-SEM) was chosen, as it has been indicated as the most appropriate for theory testing and confirmation in deductive studies (Dash & Paul, 2021; Hair Jr et al., 2017), as well as more suitable when dealing with reflective variables (Hair et al., 2019; Hair Jr et al., 2017).

## **4.4 Results**

### **4.4.1 Normality, common method variance, and multicollinearity**

Before proceeding with the confirmatory factor analysis (CFA), the normality of the data was assessed. As both skewness and kurtosis values of every item are within the recommended thresholds of  $-2/+2$  (George & Mallery, 2018), data are normally distributed. To avoid measurement errors, a common factor loading all variables was produced to verify the presence of any influence of standard method bias. After applying Harman's single factor, the sum of the squared percentage of variance was 35.079%, lower than the commonly accepted threshold value (Harman, 1976; Podsakoff et al., 2003). We can thus assert that the study does not present measurement issues related to common method variance. Finally, we controlled the linear relation among independent variables to evade overfitting issues and difficulties with the reliability of the model parameters' estimates. We assessed the variance inflation factors (VIFs) to check for multicollinearity effect. As all values are lower than 2, with a tolerance greater than 0.10, the data did not present any multicollinearity effect (Alin, 2010; Tandon et al., 2021).

### **4.4.2 Measurements validation: validity and reliability**

As all variables were taken from constructs established and accepted in theory (Kline, 2016), CFA was performed to assess validity and reliability of the measurement model, and showed a satisfying model fit (PCMIN/DF = 1.436; CFI = .945 ( $>.92$ ); TLI = .935; RMSEA = .033). Convergent and discriminant validity of the construct were assessed through factor loading, average variance extracted (AVE), factors' correlation values, and their descriptive statistics. Furthermore, the reliability of our measurement means was tested through the composite reliability (CR) value observation. The results provided in Table 4.1 show how scale items load satisfactorily onto each construct, since individual items of each scale have a measurement model factor loading higher than .35 (Hair et al., 1995). AVE and CR are also above the commonly accepted threshold (.5 and .7 respectively) (Fink, 2003; Groves et al., 2013; Zikmund & Babin, 2016).



**Table 4.1 – Factor analysis for convergent validity and reliability.**

Construct	Item	Standardized Factor Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)
Social Sustainable Operations Practices	SSOP1	.373	.503	.923
	SSOP2	.627		
	SSOP3	.473		
	SSOP4	.622		
	SSOP5	.651		
	SSOP6	.569		
	SSOP7	.477		
	SSOP8	.380		
	SSOP9	.415		
	SSOP10	.504		
	SSOP11	.498		
	SSOP12	.446		
Employee Motivation	MOTI1	.581	.526	.885
	MOTI2	.517		
	MOTI3	.553		
	MOTI4	.651		
	MOTI5	.580		
	MOTI6	.402		
	MOTI7	.399		
Employee Engagement	ENGA1	.576	.655	.851
	ENGA2	.709		
	ENGA3	.680		
Employee Retention	RETE1	.754	.705	.877
	RETE2	.669		
	RETE3	.693		

**Source: Authors' elaboration.**

Table 4.2 shows the degree to which a measure diverges from another one whose underlying construct is conceptually unrelated to it. As the square roots of AVE (in bold in Table 4.2) are higher than the latent construct’s correlation coefficients for any observed factor, all constructs and the related variables meet discriminant validity standards. All the correlation outputs are significant at the level .01 (2-tailed). The CFA thus confirms the adequacy of the measuring instrument and the trustworthiness of the information collected.

**Table 4.2 – Mean, standard deviation, and correlations for discriminant validity.**

Constr.	Mean	Std. Deviation	ENGA	SSOP	MOTI	RETE
ENGA	3.732	.761	<b>.809</b>			
SSOP	3.847	.743	.428	<b>.709</b>		
MOTI	3.661	.656	.636	.299	<b>.725</b>	
RETE	3.703	.895	.805	.408	.658	<b>.840</b>

**Source: Authors’ elaboration.**

#### **4.4.3 Hypotheses testing and structural model**

Hypotheses were tested through SEM. To assess the moderating effect of HR analytics, two different groups were created in SPSS AMOS, using the variable ‘HR analytics’ as the grouping variable. The first group (128 respondents) was composed of companies that implemented HR analytics activities in the past 3 years (dummy value = 1), the second (75 respondents) of companies that did not (dummy value = 0).

Hypothesis 1 proposed that the adoption of SSOP by organizations was positively related to their employee’s motivation. Our analysis found this to be true ( $\beta = .263$ ;  $p < 0.001$ ), supporting hypothesis 1. Similarly, Hypothesis 2 proposed that the adoption of SSOP by organizations was positively related to their employee’s engagement. This hypothesis was also supported by the analysis ( $\beta = .474$ ;  $p < 0.001$ ). Our third hypothesis sustained that the adoption of HR analytics activities would positively moderate the relationship between SSOP and employee motivation. This hypothesis was also confirmed: for companies that implemented

HR analytics activities, the relationship was significant and stronger than the one observed when considering the whole sample ( $\beta = .325; p < 0.001$ ). On the contrary, companies that did not implement HR analytics activities presented a lower  $\beta$  and a not significant  $p$  ( $\beta = .136; p > .1$ ). The fourth hypothesis proposed that the adoption of HR analytics activities by organizations would have positively moderated the relationship between SSOP and employee engagement. The relationships of the two groups were both significant, but companies that implemented HR analytics activities showed a higher correlation ( $\beta = .463; p < 0.001$ ) than those who did not ( $\beta = .441; p < 0.001$ ), seemingly confirming Hypothesis 4. However, since the  $\beta$  coefficients for the two groups were very similar, we tested whether the difference between them was statistically significant using two methods. First, we applied a **z-Test for Comparing Path Coefficients** (Clogg et al., 1995). This test calculated the z-value using the formula:

$$z = \frac{\beta_1 - \beta_2}{\sqrt{SE_{\beta_1}^2 + SE_{\beta_2}^2}}$$

where  $\beta_1$  and  $\beta_2$  are the path coefficients for the two groups, and  $SE_{\beta_1}$  and  $SE_{\beta_2}$  are their respective standard errors. The resulting z-value was compared to the critical value for a 90% confidence level. Given that the computed z-value was below the threshold of 1.645, we concluded that the difference was not statistically significant. Second, we performed a **model invariance test in a Multi-Group Analysis (MGA)** (Byrne, 2016). In this analysis, we compared two models: (1) a constrained model where the path coefficients for the relationship between SSOP and employee engagement were set equal across both groups, and (2) an unconstrained model where the path coefficients were allowed to differ. The chi-square difference between the constrained and unconstrained models was computed to assess whether the models significantly differed. The chi-square difference value ( $\Delta\chi^2$ ) was found to be well below the critical value for 1 degree of freedom (3.84 at a 0.05 significance level), further confirming that the difference in the path coefficients between the two groups was not significant. This suggests that the relationship between SSOP and employee engagement does not differ significantly between the two groups, which somewhat limits the strength of support for hypothesis four.

However, we chose not to reject the hypothesis, as even a small difference may hold significance in contexts as nuanced as SSOP and HR analytics, a point further elaborated in the discussion section below. The fifth hypothesis sustained that employee motivation was positively related to employee retention. Our analysis found this to be true ( $\beta = .479$ ;  $p < 0.001$ ), supporting Hypothesis 5. Finally, our sixth hypothesis proposed employee engagement to be positively related to employee retention. This last hypothesis was also supported ( $\beta = .729$ ;  $p < 0.001$ ). Interestingly, the result also showed something that was not hypothesized, i.e., that HR analytics also moderated the positive relationship between employee motivation and employee retention. In fact, companies that implemented HR analytics activities showed a stronger relationship than those that did not ( $\beta = .502$ ;  $p < 0.001$  for the former and  $\beta = .415$ ;  $p < 0.001$ ). Finally, we tested the moderating effect of three control variables on the relationship between SSOP and employee motivation and engagement: firm size (measured as the logarithm of sales) (Gimenez et al., 2012; Longoni & Cagliano, 2016), top management commitment to sustainability (Longoni & Cagliano, 2016; Singh & El-Kassar, 2019), and the number of employees of the organization (Akhtar et al., 2019). None produced a significant effect.

The results of our hypotheses testing are presented in Table 4.3.

**Table 4.3 – Results of hypotheses testing.**

Hypothesis	Path	Estimate ( $\beta$ )	Significance	Result
H1	SSOP $\rightarrow$ MOTI	.263	***	Supported
H2	SSOP $\rightarrow$ ENGA	.474	***	Supported
H3	(HR ANALYTICS: YES) SSOP $\rightarrow$ MOTI > (HR ANALYTICS: NO) SSOP $\rightarrow$ MOTI	.325 / .136	*** / NS	Supported
H4	(HR ANALYTICS: YES) SSOP $\rightarrow$ ENGA > (HR ANALYTICS: NO) SSOP $\rightarrow$ ENGA	.463 / .441	*** / ***	Supported
H5	MOTI $\rightarrow$ RETE	.479	***	Supported
H6	ENGA $\rightarrow$ RETE	.729	**	Supported

Source: Authors' elaboration.

## **4.5 Discussion**

The objective of this study was to empirically investigate the effect of a data-driven HR analytics approach in guiding the adoption of SSOP on employees within organizations. Specifically, our findings demonstrate that the adoption of HR analytics has strengthened the impact of SSOP on employees' motivation and engagement, ultimately contributing to improved organizational retention. While the overall findings support the positive role of HR analytics in enhancing the impact of SSOP on employees, it is important to delve further into the results related to hypothesis four. Specifically, although we found that the difference between the beta coefficients for companies that have adopted HR analytics and those that have not was not statistically significant, the results remain promising, since this study represents a pioneering assessment of the impact of HR analytics on a highly specific and complex area as SSOP. Assessing the relationship between HR analytics and SSOP is, indeed, particularly challenging, as SSOP typically fall outside the direct purview of the HR department, making the influence of HR analytics on these practices more subtle. Consequently, even a small difference in the relationship between SSOP and employee engagement across the two groups can be viewed as an encouraging sign of HR analytics potential impact. These findings suggest that, while the full effects of HR analytics may not yet be evident at the time the data were collected, there is still reason to believe that HR analytics can positively influence broader organizational practices like SSOP, even in areas not traditionally under the direct control of HR departments.

### **4.5.1 Theoretical contributions**

The findings of our study offer several contributions to sustainable operations management and HR management literature streams. First, this study contributes to the sustainable operations management literature, as it adopts a multidisciplinary perspective that also considers evidence from HR management literature. This uncommon approach allowed us to focus on social sustainability, which, despite being frequently deemed as crucial for sustainable development, has been far less considered than the environmental and the economic perspectives (Amrutha & Geetha, 2020). In fact, most previous studies typically investigated the impact of

environmentally sustainable operations, or of green HR management, on corporate performance rather than on the impact of SSOP on organizations' employees. Furthermore, the few empirical researches on the topic typically presented mixed findings. For example, Longoni and Cagliano (2016) discovered a positive association between SSOP and employees' motivation and retention. On the contrary, Kobayashi *et al.* (2018) surprisingly found that when organizations also attempted to operationalize sustainability from a social point of view, conflict could arise, both among the employees, who may have different needs and perceptions, and externally, due to societal expectation once SSOP are established. More recently, Zhu and Yang (2021) found a positive relationship between socially responsible financial institutions and the commitment of their employees. Similarly, our study confirms the positive effect of SSOP on organizations' employees, better clarifying their impact in terms of employees' motivation, engagement, and retention.

Second, this study provided further insight regarding the adoption of a data-driven approach in relation to social sustainable operations management. In fact, despite several digital technologies having been implemented to deal with environmental sustainability (Feroz *et al.*, 2021), the impact that these also have on social sustainability has often been considered relevant, particularly with reference to data-driven solutions, but, in real terms, almost entirely neglected by previous literature (Dao *et al.*, 2011; Del Giudice *et al.*, 2021; Feroz *et al.*, 2021; Longoni & Cagliano, 2016; Mani *et al.*, 2020; Massaroni *et al.*, 2015; Raut *et al.*, 2019). Among the few exceptions, both Raut *et al.* (2019) and Zhu and Yang (2021) found a positive association between the usage of big data and organizations' overall sustainable business performance. However, these studies only investigated the direct impact of this technology on sustainability. On the contrary, we wanted to investigate if a data-driven strategy would be able to improve the impact of organizations' initiatives aimed at improving organizational social sustainability, similar to the approach used by Del Giudice *et al.* (2021), and our results confirmed this to be true. This study can thus be considered as an attempt to move towards the common research agenda needed to finally consider sustainability from a holistic point of view that, despite being largely requested by academics, practitioners, and institutions, is still far from being reached (Feroz *et al.*, 2021).

Finally, this study contributed to the HR management literature related to HR analytics. In fact, through the demonstration of HR analytics' moderating effect on the relationship between SSOP and employee motivation and engagement, we showed that HR analytics can also offer its contribution to a relatively recent new domain like social sustainability. To the best of our knowledge, no previous research on the topic has been conducted. The only relatively similar study we found was the one by Muhammad and Naz (2022), which found that HR analytics was able to positively moderate the positive relationship between both employee engagement and employee retention and organizational performance. We thus responded to the literature call to verify HR analytics' impact also on organizational aspects not directly controlled by the HR department such as, in this case, SSOP (Falletta & Combs, 2021). In addition, this study broadens the stream of empirical literature regarding HR analytics' impact on organizational outcomes that, despite the increasing academic interest (e.g. McCartney & Fu, 2022), is still a minority, as most previous studies typically adopted a theoretical approach (Andersen, 2017).

#### **4.5.2 Managerial implications**

This study offers two main implications for practitioners. First, it provides useful information concerning SSOP implementation that can be useful not only for organizations that are already implementing these solutions, but also for companies that are willing to start doing so. This is particularly important because, despite the fact that most firms indicate sustainability as one of their priorities, most still neglect its social dimension (Mani et al., 2016). Consequently, the demonstration of SSOP's positive impact on organizations' employees can help convince practitioners of the validity of these solutions, as better employee motivation, engagement, and retention levels may start a virtuous cycle within the organization that may ultimately influence the overall organizational performance (van der Togt & Rasmussen, 2017).

Second, our results can raise awareness of HR analytics, thus increasing its acceptance both within and outside the HR departments. Indeed, even if the reputation of HR analytics has been continuously improving (Minbaeva, 2017), it remains relatively unknown to the majority of practitioners (van den Heuvel & Bondarouk, 2017). Demonstrating its potential benefits not only on the outcomes

of strictly HR management activities, but also on practices led from other departments, can further increase its adoption.

#### **4.5.3 Limitations and future lines of research**

Despite its relevant contributions, this study presents some limitations. First, as we focused on the difference between organizations that were already implementing HR analytics activities and others that had not yet done so, we just considered the moderating effect of HR analytics implementation. Future research could verify whether some difference also exists regarding organizations' maturity level with this practice. According to McCartney and Fu (2022), three dimensions can be considered when investigating the level of maturity of HR analytics within organizations: the quality of their data, their analytical competency, and their strategic ability to act.

Second, it may be interesting to investigate the combined effect of SSOP and HR analytics on organizational performance. In fact, we demonstrated SSOP's positive effect on HR benefits and, according to Longoni and Cagliano (2016), this may lead to a competitive advantage. Similarly, several researches have demonstrated that the use of a data-driven approach, and in particular of HR analytics (DiClaudio, 2019; Tursunbayeva et al., 2018), can positively impact organizational performance from different perspectives. Thus, it could be reasonable to assume that the combined effect of these practices can positively impact organizational performance.

Furthermore, our sample was composed only of HR managers. It could be interesting to conduct a multilevel analysis also considering the opinions of companies' employees and/or of managers from different departments. This is a common limitation of HR analytics studies, as they usually focus solely on the opinions of HR managers (Falletta & Combs, 2021). However, as we demonstrated that this practice can also support activities not directly led by the HR department, it would be interesting to investigate the opinions of other stakeholders who could benefit from HR analytics activities. Doing so would also allow future studies to move forward another limitation of our study, i.e. the fact that we addressed our questionnaire to a single informant. In fact, although our analysis demonstrated that no common method bias issues affected the result of our study, the inclusion of the



opinion of other organizational stakeholders may help in further increasing the validity and reliability of our conclusions.

Finally, we only interviewed managers from European companies. It may also be interesting to conduct this research in different contexts to verify whether our findings are generalizable despite the specific geographical, political, and cultural context.

## **4.6 Conclusion**

The contemporary context is increasingly complex for companies to interpret. Recent events, like the COVID-19 pandemic and the global geopolitical tensions, have further complicated the situation, with important consequences from both an economic and a social perspective. We believe that this study can help companies deal with this scenario. In fact, through HR analytics, companies can approach social challenges with a data-driven approach, thus maximizing the positive impact of their SSOP on their employees. Furthermore, this approach may allow organizations not only to recognize, but also to anticipate potential risks and challenges that they may have to face, whether they originate from the internal organizational context or from the external environment. By leveraging the data and the insight provided by HR analytics, organizations may adopt a proactive approach in dealing with the actual and potential issues that may affect their workforce, thus being able to quickly plan, design, and implement proper adjustments to maintain the continuity of the business. This will be crucial to respond in a timely manner to the potential, and hardly predictable, social crises that could impact organizations in the future, and may serve as the starting point for wider initiatives that could also produce positive benefits to society in general.

From a more academic point of view, we believe that this study contributes to closing some important gaps that were identifiable in academic literature. First, we focused our attention on the social dimension of sustainability, which has historically been the least considered. However, in the actual context, and even more in the future, this dimension will have to be considered with the same dignity as environmental and economic sustainability, as organizations will have to promptly react to potential social issues that may arise. Secondly, in a similar way, we investigated the impact of a data-driven approach on the social side of

sustainability, which will be crucial to identify a common research agenda to properly deal with sustainability issues. Last, differently from most previous studies, we investigated the impact of data analytics not on general organizational performance, but rather we focused directly on its potential contribution to sustainable operations management.

In conclusion, we believe that this study can be a good starting point for both academics and practitioners to deal with sustainability from a holistic, data-driven perspective, an approach that will become increasingly more necessary to answer to the challenges that will be posed by potential future crisis situations.

## **Appendix: The questionnaire**

### Social sustainable operations

In the following section we investigate the social sustainable operations implemented by your company, i.e. practices aimed at improving employees' working conditions, health, and safety.

Please indicate whether you agree or disagree with the statements.

Currently your supply chain function:

SSOP1: Ensures supply chain facilities adhere to strict safety regulations.

SSOP2: Ensures women's safety across the supply chain.

SSOP3: Ensures the safe incoming and outgoing movement of product to and from trading partner facilities.

SSOP4: Ensures strict adherence to gender non-discrimination policies at trading partner locations.

SSOP5: Ensures workplace diversity at trading partners facilities.

SSOP6: Ensures gender non-discrimination policies are in place at trading partners facilities.

SSOP7: Ensures welfare of stakeholders at trading partners locations.

SSOP8: Ensures availability of health care facilities in trading partner locations.

SSOP9: Ensuring clean drinking water and sanitation.

SSOP10: Has a human rights policy for our manufacturing facilities.

SSOP11: Audits trading partner locations and ensures non employment of child and bonded labor.

SSOP12: Ensures non-employment of sweatshop labors in trading partner locations.

### HR benefits

In this section we will ask you questions about the motivation, engagement and retention of the employees of the company you work for.

In the last three years, the employees of the company you work for...

MOTI1: Improved the quality of their work.

MOTI2: Gave sustained high performance.

MOTI3: Improved their priorities at work.

MOTI4: Show less initiative [Reverse-coded].

MOTI5: Express themselves with greater clarity.

MOTI6: Are more effective in dealing with the public.

MOTI7: Improved their sensitivity towards colleagues. Indicate to what extent do you agree with the following statements.

ENGA1: Involvement in the process of decision-making engages the employees of the company you work for to contribute to the company's performance.

ENGA2: Effective communication regarding the clarity of their role and nature of work motivates the employees of the company you work for to work with full dedication.

ENGA3: The company you work for trusts the integrity of talented employees, which encourages them to work with full capacity.

Indicate to what extent do you agree with the following statements.

RETE1: The company you work for provides career development opportunities to retain key employees.

RETE2: Managerial support of the company you work for inspires its employees to continue their job.

RETE3: The conducive environment of the company you work for motivates talented employees to stay a shorter period [Reverse-coded].

**Chapter 5 – Thriving through Disruption:**  
**Unveiling HRM Strategies for Employee**  
**Resilience**

## 5.1 Introduction

Resilience has become a central tenet in contemporary management studies, gaining unprecedented significance in the face of tumultuous global events such as the COVID-19 pandemic, geopolitical conflicts, and economic uncertainties (Hillmann & Guenther, 2021; Williams et al., 2017). Recently, the spotlight has turned to Human Resource Management (HRM) practices as key contributors to fostering employee resilience (Cooper et al., 2019). Scholars have increasingly recognized that HRM practices are pivotal in shaping the adaptive capabilities of individuals within organizations. Such practices have been considered as “internal capabilities builder” (Zhou et al., 2023) designed to promote the development of unique employees’ knowledge, skills, abilities, and others (KSAOs), which can ultimately help organizations developing and/or protecting their competitive advantage, also in turbulent times (Eisenhardt & Martin, 2000; Teece, Pisano & Shuen, 1997). More specifically, the positive relationship between HRM practices and employee resilience can be elucidated through the lens of positive psychology. According to this research stream, HRM activities play a crucial role in fostering the cultivation and effective management of employee resilience, ultimately improving the response of employees to challenging and stressful situations (Cooper et al., 2019). HRM activities may thus enable the creation of a favorable organizational environment that encourages employees’ adaptive capacity, consequently promoting the adoption of proactive, adaptive, and support-seeking behaviors needed to gain the resilience attribute (Näswall et al., 2019).

Furthermore, the role of HR analytics in this landscape is gaining prominence, emphasizing the need for data-driven insights to inform strategic HRM decisions (Xiao et al., 2023). HR analytics is defined as “a proactive and systematic process for ethically gathering, analyzing, communicating and using evidence-based HR research and analytical insights to help organizations achieve their strategic objectives” (Falletta & Combs, 2021, p.54) and may, indeed, be used across a great variety of organizational situations as well as to deal with different activities, as job evaluation or sentiment analysis related to HRM (Margherita, 2022). This will aid employees in effectively handling diverse workplace demands also in adverse conditions, thus contributing to the restoration of a positive mental state, ultimately

leading to increased employee resilience (Xiao et al., 2023).

Based on these premises, several loose ends can be identified within the literature. Firstly, the majority of previous studies adopted a conceptual perspective, with just few empirical studies investigating the processes and practices able to foster employee resilience (Malik & Garg, 2020). As a result, much heated debate is still detectable regarding the capabilities able to foster resilience (Rodríguez-Sánchez et al., 2021). Although many studies suggest that HRM practices and policies may fill this role (Lengnick-Hall et al., 2011), previous research examining the interplay between HRM practices and employee resilience typically adopted a retrospective case analysis approach to investigate the crucial factors able to originate resilience within particular organizational contexts or as a response to certain events (Zhou et al., 2023). In spite of their relevant contributions, the heavy use of this methodology led to the identification of a bundle of HR activities that may be effective only within the context where they were identified, thus jeopardizing their applicability in other scenarios or circumstances (Linnenluecke, 2017).

Furthermore, the reliance on retrospective case studies in previous research falls short of paving the way towards a more systematic approach to fostering employee resilience through HRM, despite earlier academic suggestions advocating for such an approach (Lengnick-Hall et al., 2011). Xiao et al. (2023) proposed that a data-driven approach, allowed by the insight provided by HR analytics, may overcome this issue and contribute to finally reaching a systematic approach. They consequently tested the direct impact of HR analytics on employee resilience. Despite relevant, considering HR analytics as a “deus ex machina” able to produce an impact by itself on organizations and their employees is a questionable approach (Angrave et al., 2016): HR analytics is a tool at the disposal of organizations to improve their operations, but it cannot act by itself (Falletta & Combs, 2021). It would thus be worth investigating whether the usage of HR analytics is able to improve the relationship between HRM practices and their outcomes, as employee resilience, rather than considering it as an antecedent.

Lastly, it is yet not clear if the suggested systematic approach to the HRM practices intended to foster resilience can actually be related to other organizational outcomes, as the company innovation and financial performance (Sheehan, 2014).

Zhou et al. (2023) partially explored this issue, however, they only focused their analysis at the organizational level, not considering the employee level.

To advance the academic knowledge on the topic and resolve the ambiguities that are still detectable, this study aims to investigate, from a quantitative point of view, the relationship between specific HRM practices and employee resilience. The study also pursues to unravel the impact of a systematic, data-driven approach by investigating the moderating role of HR analytics in the aforementioned relationship. Finally, the study seeks to offer organizational implications by assessing the relationship between employee resilience and the organization's innovative and financial performance, thus taking a first step towards the integration of both the individual (i.e., employee) and the organizational level of analysis. In order to do so, we will rely on the dynamic capabilities theory proposed by Teece, Pisano, and Shuen (1997), which provides a lens to understand how organizations can adapt their HRM practices dynamically (Chatterji & Patro, 2014; Helfat & Peteraf, 2015). Such a theoretical standpoint aligns with the need for organizations to possess the capacity to sense, seize, and transform resources to navigate dynamic environments, making it an ideal theoretical foundation for exploring the nuanced relationship between HRM practices, HR analytics, and employee resilience.

In sum, the present research contributes to the HRM and resilience literature by advancing the theory-building process initiated by previous studies through empirical testing, adopting a robust quantitative methodology offering empirical insights that extend beyond conceptual discussions. Moreover, by highlighting the moderating effect of HR analytics, the study contributes to the evolving landscape of data-driven HRM strategies, ascertaining the positive effect of a systematic approach to HRM and offering a roadmap for organizations looking to leverage analytics to enhance resilience. Ultimately, by establishing the connection between employee resilience and organizational financial and innovative performance within the dynamic capabilities framework, this study responds to the call of the literature to delve into employees' resilience outcomes.



## **5.2 Theoretical backbone and hypotheses development**

### **5.2.1 Framing human resource management for employee resilience**

Research on resilience within organizations has become one of the foundational elements within the realm of positive psychology and positive organizational behavior (Hartmann et al., 2020). In this sense, the seminal work by Luthans (2002a) categorizes resilience as one of the four constituents of psychological capital, alongside self-efficacy, hope, and optimism. He considers resilience as a personal attribute, describing it as the developable “positive psychological capacity to rebound, to ‘bounce back’ from adversity, uncertainty, conflict, failure or even positive change, progress and increased responsibility” (Luthans, 2002b, p.702). As such, it can be “measured, developed, and effectively managed for performance improvement” (Luthans, 2002a, p.59). Last decade saw a growing research interest in enhancing and fostering resilience among employees, driven by the desire to fortify organizational systems and infrastructure, ensuring sustainability that relies on the ability of employees to sustain performance levels (Lengnick-Hall et al., 2011). In particular, an expanding literature, influenced by positive psychology, posits that leveraging employee resilience, facilitated by HRM, could serve as a viable strategy for organizations in effectively navigating and providing support to their workforce in overcoming modern workplace challenges (Luthans, 2002a). A key contention of this view emphasizes the necessity for organizations to embrace a positive approach to HRM by proactively managing their psychological capital, in contrast with the predominant negative perspective that centers on occupational stress (Avey et al., 2009). The literature in this domain implies that resilience involves the cultivation of internal competencies, skills, and capacities among key employees (Santoro et al., 2021). Individual-level resilience is thus conceptualized as a component of psychological capital and is considered developable through managerial intervention as HRM activities (Khan et al., 2019).

In this sense, Lengnick-Hall et al. (2011) delineate three distinct dimensions crucial for fostering resilience: cognitive, behavioral, and contextual. The cognitive facet involves nurturing a positive and constructive conceptual orientation, achieved through a clear sense of purpose, foundational values, an authentic vision, and

intentional language use. This dimension thrives on individual expertise, creativity, opportunism, and decisiveness, enabling individuals to navigate uncertainty and generate innovative solutions by challenging underlying assumptions. The behavioral dimension centers on cultivating individual characteristics such as resourcefulness, counterintuitive agility, and the development of beneficial habits and preparedness. Finally, the contextual dimension relies on fostering relationships both within and outside the organization to navigate environmental complexities effectively. This involves building interpersonal connections, sharing knowledge and information, and distributing accountability and power.

Placing a strong focus on HRM activities can aid organizations in developing the three dimensions of individual resilience (Lengnick-Hall et al., 2011). In the past years, several studies proposed and demonstrated that a plethora of HRM activities can foster employees resilience, such as wellbeing oriented HR practices (Cooper et al., 2019), sustainable HR practices (Lu et al., 2023), and high performance working systems (Zhou et al., 2023). However, all these studies focused on very specific sets of practices depending on the overall aim of the respective studies. The tested HR practices were therefore aimed at improving heterogeneous organizational outcomes, such as employee wellbeing and performance, and not specifically designed to foster employee resilience. Furthermore, the studies were conducted with single-region and single-country samples (also single-industry for Cooper et al., 2019), heavily limiting the generalizability of their results. On the contrary, in 2014 Bardoel, Pettit, De Cieri, and McMillan proposed a set of general HRM activities able to foster employee resilience. They defined them as “resilience-enhancing HRM practices”, i.e., “HRM practices that are intended, implemented and perceived to offer employees opportunities to ‘spring back’ from adversity and to develop and maintain resources that strengthen the resilience dimension of psychological capital” (Bardoel et al., 2014, p.283). These resilience-enhancing HRM practices fall within the following categories: development of social supports at work; work-life balance practices; employee assistance programs; employee development programs, such as resilience training; flexible work arrangements, reward and benefits systems; occupational health and safety systems; risk and crisis management systems; and diversity management.

However, to the best of our knowledge, no previous study empirically tested the validity of these presumed resilience-enhancing HRM practices for fostering employee resilience. As a consequence, quite surprisingly no empirical evidence has confirmed the link between these two constructs yet. Notwithstanding this, according to the authors, these practices should constitute a comprehensive set of activities, including the large majority of HRM practices that past studies demonstrated to be positively related to employee resilience. Consequently, we formulate the following hypothesis:

H1: Resilience-enhancing human resource management practices<sup>1</sup> are positively related to employee resilience.

### **5.2.2 HR analytics: a data-driven approach to foster employee resilience**

HR analytics represents the systematic application of data analysis and data mining to HR data (Margherita, 2022). It empowers organizations to derive actionable insights from a wealth of HR-related data, fostering informed decision-making across various facets of workforce management (Chalutz Ben-Gal, 2019). The growing importance of HR analytics stems from its ability to transcend traditional HR practices, providing a nuanced understanding of employee behavior, preferences, and performance (Di Prima et al., 2023). By harnessing the power of data, HR analytics enables organizations to tailor their strategies with precision, aligning human capital management with overarching business objectives (Ellmer & Reichel, 2021).

Within the context of organizational resilience, it is posited that HR analytics assumes a pivotal role as a potential moderator in shaping the relationship between resilience-enhancing HRM practices and employee resilience. This proposition aligns with the perspective that HR analytics acts as a facilitator, enhancing the impact of various resilience-centric initiatives within an organization. The idea is

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<sup>1</sup> We acknowledge the intrinsic tautology in suggesting a positive relationship between resilience-enhancing HRM practices and employee resilience. Nonetheless, we have decided to maintain the terminology introduced by Bardoel et. al (2014) to reflect their proposition that these should constitute a more comprehensive set of HRM practices designed to foster resilience than those analyzed in similar studies. However, since no previous study has analyzed the relationship between the entire set of practices and employee resilience, confirmation is needed to verify if the suppositions of Bardoel et al. (2014) hold true.

not simply that HR analytics directly influences employee resilience but rather acts as an orchestrator, aiding in the creation of a coherent and holistic set of strategic HRM practices as advocated by prior research (Branicki et al., 2019). By leveraging data-driven insights, organizations can tailor these practices to align with the specific needs and challenges faced by their workforce (Falletta & Combs, 2021), thereby fostering a more comprehensive and effective approach to employee resilience.

One key way HR analytics enhances the relationship between HRM and employee resilience is through the identification of trends and patterns within workforce data (Gurusinghe et al., 2021). For example, analytics may reveal correlations between specific HRM practices, such as training programs or flexible work arrangements, and indicators of employee resilience, such as job satisfaction or stress levels. Armed with this knowledge, management can tailor HRM strategies to prioritize initiatives that have been shown to have a positive impact on resilience, thus maximizing their effectiveness.

Moreover, HR analytics enables organizations to conduct predictive analyses, forecasting future trends and potential challenges that may impact employee resilience (Chalutz Ben-Gal, 2019). For instance, predictive analytics may identify emerging stressors within the workplace or anticipate shifts in employee engagement levels. By preemptively addressing these issues through targeted HRM interventions, organizations can proactively support employee resilience and mitigate potential risks.

Additionally, HR analytics facilitates the measurement and evaluation of the effectiveness of HRM practices in promoting employee resilience over time (Marler & Boudreau, 2017). Through metrics such as turnover rates, absenteeism, and employee engagement scores, organizations can gauge the success of their resilience-enhancing initiatives and make adjustments as necessary (Malik & Garg, 2020). For instance, if analytics reveal a decline in resilience indicators following the implementation of a new HRM program, management can swiftly identify areas for improvement and refine their approach accordingly.

Furthermore, HR analytics empowers organizations to assess the impact of external factors, such as industry trends or economic fluctuations, on employee resilience

(Larsson & Edwards, 2022). By integrating external data sources into their analytics framework, organizations can gain a comprehensive understanding of the contextual factors shaping resilience within their workforce (Iftikhar et al., 2021). For example, analytics may reveal that employees in certain departments or geographic regions are more susceptible to resilience challenges due to external factors such as job insecurity or workload fluctuations. Armed with this insight, management can implement targeted interventions to support these vulnerable populations and bolster overall resilience across the organization.

In summary, HR analytics will lay the foundation for the implementation of a data-driven decision-making approach in the realm of HRM. By leveraging the insights derived from this tool, organizations will be able to design HR practices based on the actual needs of their employees and on their specific organizational context (Di Prima et al., 2023). Furthermore, HR analytics will help keep track of the outcomes of these initiatives, allowing for the implementation of corrective actions in a timely manner (Shah et al., 2017). These would be extremely crucial in the context of employee resilience, as organizations may need to adapt their strategies according to the unexpected events that they will be facing (Marcazzan et al., 2022).

Consequently, we posit that HR analytics amplifies the effectiveness of the strategic HRM practices that have been proposed in our first hypothesis. For each of them, HR analytics serves as a catalyst, enhancing their impact on employee resilience. In the development of social support at work, HR analytics aids in identifying key areas where social support mechanisms can be strengthened, fostering a sense of belonging and community among employees (Soltis et al., 2023). Work-life balance practices, when informed by HR analytics, can be tailored to individual preferences and needs, promoting a healthier integration of professional and personal life (Cavanagh et al., 2022). Employee assistance programs benefit from HR analytics by identifying specific stressors and customizing interventions to address the unique challenges faced by employees (Hastuti & Timming, 2023). Resilience training, supported by HR analytics, gains precision by targeting areas identified as crucial through data-driven insights (Kellner et al., 2021). Flexible work arrangements, when guided by HR analytics, are optimized to align with employee preferences, ensuring a seamless balance between flexibility and organizational

goals (Huang et al., 2023). Reward and benefits systems, informed by HR analytics, can be personalized to recognize and reinforce behaviors that contribute to resilience (Huang et al., 2023). Occupational health and safety systems, with the aid of HR analytics, can proactively address potential risks and hazards, ensuring a safe and supportive work environment (Lathabhavan, 2023). In the realm of risk and crisis management, HR analytics offers predictive capabilities, allowing organizations to anticipate and mitigate potential crises, thereby bolstering overall resilience (Kashive & Khanna, 2022). Lastly, diversity management, when enhanced by HR analytics, ensures a nuanced understanding of the diverse needs and challenges faced by different demographic groups within the workforce, fostering a more inclusive and resilient organizational culture (Giermindl et al., 2022).

In essence, HR analytics emerges as an enabler, aligning and amplifying the impact of these strategic HRM practices, thereby contributing to the overarching goal of cultivating and sustaining employee resilience within the organizational context. We thus posit the following hypothesis:

H2: HR analytics moderate the positive relationship between resilience-enhancing human resource management practices and employee resilience, such that the relationship is more pronounced the higher the maturity level of organization's HR analytics.

### **5.2.3 The impact of employee resilience on organizational performance**

Enhancing the resilience of employees may actually lead to an enhancement in their performance and, consequently, of the organization, with positive effects on both employee outcomes and organizational value (Bardoel et al., 2014). Despite this, according to Cooper et al. (2019) only a minority of studies has focused on the actual relationship between employee resilience and performance. For example, Luthans, Avolio, Walumbwa, and Li (2005) found a positive association between employee resilience and performance in Chinese organizations that were experiencing heavy organizational changes. Similar results were obtained by Avey et al. (2009) in a large financial company in Melbourne.

According to Akgün and Keskin (2014), this potential positive relationship may be

explained by the fact that resilience consists of a dynamic and developmental process of change and evolution rather than of a fixed trait, thus fostering the creation of new opportunities. This is in line with the suggestions from the positive psychology stream, which advocates that the development of employee resilience will enhance their adaptation abilities and success over time (Luthans, 2002a), increasing their tendency to react in a positive and persevering way to setbacks and adversities (Peterson et al., 2011). Resilience will thus provide employees with the motivation to produce an extra effort, ultimately leading to better performance (Avey et al., 2011). This may, in turn, enhance organizational performance in terms of product and process innovation, as well as of financial performance.

Akgün and Keskin (2014) suggest that product innovativeness will play a crucial role in the relationship between resilience and organizational performance. More specifically, resilience serves as an essential prerequisite for organizational performance, influencing the initial stage of performance development. Product innovativeness, in turn, offers the firm the required structure and coherence to actually benefit from these resilience capabilities. Resilient employees will be more inclined towards ideas exploitation and knowledge sharing, leading to their recombination. Typically, they will also show higher levels of prosocial behaviors, i.e., behaviors that benefit other parties. This increases their negotiation abilities and reduces the risk of breaking the psychological contract, facilitating the creation of healthy organizational relationships (Cameron et al., 2004). In turn, this may lead to the embrace of more ambitious goals, heightened commitment to goals, improved creative problem-solving abilities, and enhanced decision-making in innovation endeavors (Staw & Barsade, 1993). Finally, resilient employees are typically able to learn from their mistakes, reducing the chances of these happening again, helping the development of new possible avenues for both new product and process development (Carroll et al., 2002). In fact, resilient employees are better able to leverage the knowledge and information from their environments to evolve the internal processes of their organizations (García-Morales et al., 2006). Fostering employee resilience can play a crucial role in handling tensions associated with the organizational process innovation (Bouguerra et al., 2024), as the ability of individuals to confront challenges and navigate stress is pivotal for organizations to

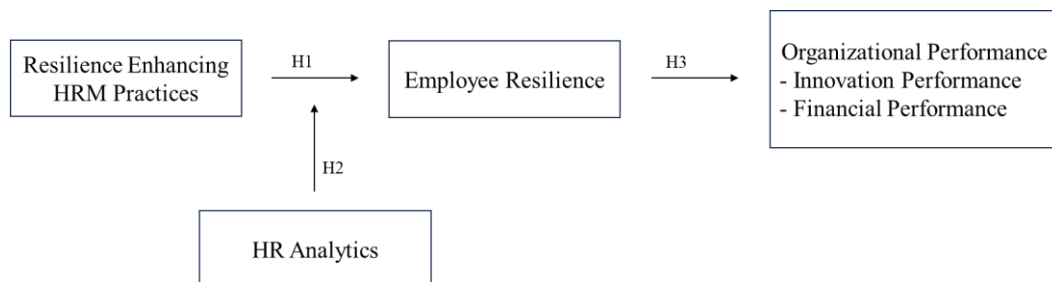
adapt and respond effectively to evolving environmental conditions (Khan et al., 2019). Additionally, self-efficacy, which reflects a personal belief in one's capability to adequately perform specific tasks, becomes vital in accepting changes and alleviating tensions by exerting adequate effort and confidence to achieve successful outcomes (Luthans et al., 2006).

For all these reasons, Pinto, Pereira, and Uyarra (2019) propose the concept of “resilience of innovation”, based on the assumption that resilient employees will be able to find new solutions more easily than their colleagues who do not possess this capability. This will produce potential positive benefits to both the product and process innovation of their organizations and, ultimately, to their financial performance. Based on this, we posit our last hypothesis:

H3: Employee resilience is positively related to organizational performance, in terms of product innovation, process innovation, and financial performance.

Figure 5.1 summarizes our model and hypotheses.

**Figure 5.1 - Research model and hypotheses.**



Source: Authors' elaboration.

## 5.3 Research design

### 5.3.1 Sampling and data collection

According to its deductive approach to theory building, this research addresses the hypotheses put forward earlier by carrying out an empirical investigation conducted surveying leading members of more than 400 European companies. In the form of a cross-sectional study, we advanced a purposeful sampling to involve managerial figures who are more likely to be aware of the dynamics investigated through our survey to grant rigorous and reliable empirical observations.

Several measures have been taken to ensure the minimum presence of bias in data



collection. On the one hand, we avoided systematic biases and ensured external validity by collecting a proper number of responses (according to structural equation modeling principles; see Kline, 2023) from randomly selected managers belonging to the identified population, attempting to achieve the highest representativeness in the data distribution (Perotti et al., 2024; Short et al., 2002). On the other hand, with the intention of preventing common method bias due to respondents' self-reported assessment, we gathered information from different respondents of the same company, at different times (Bozionelos & Simmering, 2022; Podsakoff et al., 2003). More specifically, we collected data from HR managers or general managers in charge of the HR management, where the sampled company did not have a structured HR department. HR managers are recognized as the most informed individuals about HR management practices and HR data management (Di Prima et al., 2023; McCartney & Fu, 2022) and, where companies do not have the dimensional capacity to develop an HR department, general managers showed to be the most appropriate respondents to asks for an assessment of employees' conditions (Santoro et al., 2021). Furthermore, data related to organizational performance was gathered from general managers, chief executive officers, product managers, innovation managers, or chief innovation officers of the same companies (Akgün & Keskin, 2014; Prajogo & Ahmed, 2006; Spanos & Lioukas, 2001). Overall, we collected data referring to internal assessments of dynamics related to HR practices, employees' condition, and organizational outcomes considering the past three years of activity in the companies where the respondents currently work. It allows us to gather information over a time span that qualifies managers to make solid judgments about collective and organizational phenomena. Specifically considering HR analytics adoption in companies, it also represents a suitable timeframe because of the time necessary before reaching a proper maturity with the tool (McCartney & Fu, 2022).

### **5.3.2 Survey design and variables measurement**

Data was collected through a self-administered online survey, which has been built to grant rigorous and reliable empirical observations. The constructs have been assessed through variables made up of items adapted from previous highly ranked studies. Thus, each variable was measured by a multi-item structure to increase

survey reliability and validity, according to a five-point Likert Scale ranging from 1 (i.e., strongly disagree; worst in the industry) to 5 (i.e. strongly agree; best in the industry) (Groves et al., 2011; Zikmund & Babin, 2016). In detail, we measured the adoption of resilience-enhancing HR practices in companies drawing on the scales advanced by Bardoel et al. (2014, p. 291). These authors performed a conceptual review to bridge employees' resilience and HRM and outline, as a result, some "sample scale items". Then, we relied on Santoro et al. (2021) to assess employees' resilience in economic organizations, and adapted the items from McCartney and Fu (2022) to assess the moderating role of HR analytics adoption on our main relationship. Finally, organizational performance represents a latent variable measured through innovation performance, whose measurement is based on the items assessed by Prajogo and Ahmed (2006), and financial performance, whose items were previously tested by Akgün and Keskin (2014) and Spanos and Lioukas (2001). We chose to measure organizational performance through survey questions, asking respondents to rate their organization's performance relative to major competitors, rather than using objective measures. Given the specific scope of our study, the characteristics of the sample, and the timing of the research, this approach offered several advantages. First, it captures subjective insights from individuals who are closely involved in the organization, such as managers, offering valuable perspectives on how the organization is viewed from within (York & Miree, 2004). This method allows for a more nuanced understanding of competitive positioning, as it reflects both internal and external perspectives. In fact, this approach reflects not only how the organization performs according to internal benchmarks but also how it is perceived in comparison to key competitors, providing a broader view of its market position (Stede et al., 2006). Additionally, using relative measures such as "performance compared to competitors" accounts for industry-specific factors that might influence absolute financial metrics, offering a more context-sensitive evaluation (Akgün & Keskin, 2014). This is particularly important given the multi-company, multi-industry nature of the sample, where firm characteristics may vary. It also helped mitigate the effects of external "shocks" in organizational performance (Hao, 2021) caused by the COVID-19 pandemic, as data collection covered the period from 2021 to 2023, a time of recovery and adjustment for many

organizations. Finally, this method reduces reliance on the availability of financial data, which may not be accessible or standardized across organizations, and avoids potential biases in financial reporting (Rajan & Reichelstein, 2009; Wall et al., 2004).

Additional questions related to company size, industry, country, firm age, and organizational type (multinational/domestic) have been included as control variables in the survey (Akgün & Keskin, 2014; McCartney & Fu, 2022; Perotti et al., 2023). In order to ensure respondents' attention during the whole survey and reliable data, we also adapted a few sentences to include reverse coded items and set up attention check filters in the questionnaire (Fink, 2002a; Fink, 2002b; Groves et al., 2011; Martin, 2006). As a result, the Appendix showcases the items employed in the questionnaire and their scientific sources.

After an initial version of the questionnaire was produced, it was submitted to four scholars (other than the authors) and five managers in order to validate the survey's form and content. According to their feedback, the authors revised the survey to include two questionnaires that were administered to the same individuals one week apart. The first questionnaire aimed to ascertain the extent of HR practices adopted by the company and the degree of adoption of HR analytics tools, while the second one was designed to capture overall assessments of employee resilience and gauge the company's performance.

### **5.3.3 Data analysis method**

Before proceeding to data analysis, we ascertained the normal distribution of the data and the absence of multicollinearity (Hair, Black, Babin, & Anderson, 2019; Kline, 2015). The absence of common method variance was also checked by Harman's single factor (Harman, 1976) and by observing our constructs in relation to a marker variable (Bozionelos & Simmering, 2022; Lindell & Whitney, 2001; Podsakoff et al., 2003). Then, we carried out a confirmatory factor analysis to assess the validity and reliability of our measurement model.

In line with the nature of this deductive study, we relied on a covariance-based structural equation modelling (CB-SEM) technique to test our hypothesis. Assessing the multiple statistical relationships simultaneously through visualization and model validation, this approach suits for theory testing in deductive studies

(Dash and Paul, 2021; Hair et al., 2017; Hair et al., 2019) and shows consistency with previous studies on HR management (e.g., Di Prima et al., 2023; del-Castillo-Feito, Blanco-González, & Hernández-Perlines, 2022; McCartney & Fu, 2022). Data was cleaned and processed by IBM SPSS Statistics v.28 and analysed recurring to SPSS AMOS v.28.

## **5.4 Results**

### **5.4.1 Normality, common method variance, and multicollinearity**

Before performing the confirmatory factor analysis (CFA), the authors assessed the eligibility of data by carrying out diagnostics. A total of 427 valid answers have been collected from the self-administered surveys. Then, 12 were removed during the data cleaning process due to extreme response bias. This procedure was conducted in accordance with the notions found in the literature, observing the recommended threshold values (Ghosh & Vogt, 2012; Hawkins, 1980). As a result, 415 eligible answers were taken into account to study the goodness of data.

The normal distribution of data was assessed through skewness and kurtosis statistic values, as well as considering items' significance in the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality. This study can rely on a fine distribution of data as both skewness and kurtosis statistic values of the items fall under the recommended thresholds of  $-2/+2$  (Hair et al., 2019; George & Mallery, 2018). Then, to avoid systematic bias related to the data collection method rather than the constructs being measured, common method variance has been assessed by the authors (Podsakoff et al., 2003). Although we attempted to reduce the bias associated with our data collection instrument by addressing two different subjects from the same company, we statistically ensured the absence of common method bias. All items were thus loaded in a common factor to test any influence of standard method bias. Following the procedure supported by the literature, Harman's single factor has been tested and the sum of the squared percentage of variance turned out to be 17.28%, lower than the 50% recommended by the literature (Harman, 1976). This result suggests that this study has no measurement issues related to common method variance. Finally, the linear relation among independent variables was checked to avoid overfitting problems and complications with the reliability of the

model parameters' estimates. Thus, data were checked for multicollinearity effect by assessing the variance inflation factors (VIFs), whose values are less than 2, with a tolerance greater than 0.10. After assessing the general goodness of the data, it was legitimate to move forward with the confirmatory factor analysis (CFA).

#### 5.4.2 Measurement validation: validity and reliability

We relied on a confirmatory factor analysis to assess the validity and reliability of our measurement model since the variables included in our study are based on constructs acknowledged in previous studies (Hair et al., 2019; Kline, 2015). First of all, the confirmatory factor analysis showed a satisfying model fit (PCMIN/DF = 3.804; CFI = .927; TLI = .902; RMSEA = .074). Whereas information measurement validity is the ability of an instrument to capture what it is intended to bring out, the construct convergent validity and discriminant validity were assessed considering factor loadings, the average variance extracted (AVE), factors' correlations values, and their descriptive statistics. Alongside this, we questioned the trustworthiness of our measurement means, namely its reliability, through the observation of the composite reliability (CR) value. The results in Table 5.1 prove how the scale items load satisfactorily onto each variable, due to their measurement model factor loading higher than .6. However, the elements REP4 and REP8 were removed due to low standardized factor loading. The AVE and CR values also comply with the threshold commonly recommended in the literature, which are .5 and .8, respectively (Hair et al., 2019; Kline, 2015; Zikmund & Babin, 2016).

**Table 5.1 - Factor analysis for convergent validity and reliability.**

Variable	Item	Standardized Factor Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)
Resilience-Enhancing HRM Practices	REP1	.889	.625	.952
	REP2	.772		
	REP3	.777		
	REP4	.372		
	REP5	.885		
	REP6	.673		
	REP7	.693		
	REP8	.496		
	REP9	.701		
	REP10	.896		

	REP11	.683		
	REP12	.701		
	REP13	.896		
	REP14	.725		
Employee Resilience	RCG1	.813	.536	.941
	RCG2	.752		
	RCG3	.734		
	RCG4	.602		
	RCG5	.773		
	RCG6	.801		
	RBD1	.722		
	RBD2	.687		
	RBD3	.602		
	RBD4	.753		
	RBD5	.734		
	RCT1	.697		
	RCT2	.737		
	RCT3	.802		
Innovation Performance	PROD1	.688	.541	.913
	PROD2	.703		
	PROD3	.678		
	PROD4	.822		
	PROD5	.742		
	PROC1	.777		
	PROC2	.708		
	PROC3	.671		
	PROC4	.811		
	Financial Performance	FP1		
FP2		.762		
FP3		.699		
FP4		.681		
FP5		.736		
FP6		.782		
HR Analytics	HQD1	.788	.536	.941
	HQD2	.626		
	HQD3	.811		
	HQD4	.744		
	HQD5	.728		
	AC1	.701		
	AC2	.756		
	AC3	.788		
	AC4	.699		
	AC5	.707		
	AC6	.639		
	SAA1	.800		
	SAA2	.685		
	SAA3	.747		

Source: Authors' elaboration.

In addition, Table 5.2 shows the degree to which a measure diverges from another

one whose underlying construct is conceptually unrelated to it. We can state how all constructs and the related variables meet discriminant validity standards, as the square roots of AVE (in bold in Table III) proved to be higher than the latent construct's correlation coefficients for any observed factor. All the correlation outputs are significant at the .01 level (2-tailed).

**Table 5.2 - Mean, standard deviation, and correlations for discriminant validity.**

Variable	Mean	Std. Deviation	REP	ER	INP	FIP	HRAN
REP	3.529	.537	<b>.779</b>				
ER	3.318	.657	.575**	<b>.732</b>			
INP	2.937	.735	.688**	.421**	<b>.735</b>		
FIP	3.879	.695	.521**	.364**	.278**	<b>.724</b>	
HRAN	2.013	.892	.478**	.523**	.499**	.638**	<b>.732</b>

**Source: Authors' elaboration.**

Overall, the CFA confirms the suitability of the measuring instrument and the trustworthiness of the data gathered, so that the authors proceed with structural modelling to test the advanced hypotheses.

### **5.4.3 Hypotheses testing and structural model**

After assessing the indicators of the measurement model, the authors carried out the CB-SEM to identify any relationship between the observed variables. Data analysis revealed all path coefficients to be statistically significant and supported (Table 5.3). First, we assessed the positive relationship between resilience-enhancing HR practices and employees' resilience attribute. In turn, the greater the resilience shown by employees, the greater the collected values related to innovation performance and financial performance of the company. The data-driven approach in HR analytics was also assessed, outlining its positive moderating role in enhancing the relationship between resilience-enhancing HR practices and employee resilience.

In conclusion, the relationships between each control variable and the endogenous variables in our model showed no significant results, suggesting how any observed variation in the dependent variables cannot be attributed to changes in the control variable, at least within the range and conditions covered by your study.

**Table 5.3 - Results of hypotheses testing.**

Hyphothesis	Path	Est. ( $\beta$ )	Sig. ( $p$ )	Result
HP 1	REP $\rightarrow$ ER	.287	.002	Supported
HP 2	HRAN * ER	.113	.000	Supported
HP 3.1	ER $\rightarrow$ INP	.210	.004	Supported
HP 3.2	ER $\rightarrow$ FIP	.087	.000	Supported

**Source: Authors' elaboration.**

## **5.5 Discussion**

The objective of this study was to investigate the relationship between specific HRM practices and employee resilience in SMEs, also considering the moderating role of HR analytics on this relationship, and between employee resilience and the organization innovative and financial performance. In particular, we outlined that HRM activities produce a high impact on employee resilience. This can be interesting for both future scholars, who may try to conduct further analysis to understand why these activities appear as the most influencing, as well as for practitioners. In fact, for SMEs, it can be difficult to design a wide set of HRM activities, so they can leverage our results to concentrate just on a narrow selection of the most effective ones.

Moving to the potential impact of HR analytics, we took a step further than the study of Xiao et al. (2023), by demonstrating that HR analytics can increase the positive impact of HRM activities on employee resilience, besides producing a direct positive effect on it. Moreover, the confirmation of a positive correlation between employee resilience and organizational performance adds depth to the discourse on the interplay between individual and organizational variables. This substantiates the intricate connections that can exist between these levels, further affirming the relevance of individual resilience in contributing to the broader framework of organizational resilience. The implications of these findings ripple across both scholarly and practical realms, shedding light on avenues for future research and offering actionable strategies for organizational enhancement in the distinctive landscape of SMEs.

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that can exist between these levels, further affirming the relevance of individual resilience in contributing to the broader framework of organizational resilience. The implications of these findings ripple across both scholarly and practical realms, shedding light on avenues for future research and offering actionable strategies for organizational enhancement in the distinctive landscape of SMEs.

### **5.5.1 Theoretical contributions**

The present study makes significant theoretical contributions to the field by addressing and rectifying limitations in previous research methodologies and by delving into the intricate relationships between HRM practices, HR analytics, employee resilience, and organizational outcomes. The following points encapsulate the theoretical advancements elucidated in this study.

First, in terms of methodology, this study moves away from the constraints of retrospective case analysis which was mostly applied by previous studies. This situation led to the identification of several different sets of HR activities that may be effective only within the context where they were identified, thus jeopardizing their applicability in other scenarios or circumstances. Our study, in contrast, leverages a robust quantitative methodology, the CB-SEM, to test the effect of the resilience-enhancing HRM practices identified by Bardoel et al. (2014). In this study, the authors identified some general HRM practices that should be able to enhance employee resilience despite the context where they were applied. However, to the best of our knowledge no previous studies have empirically tested this assumption. Some studies which tried to test similar relationships exist, but did not use such a broad set of HRM practices, just focusing on very specific sets depending on the objectives of their studies and/or on the context where they were conducted: Cooper et al. (2019) focused on wellbeing oriented HR practices, Lu et al. (2023) on sustainable HR practices, and Zhou et al. (2023) on high-performance working systems. The first two studies were conducted in China and the last one in Nigeria. All three studies recognize that the context where they were conducted, as well as the limited set of HR practices considered, may be a limitation. By including a broader set of activities and a continental, rather than national, sample, our work extends beyond these limitations, contributing to a more universal understanding of resilient HRM practices.

Second, our study responds to the call by Rodríguez-Sánchez et al. (2021) to identify, through the lenses of dynamic capabilities theory, not only which HRM practices are most effective for improving resilience, but also to delve into resilience subsequent outcomes such as, in our case, innovation and financial performance. We built on the dynamic capabilities theory, assessing the role of HRM practices in developing individual capabilities related to resilience attributes in response to a rapidly changing environment (Teece et al., 1997). In this vein, competitive advantage and long-term thriving for business can be achieved by fostering employees' capacity to constantly change and develop new capabilities that enable it to adapt to changing market conditions, technologies, and customer needs.

Third, despite previous studies often advocating that a more systematic approach would have fostered the impact of HRM on employee resilience, no previous studies tried to measure the actual impact of this approach. Our study thus goes a step further by empirically measuring the effect of HR analytics, a practical tool that enables organizations to systematize their approach towards HRM and make it a data-driven process, on the relationship between HRM practices and employee resilience. Our analysis thus ascertained that a systematic approach, facilitated by HR analytics, not only positively influences employee resilience but also translates into broader organizational benefits, including enhanced innovation and financial performance. This is particularly relevant in the context of SMEs, as these organizations are typically more affected by the negative repercussions of disruptive events.

### **5.5.2 Managerial implications**

The findings of this study also carry significant managerial implications for organizations seeking to enhance their performance through strategic HRM practices. Central to these implications is the robust confirmation of the positive influence of HRM practices on employee resilience. This revelation underscores the strategic role that HRM can play in fortifying the workforce against adversities. Organizations can leverage this insight to tailor and implement HRM activities that specifically contribute to fostering employee resilience. By doing so, they not only invest in the well-being and adaptability of their workforce but also pave the way

for a more resilient organizational culture. The strategic alignment of HRM practices to bolster employee resilience bears multifaceted benefits for organizations. By investing in the well-being and adaptability of their workforce, organizations cultivate an environment conducive to sustained high performance. This not only contributes to the overall organizational health but also positions the workforce to navigate challenges with resilience and agility, ultimately enhancing both individual and collective productivity.

Furthermore, the research underscores the instrumental role of employee resilience in driving organizational performance, particularly in terms of innovation and financial outcomes. Recognizing this interdependence, organizations can strategically position HRM practices as key drivers of innovation and financial success. By fostering employee resilience, organizations create a foundation for creative problem-solving, adaptability to market changes, and overall enhancement of the organizational bottom line.

Finally, the study sheds light on the positive moderating effect of HR analytics on the relationship between HRM activities and employee resilience. This highlights the strategic value of adopting HR analytics as a practical tool for decision-making. Organizations are encouraged to embrace HR analytics to systematize their HRM approach, transforming it into a data-driven process. By doing so, they not only enhance their ability to implement targeted HRM activities but also amplify the positive impact of these practices on employee resilience.

### **5.5.3 Limitations and future research avenues**

Despite its relevant contributions, this research is not exempt from limitations. First, the cross-sectional design employed in this study, while useful in capturing a snapshot of relationships at a specific point in time, limits the ability to establish causal relationships or observe changes over time. Future studies may enhance the robustness of findings by incorporating longitudinal designs, enabling a more nuanced understanding of the temporal dynamics of the relationships under investigation.

Second, the exclusive reliance on a quantitative approach may have constrained the depth of insights into the intricacies of HRM practices, employee resilience, HR analytics, and organizational outcomes. Future research endeavors could consider

adopting a mixed-methods approach, incorporating qualitative methods such as interviews or focus groups. This would allow for a richer exploration of the experiences and perceptions of both employees and managers, providing a more comprehensive understanding of the phenomena studied.

Third, the study's exclusive focus on employee resilience rather than organizational resilience presents a limitation in terms of comprehensiveness. Future research may extend its scope to encompass organizational resilience, providing a more holistic perspective on the adaptive capacities of entire organizations. This expansion would enable a nuanced exploration of how HRM practices contribute not only to individual resilience but also to the broader resilience of the organizational system. The absence of direct interviews with employees to gather data raises the possibility of divergencies between their self-perceived resilience and the perspective of managers, who have been surveyed to conduct the study. Future research may employ a multi-source assessment approach, combining self-report measures from employees with managerial evaluations. This triangulation of data would offer a more comprehensive and nuanced understanding of employee resilience by capturing both subjective and objective viewpoints.

Lastly, to overcome the possible effects of market fluctuations and provide a more precise appraisal, we relied on managers' subjective evaluations of innovation and financial performance, benchmarked against competitors. However, this may have introduced potential bias and subjectivity. Future research could employ more objective measures, such as financial reports, market share data, or innovation metrics. Incorporating objective indicators would enhance the reliability and validity of the findings, providing a more accurate representation of organizational performance in these domains.

## **5.6 Conclusion**

In recent years, individuals and organizations alike have grappled with unprecedented challenges, navigating a landscape of unpredictability that necessitated constant adaptation. As the ebb and flow of uncertainty reshaped the status quo, the imperative to not merely endure but thrive has become paramount. Against this backdrop, the surge of interest among researchers and practitioners in resilience, and its cultivation within employees, has marked an exponential

trajectory, injecting fresh vigor into an already burgeoning trend.

This research contributes a significant point of reference for organizations seeking clarity amid the intricate relationship between HRM practices and employee resilience. It serves as a valuable resource for organizations aiming to leverage our findings, forging strategies to fortify the resilience of their workforce. Beyond the individual level, the integration of HR analytics emerges as a transformative tool, poised to extend a positive ripple effect across overall company performance. This dual approach not only equips organizations to weather the uncertainties of our contemporary environment but positions them to flourish and evolve within this dynamic landscape.

### **Appendix: Variables and items**

<p><b>Resilience-Enhancing HRM Practices (REP)</b></p>	<p>REP1 Employees have access to training workshops in resilience development techniques.</p> <p>REP2 Employees have access to flexible work arrangements that help employees to cope with multiple work and non-work demands.</p> <p>REP3 Employees have access to employee involvement in decision-making about organisational change.</p> <p>REP4 Employees have access to an employee assistance program.</p> <p>REP5 Employees have access to event response programs such as grief counselling.</p> <p>REP6 In organisational restructuring, changes are made to the reward systems to accommodate employee interests (e.g. reduction of bonuses rather than termination of some workforce members).</p> <p>REP7 In organisational restructuring, changes are made to working conditions to accommodate employee interests (e.g. changes to shifts or working hours rather than termination of some workforce members).</p> <p>REP8 There is a crisis management plan that includes items such as such as emergency compensation for displaced employees.</p> <p>REP9 Employees have access to work–life balance practices.</p> <p>REP10 OHS systems are designed to address mental health.</p>	<p>Bardoel, Pettit, De Cieri, &amp; McMillan, 2014</p>
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	<p>REP11 The organisation has a system to manage return to work following a workplace injury or period of extended leave.</p> <p>REP12 The organisation has flexible rewards and benefits to accommodate the diverse needs of employees.</p> <p>REP13 The organisation embraces/encourages diversity of ideas.</p> <p>REP14 The organisation embraces/encourages diversity of people.</p>	
<p style="text-align: center;"><b>HR Analytics (HRAN)</b></p>	<p><u>High-quality data</u></p> <p>HQD1 The HR data we have is correct and accurate.</p> <p>HQD2 The HR data we have is generally updated once a year. (RC)</p> <p>HQD3 The HR data we have is presented in the same format (consistency of measurement and data collected).</p> <p>HQD4 The HR data we have is complete and no necessary data are missing.</p> <p>HQD5 The HR data we have are collected on a regular basis.</p> <p><u>Analytical competency</u></p> <p>AC1 Our HR Department translates data into useful insights for the organization.</p> <p>AC2 Our HR Department identifies organization's problems that can be solved with data.</p> <p>AC3 Our HR Department used data to influence the organizational decision making.</p> <p>AC4 Our HR Department effectively uses HR analytics to create value for the organization.</p> <p>AC5 Our HR Department identifies important questions about the organization that can be answered with data.</p> <p>AC6 Our HR Department struggles with interpreting statistics. (RC)</p> <p><u>Strategic Ability to Act</u></p> <p>SAA1 Our HR Department has success stories to justify HR analytics projects.</p> <p>SAA2 Our HR Department inspires relevant organizational stakeholders (e.g. senior management teams and line managers) to take action on the basis of their findings.</p> <p>SAA3 The data-driven insights that we provide are used by our organization's stakeholders.</p>	<p style="text-align: center;">McCartney, &amp; Fu, 2022</p>

<p><b>Employees Resilience (ER)</b></p>	<p><u>Cognitive dimension of employee-level resilience</u>  RCG1 Our employees usually use expert advice to deal with challenges.  RCG2 Our employees usually seize opportunities presented by crises.  RCG3 Our employees are usually creative in responding to crises.  RCG4 Our employees often struggle with making decisions, especially in uncertain situations. (RC)  RCG5 Our employees usually question the fundamental assumptions about running the business.  RCG6 Our employees usually develop novel and appropriate solutions.</p>	
	<p><u>Behavioral dimension of employee-level resilience</u>  RBD1 Our employees usually devise unconventional, yet robust responses to unprecedented challenges.  RBD2 Our employees usually combine originality and initiative to capitalize on immediate situations.  RBD3 Our employees sometimes follow a dramatically different course of action from what is the norm for the organization.  RBD4 Our employees practice repetitive, over-learned routines as the first response to any unexpected threat.  RBD5 Our employees take actions and make investments before they are needed to ensure that the organization can benefit from emerging situations.</p>	<p>Santoro, Messeni-Petruzzelli, &amp; Del Giudice, 2021</p>
	<p><u>Contextual dimension of employee-level resilience</u>  RCT1 Our employees develop interpersonal connections and resource supply lines that lead to the ability to act quickly.  RCT2 Our employees share information and knowledge widely across the organization.  RCT3 Our employees are involved in sharing power and accountability within the organization.</p>	

<p><b>Innovation Performance (INP)</b></p>	<p><u>Product innovation</u>  PROD1 The level of newness (novelty) of our firm’s new products.  PROD2 The use of latest technological innovations in our new products.  PROD3 The speed of our new product development.  PROD4 The number of new products our firm has introduced to the market.  PROD5 The number of our new products that is first-to-market (early market entrants).</p> <p><u>Process Innovation</u>  PROC1 The technological competitiveness of our company.  PROC2 The speed with which we adopt the latest technological innovations in our processes.  PROC3 The updatedness or novelty of the technology used in our processes.  PROC4 The rate of change in our processes, techniques and technology.</p>	<p>Prajogo &amp; Ahmed, 2006</p>
<p><b>Financial Performance (FIP)</b></p>	<p>FP1 Return on investment.  FP2 Market share in volume.  FP3 Market share in value.  FP4 Revenues.  FP5 Profitability (%).  FP6 Gross margin (profitability/total sales).</p>	<p>Akgün &amp; Keskin, 2014;  Spanos &amp; Lioukas, 2001</p>
<p><b>Control Variables</b></p>	<p>Size of the company  Industry  Country  Firm age (number)  Organizational type (multinational/domestic)</p>	<p>Akgün &amp; Keskin, 2014;  McCartney, &amp; Fu, 2022;  Perotti, Belas, Jabeen, Bresciani, 2023</p>

Source: Authors’ elaboration based on previous studies.



## **Chapter 6 – General discussion and conclusion**

## 6.1 Introduction

In an increasingly complex and competitive world, the importance of managing organizational resources in a proper way is gaining more and more relevance (Dubey et al., 2023). The last decades saw a growing recognition of the importance of the human resources of the organization, which were finally put on an equal footing with other organizational resources, if not above them (Minbaeva, 2017). In order to better manage their human resources, organizations are resorting more and more to new technological tools able to improve the efficiency and effectiveness of their HR activities (van den Heuvel & Bondarouk, 2017). Among these, HR analytics holds the promise of allowing organizations to adopt a data-driven approach also when it comes to the management of their workforce, something that could be useful not only within the realm of HR management, but also to improve wider organizational outcomes (McCartney & Fu, 2022). The last decade saw a growing interest in HR analytics also from the academic world. Nonetheless, the majority of studies on the topic adopted a theoretical perspective (Levenson & Fink, 2017), with just a few exceptions aimed at measuring the direct impact of HR analytics on organizational phenomena or activities directly controlled or performed by the HR department (McCartney & Fu, 2022). However, a review of the literature dedicated to HR analytics reveals that both the definitions that have been proposed and the objectives that have been attributed to this tool over the years are converging towards the proposition of HR analytics as a tool capable of providing insight that may be useful to improve the outcomes of several organizational activities, not necessarily limiting its potentialities to the HR department (Falletta & Combs, 2021). As a consequence, to advance the academic knowledge on the topic, it is worth investigating HR analytics' role as a facilitator of organizational initiatives rather than as an antecedent of organizational outcomes, testing the effect of a data-driven approach enabled by this tool on activities performed both within and outside the HR department. In light of this, the present dissertation aimed to answer three main research questions:

RQ1: Can a data-driven approach enabled by HR analytics improve the effectiveness of the activities directly controlled by the HR department?

RQ2: Can the reliance on the insight offered by HR analytics improve the effectiveness of activities performed outside the HR department?

RQ3: What is the ultimate impact of an HR analytics, data-driven approach on organizational performance?

The four articles included in this thesis were based on the assumptions of the contingency theory applied to HR management. Such theory claims that, for HR practices to be effective, these should be aligned with the specific organizational context and with the broader organizational strategy. The insight provided by HR analytics should allow organizations to do so, thus improving the effectiveness of their HR management activities. Furthermore, this insight may also be useful to improve the effectiveness of other organizational activities not directly controlled by the HR department but that could, nonetheless, benefit from being aligned with the actual needs and the specific characteristics of the organizational workforce.

## **6.2 Findings and theoretical contributions**

### **6.2.1 RQ1: Can a data-driven approach enabled by HR analytics improve the effectiveness of the activities directly controlled by the HR department?**

Although it may seem like a trivial question, empirical confirmation of HR analytics' ability to improve the effectiveness of HR activities is essential to validate the assumptions of existing literature. The current body of work is predominantly theoretical, with limited empirical studies primarily examining HR analytics' direct impact on various business phenomena, positioning it as an antecedent rather than a facilitator (e.g. Huang et al., 2023; McCartney & Fu, 2022). By testing its ability to function in this latter capacity, we aim to assess not merely the effect of HR analytics itself but the broader impact of a data-driven approach enabled by this tool. This approach will allow us to confirm the propositions put forth in conceptual literature and provide a more comprehensive understanding of HR analytics' role in enhancing HR activities. Expanding the empirical evidence in this area is crucial for bridging the gap between theory and practice, ultimately leading to more effective HR management strategies.

To address this initial research question, the first article in this dissertation aimed to test whether adopting a data-driven approach enabled by HR analytics could

enhance the effectiveness of traditional HR department activities, specifically talent management. The study focused on evaluating how the integration of HR analytics impacts the relationship between key talent management activities, such as identification of critical positions, talent acquisition and talent development, and talent motivation and the quality of hires. The results of the study confirmed this hypothesis. Firstly, a positive correlation was identified between talent management activities and talent motivation, as well as between talent management activities and the quality of hires. These findings suggest that effective talent management practices can lead to higher employee motivation and better hiring outcomes. Moreover, the study observed that the positive link between talent management activities and outcomes was more pronounced in companies that had implemented HR analytics compared to those that had not adopted the tool. This indicates that HR analytics not only enhances the effectiveness of talent management activities but also amplifies the positive outcomes associated with these practices.

Obtaining these results entails significant theoretical contributions. First, from the perspective of HR analytics literature, it serves as a crucial starting point for empirically confirming the assumptions of contingency theory applied to HR management. This validation underscores the potential positive impact of a data-driven approach enabled by HR analytics. Furthermore, the study empirically confirms the potential benefits of HR analytics specifically in the area of talent management, as suggested by previous theoretical literature (e.g. Gurusinghe et al., 2021; Mayo, 2018).

In addition, investigating the effect of HR analytics allows this study to take a step beyond the previous literature devoted to talent management. In fact, previous studies had already hypothesized and confirmed that aligning talent management activities with the specific organizational context can enhance their impact (e.g. Kontoghiorghes, 2016; Langenegger et al., 2011). However, these studies had limited themselves to testing "soft" aspects of achieving this alignment, such as organizational culture (Harsch & Festing, 2020). These aspects, although fundamental, are very difficult to manage, as well as not modifiable except in the long run. In contrast, HR analytics represents a "hard" tool that can be used to provide this alignment. This, of course, does not mean that the mere implementation

of this tool in organizations will be able to guarantee the success of talent management activities. However, this tool will be able to provide data-driven insights that, if properly leveraged, will enable the design of talent management activities based on the specific organizational context.

While addressing the same research question, the second study included in this dissertation takes a step further. In fact, by investigating the moderating effect of a data-driven strategy enabled by HR analytics on the relationship between HRM and organizational creativity, it broadens the purview of HR analytics to potentially potentiate those activities that, while still being a prerogative of the HR department, are able to produce an impact also on a practical capability as their creativity, which may be transversally applied overall the organizational context. The results of the study highlighted that three HR practices, namely employee training, organizational knowledge sharing, and recruitment and selection activities are positively related to organizational creativity, whilst no significant relationship was found between employee rewards and incentives and creativity. The findings also confirmed the potentialities of HR analytics, as the organizations who implemented this tool once again presented a more pronounced link between their HR management activities and organizational creativity. It is worth noting that, on the contrary, the organizations that used HR analytics did not present a stronger relationship between their rewards and incentives initiatives and their organizational creativity. These results provide further confirmation of the conceptualization of HR analytics as a catalyst rather than as an antecedent to either HR or organizational outcomes: the insight derived by the tool may help in guiding organizational activities, but it does not work as a *deus ex machina* able to guarantee their unconditional success. In any case, the consideration of HR analytics' role in this context also allowed us to explore the impact of innovative approaches to fostering organizational creativity, overcoming the limitations of traditional HR activities. Moreover, this study advanced the academic knowledge on the topic by clarifying the mixed findings of previous literature regarding the antecedents of organizational creativity (e.g. Nawaz et al., 2014; Zhang et al., 2015). Specifically, previous literature has often examined HRM practices as a collective entity (Song et al., 2019), sometimes yielding inconclusive or inconsistent results regarding their impact on

organizational creativity. By disaggregating HRM practices and assessing their individual effects, this study provides a more granular view, pinpointing the exact mechanisms through which HRM can influence creative outcomes, rather than attributing the effect to a broad and undefined set of practices. Such a granular approach helps clarify why previous studies might have reported mixed results. Aggregated studies may mask the distinct effects of individual practices, leading to contradictory findings. For instance, while training and knowledge sharing might positively impact creativity, other practices like rigid performance appraisals or certain reward systems might not. Disaggregating these practices reveals their unique contributions and mitigates the risk of conflating their effects. Such an approach should enhance the theoretical precision of HRM-creativity research, allowing scholars to develop more accurate models and theories that specify the conditions under which each practice is likely to be effective. This specificity helps build a more robust and testable body of knowledge.

The finding that the implementation of rewards and incentive systems does not significantly influence organizational creativity challenges some traditional assumptions in HRM literature. It suggests that while rewards and incentives may drive performance in routine tasks, their role in promoting creativity is limited. This could be due to the complex and intrinsic nature of creative processes, which are not always aligned with extrinsic rewards. This observation encourages further exploration into the contextual factors that may moderate the effectiveness of reward systems in creative endeavors. The study suggests a need to rethink traditional reward systems in the context of creativity. Organizations may benefit from exploring alternative motivational strategies that align more closely with the intrinsic nature of creative work. This could include offering greater autonomy, providing opportunities for meaningful work, and fostering a supportive and inclusive culture that values creative efforts.

Finally, the fourth article also contributes to the discussion regarding the beneficial influence of HR analytics on the activities directly controlled and performed by the HR department by investigating its moderating effect on the relationship between resilience-enhancing human resource management practices and employee resilience. The study goes one step further than the previous ones as it is not

confined to assessing the differences between the organizations that are using HR analytics and those that still have not implemented this tool. On the contrary, in this study only the former were included, demonstrating that the organizations with the higher maturity level with the tool (measured in terms of high-quality data, analytical competencies, and strategic ability to act) typically presented more effective resilience-enhancing human resource management practices than their less expert counterparts. This is quite an important contribution as, to the best of our knowledge, it represents the first assessment of the actual strength of HR analytics as a facilitator depending on the actual skills, competencies and capabilities of organizations, rather than on the mere implementation of the tool. Such an approach provides further confirmation of the new conceptualization of HR analytics that has been proposed in the introduction of this dissertation.

Furthermore, the consideration of the role of HR analytics on the relationship between resilience-enhancing human resource management practices and employee resilience provides a first assessment of the impact of a systematic approach aimed at fostering employee resilience. In fact, previous literature had long advocated for such an approach (Lengnick-Hall et al., 2011). However, no previous studies had actually confirmed its efficacy. We thus propose HR analytics as a practical tool to reach this systematic approach, providing organizations with the necessary information and insight to design HRM practices reflecting the exact needs, desires, and inspirations of their workforce, as well as taking into account the exogenous contingencies that may affect the organizational environment. The study thus advances theoretical understanding by elucidating the mechanisms through which HRM practices influence employee resilience. By demonstrating that HR analytics can effectively moderate this relationship, the study clarifies several critical mechanisms. First, HR analytics enables the systematic identification of stressors and resilience-related needs within the workforce by leveraging large datasets and sophisticated analytical techniques. This allows for the precise detection of patterns and trends that are not readily apparent through traditional HR methods, providing a deeper theoretical insight into the specific factors that contribute to employee resilience. Second, the ability of HR analytics to tailor HRM interventions based on data-driven insights enhances the theoretical understanding of individualized and

group-level dynamics in resilience-building. This aligns with theories of personalized HRM, which advocate for the customization of HR practices to fit the unique characteristics and needs of employees, thereby maximizing the effectiveness of resilience-enhancing strategies (Huang et al., 2023). Third, HR analytics facilitates the ongoing monitoring and assessment of HRM interventions, which is crucial for understanding the dynamic and evolving nature of employee resilience. The continuous feedback loop enabled by HR analytics supports the development of adaptive HRM models that can respond to changing employee needs and organizational contexts, contributing to the theoretical discourse on the fluidity of resilience (Prayag et al., 2024). Fourth, the study underscores the theoretical importance of evidence-based HRM, where decisions are grounded in empirical data rather than anecdotal evidence or managerial intuition. This paradigm shift towards evidence-based practices aligns with broader theoretical frameworks in management science that emphasize the critical role of data and analytics in enhancing organizational effectiveness (Akter et al., 2016). Lastly, by demonstrating the predictive capabilities of HR analytics, this study contributes to the theoretical understanding of proactive HRM. The ability to anticipate resilience-related challenges before they manifest supports the development of forward-looking HRM models that integrate predictive analytics into strategic planning, thereby advancing the theory on proactive organizational behavior and resilience (Lu et al., 2023).

In summary, these three articles provide strong confirmation of HR analytics' role as a facilitator to improve the effectiveness of heterogeneous HRM practices directly controlled by the HR department. Notably, the potential benefits of HR analytics extend beyond traditional HR activities, such as those related to talent management, to include more peculiar and specialized activities as those intended to foster the creativity or the resilience of the workforce. HR analytics is thus confirmed as a crucial tool at the disposal of HR functions to elevate their operations, enabling them to properly implement the data-driven approach that is typically taken for granted in other organizational departments.



### **6.2.2 RQ2: Can the reliance on the insight offered by HR analytics improve the effectiveness of activities performed outside the HR department?**

In the last decade, theoretical studies on HR analytics have proposed a new conceptualization of this tool, hypothesizing its ability to guide not only the activities performed within the boundaries of the HR department, but also of other activities that may benefit from the insight provided by this tool (Falletta & Combs, 2021). To confirm this proposition, the third study included in this dissertation aimed at verifying whether a data-driven approach, guided by HR analytics, was able to improve the relationship between social sustainable operations practices and the motivation and engagement of employees. Social sustainable operations practices represent the ideal activities to test the potentialities of HR analytics also beyond the HR department: in fact, whilst these are aimed at improving employees' working conditions, health, and safety, showing therefore a strong connection with the organizational workforce, they are typically strictly operational initiatives (Gimenez et al., 2012). Consequently, whilst HR departments may provide precious consultancy and expertise, they cannot implement social sustainable operations practices by themselves. On the contrary, this responsibility typically falls on the operations management department. However, the availability of insight regarding the necessities of employees, as well as of predictive analysis on the potential criticalities to which they might be exposed in the future, may help in designing social sustainable operations practices in line with the specific actual and future necessities of the workforce.

The results of the analysis confirmed the potentialities of HR analytics also beyond the boundaries of the HR department, as the organizations that implemented this solution typically presented a stronger relationship between their social sustainable operations practices and their employees' motivation and engagement than the organizations that still did not rely on this tool. Such demonstration advances the academic knowledge regarding HR analytics in two complementary ways. First, it takes a first step towards the refinement of existing HR analytics theoretical models that, leading to the development of new approaches that better capture the multidimensional effects of HR analytics across the organization, pave the way for more comprehensive and inclusive frameworks. Thus, the empirical evidence

necessitates the refinement of existing HR analytics models to incorporate variables and outcomes related to non-HR functions. Traditional models focused solely on HR metrics and outcomes must be expanded to include broader business performance indicators. New models should therefore explicitly account for the multi-functional impact of HR analytics, going beyond HR to include strategic business outcomes, thereby providing a more comprehensive understanding of how HR analytics drives overall organizational success. In this sense, we could consider this first development as an “inward evolution” of HR analytics theoretical models, which should systematically include also broader business indicators. Second, the empirical demonstration that HR analytics can positively impact non-HR activities provides strong support for interdisciplinary theories that emphasize the interconnectedness of organizational functions. It validates the notion that human capital data, traditionally confined to HR, can have significant implications for other areas of the business. Such results thus provide empirical backing to theories suggesting that value chains within organizations are highly integrated (Papazoglou et al., 2000). When HR analytics is shown to improve outcomes in non-HR functions such as supply chain management, marketing, or customer service, it substantiates the idea that workforce-related data is integral to the entire value chain. This may be seen as an “outward evolution” of HR analytics models, which could better forecast performance and identify areas for improvement across all functions.

In addition to the contribution to the literature related to HR analytics, as this study is the first to demonstrate its potentialities also beyond the HR department, this research also provides advancements to the operations management literature. In fact, previous studies on the topic already proposed that a data-driven approach could have benefited the three dimensions of sustainability – i.e., environmental, financial, and social sustainability (Del Giudice et al., 2021). However, these studies typically focused on the first two dimensions of sustainability, whilst empirical confirmation of the positive effect of a data-driven approach on its social side was still needed. Similarly to what happened for HR analytics-related literature, the few studies that took into account the social side of sustainability tested the direct impact of new data-driven technologies, as big-data-based

solutions, on the sustainable performance of companies, rather than verifying whether the adoption of a data-driven approach would have increased the effectiveness of initiatives aimed at improving the social sustainability of organizations (Raut et al., 2019; Zhu & Yang, 2021). By adopting this last approach, this study represents an important advancement toward the consideration of sustainability from a holistic perspective, as a data-driven approach may actually be beneficial across all three dimensions of sustainability.

### **6.2.3 RQ3: What is the ultimate impact of an HR analytics, data-driven approach on organizational performance?**

The four studies included in this dissertation all contribute to responding to this last research question. The first and third study do so by investigating the relationship between three employee level outcomes, namely employee motivation, quality of hires, and employee engagement, and an organizational level outcome, employee retention. The results of both studies provide confirmation of these positive relationships. Consequently, it is possible to affirm that the positive benefits of HR analytics are not limited to the employee level but may also be translated to the organizational one. This provides further advancement towards the proposition of new “inward-outward” HR analytics theoretical models to better reflect the higher potentialities of the tool. Furthermore, we clarified the blurred relationship between the four aforementioned outcomes, as previous research had approached them in various ways. In some cases, one outcome was treated as the antecedent of the other, in others as a moderator, and sometimes the relationship was even reversed (Wollard & Shuck, 2011). Our results thus provided theoretical clarification of the relationships existing among the constructs, helping to create a more comprehensive view of workforce dynamics. This should therefore contribute to the development and refinement of comprehensive theories in organizational behavior, allowing scholars to create more robust models that accurately reflect the complex interactions between different employee- and organizational-related factors. Such clarification may be considered as a first step towards the identification of causal pathways, enabling a deeper understanding of how these factors influence each other and lead to certain outcomes, as well as for longitudinal

studies that can track changes over time, providing insights into the long-term effects of employee motivation, engagement, and retention strategies.

The second study included in this dissertation takes a step further, as it considers the effect of an HR analytics, data-driven approach on the direct relationship between HRM activities and an organizational outcome as organizational creativity. The empirical confirmation of the possibility for HR analytics to influence such outcomes provides a great contribution to the conceptualization of HR analytics as a tool able to improve high stake decisions making. In fact, since organizational creativity has been proven to be a significant precursor to organizational innovative capacities and, as a consequence, of organizational competitiveness, decisions regarding how to develop and manage organizational creativity can indeed be considered as high stake decisions, since incorrect choices may produce a substantial negative impact on the organization, potentially jeopardizing its competitiveness also in the long run (Olszak & Kisielnicki, 2016).

The confirmation of the potential of HR analytics to produce an impact in such a peculiar context as creativity, as well as in the sustainability realm as demonstrated in our third study, can be considered as an additional contribution to the literature related to the topic, as both represent “soft” aspects of organizational performance. As such, this demonstrates the versatility of HR analytics, which may be used to boost heterogeneous aspects of organizational performance. Furthermore, the consideration of a data-driven approach enabled by HR analytics contributes to the literature dedicated to organizational creativity by assessing the impact of an innovative approach to fostering this outcome. In fact, previous studies on the topic suggested the need to find innovative solutions to foster creativity, but only a minority of them proposed and tested the impact of specific tools or strategies that may be used to do so (Ikhida et al., 2022). Furthermore, the study contributed to clarifying the mixed findings on the antecedents of organizational creativity (Nawaz et al., 2014; Zhang et al., 2015). Whilst the positive effect of employee training, knowledge sharing, and recruitment and selection practices was confirmed, the same cannot be stated for the implementation of rewards and incentive systems. Such knowledge may be used to design more effective initiatives to foster

organizational creativity, with consequent positive impacts on the overall organizational performance.

Finally, the fourth paper demonstrates that the beneficial impact of resilience-enhancing human resource management practices is ultimately translated into better organizational performance, in terms of product and process innovation and financial performance. Such result advances the academic knowledge on the topic by delving into the subsequent outcomes of resilience through the lenses of dynamic capabilities theory. As such, this study provides a more complete understanding of resilience, demonstrating the positive relationship between this construct and broader organizational outcomes not only when considering it at the organizational level, i.e. organizational resilience, but also at the individual level, i.e. employee resilience. This significantly enriches existing frameworks within organizational behavior and resilience theory, highlighting the contribution of resilient employees to the enhancement of the adaptive capacity of the organization as a whole. This insight paves the way toward a more integrated model of resilience, where the micro-level (individual) and macro-level (organizational) resilience are interdependent and mutually reinforcing. It advances our understanding of resilience by proposing that employee resilience acts as a foundational element that drives superior performance, innovation, and adaptability in the face of challenges. This relationship implies that theories of organizational success must account for the resilience attributes of both individuals and the organization, leading to a more comprehensive and nuanced conceptualization of how resilience influences broader organizational outcomes. Such theoretical advancements pave the way for more holistic strategies in resilience building, suggesting that investments in employee resilience development can yield substantial organizational benefits.

Similarly, by including the moderating effect of HR analytics in the analysis, the study also demonstrates that the beneficial impact of a systematic approach to foster resilience does not end on the individual, employee level, but is also translated at the organizational level.

#### **6.2.4 Contribution to the contingency theory of human resource management**

One of the central assumptions of the thesis was the proposition, advanced both in the introduction and within the articles, that HR analytics can enhance the alignment

between HRM activities (or, more precisely, of people-oriented organizational activities) and both environmental demands and employee needs, which ultimately leads to more effective HRM practices. This argument is grounded in the contingency theory of HRM, which posits that the effectiveness of HR strategies is contingent upon their alignment with the organization's internal and external environment (April Chang & Chun Huang, 2005; Delery & Doty, 1996). In this context, HR analytics provide organizations with data-driven insights that allow for more adaptive and responsive decision-making processes (Margherita, 2022). These insights facilitate a better fit between HR practices and the organization's specific conditions (Ellmer & Reichel, 2021), such as its culture, workforce composition, and external market trends.

However, it is important to acknowledge that this argument, while theoretically grounded, was not empirically tested within the scope of this dissertation. In fact, the primary focus of the thesis was to examine whether an HR analytics, data-driven approach to reach the fit between people-oriented organizational activities and the specific organizational context ultimately translated into greater effectiveness of the practices that were informed by these insights, rather than testing whether HR analytics itself directly leads to such better alignment. The assumption that HR analytics enhance the alignment between HRM activities and organizational needs is grounded in a growing body of literature that highlights the strategic value of data-driven decision-making in HRM. At its core, HR analytics involves the systematic collection, analysis, and application of employee and organizational data to inform HR decisions (Falletta & Combs, 2021). This data-driven approach enables HR professionals to move beyond traditional, intuition-based decision-making and adopt more evidence-based practices that are better suited to the specific conditions of their organizations (Chalutz Ben-Gal, 2019).

One of the primary mechanisms through which HR analytics fosters alignment is by providing actionable insights into both internal workforce dynamics and external environmental factors. Internally, HR analytics helps organizations better understand employee behaviors, needs, and performance patterns by analyzing data on employee engagement, turnover, productivity, and other key indicators (Shah et al., 2017). These insights allow HR professionals to tailor their strategies to better

meet the diverse needs of employees, improving satisfaction and retention while aligning HR practices with workforce demands (McIver et al., 2018). For example, analytics can help identify skills gaps within the organization, enabling targeted learning and development programs that address specific needs and optimize talent management (Thakral et al., 2023).

Externally, HR analytics supports alignment by helping organizations monitor and respond to changing market conditions, economic trends, and industry benchmarks (Ulrich & Dulebohn, 2015). By tracking labor market data, competitor practices, and broader economic shifts, HR teams can adapt their policies and practices to remain competitive and responsive to external pressures (Shet et al., 2021). For instance, compensation strategies can be adjusted based on market data to ensure they remain attractive to top talent (Chalutz Ben-Gal, 2019; van den Heuvel & Bondarouk, 2017). Furthermore, predictive analytics allow organizations to anticipate future workforce challenges, such as potential talent shortages, enabling proactive workforce planning that aligns with long-term business goals (Chalutz Ben-Gal, 2019; Tursunbayeva et al., 2018; van den Heuvel & Bondarouk, 2017).

Additionally, HR analytics enhances the flexibility of HRM activities by allowing real-time adjustments based on up-to-date data (Chalutz Ben-Gal, 2019). This agility is crucial in dynamic environments, where employee needs and external conditions can shift rapidly (McIver et al., 2018). For example, during times of economic uncertainty or organizational restructuring, HR analytics can provide the necessary insights to quickly pivot HR strategies in response to new challenges, ensuring continued alignment between HR activities and evolving organizational needs (Shah et al., 2017).

In sum, HR analytics promotes a more adaptive and evidence-based approach to HRM by providing data-driven insights that inform decision-making, fostering both internal and external alignment. This alignment is achieved through better understanding and responding to employee needs and market conditions, resulting in more effective and strategically aligned HR practices. The four articles included in this thesis provide strong confirmation of HR analytics' role as a facilitator that enables the implementation of a data-driven approach to activities conducted both within and outside the boundaries of the HR department. Furthermore, the fact that

organizations using HR analytics could design more effective activities than those not using this technology, along with the positive moderating effect of the maturity level of organizations' HR analytics on the relationship between these activities and their outcomes, provides robust empirical confirmation for the assumptions of contingency theory applied to HRM (Delery & Doty, 1996).

The demonstration of the moderating role of HR analytics provides empirical confirmation to the assumption of the contingency theory that the relationship between the pertinent independent and dependent variables will vary across different levels of the critical contingency variable (Delery & Doty, 1996). HR analytics is thus proposed as a critical tool to potentiate the effectiveness of heterogeneous organizational activities, depending on the maturity level of organizations with the tool. Furthermore, the consideration of both individual and organizational outcomes allowed us to consider HR analytics' role in the interaction between HR-related practices and overall organizational performance. Such an approach further reinforces the intertwined relationship between HR strategy and firm strategy: HR analytics may be the appropriate tool not only to increase the connection between the two, but also to finally reach their complete hybridization, cementing the strategic valence of managing the human resources of the organization.

The confirmation of HR analytics potentialities also empirically confirms the intra-organizational perspective of the contingency theory of HR management (Clinton & Guest, 2013). The insight provided by the tool may be useful for organizations to refine their strategies based on the actual needs and necessities of the group of employees to whom they will be directed, all the way to the possibility of customized approaches in the case of more advanced HR analytics solutions. By doing so, HR analytics will aid organizations in better conveying the actual beneficial intentions of their HR-related activities to their employees, avoiding potential negative reactions due to the perception of these activities as something only based on the interest of the company rather than of those of its workforce.

In addition, the results of the four studies collectively concur in advancing the contingency theory of HR management. First, the four research detach from the large majority of studies that adopted this theoretical lens, as they typically aimed



to demonstrate that organizations relying on a contingent approach were able to obtain better results than those adopting a universalistic approach (e.g. Clinton & Guest, 2013; Tzabbar et al., 2017). However, these studies did not provide any information regarding how such a contingency approach could be reached. On the contrary, our study highlights HR analytics as a specific tool able to provide organizations with the necessary information for adopting the data-driven decision-making process that constitutes the basis for a contingent approach. Second, this thesis constitutes a first attempt to further elaborate the premises of the theory, which entails interactions rather than the straightforward linear relationships characteristic of the universalistic perspective (Schoonhoven, 1981; Van de Ven & Drazin, 1985; Venkatraman, 1989). More specifically, the core of the theory suggests that the connection between the independent and dependent variables of interest will change depending on the varying levels of the crucial contingency variable (Delery and Doty, 1996). However, previous studies typically tried to empirically validate this argument by focusing on the importance of reaching internal and external fit, typically by aligning organizational HR practices with the most important organizational and environmental factors (April Chang & Chun Huang, 2005). In substance, the main aim of previous studies was to find the most determining contingency factor, typically organizational strategy (Delery & Doty, 1996), and to demonstrate that the higher the fit between HR practices and the crucial contingency factor, the higher the success of HR management activities. Recent studies have tried to integrate this view with new factors such as industry, company size, and environmental intensity (Harney, 2023), but the theoretical conceptualization remained almost unchanged. On the contrary, we propose HR analytics not as a contingent factor, but as the tool able to take into consideration not only the factor that emerged as the crucial one but, ideally, all the factors that may concur in determining the final outcome of (not only) HR activities. Such an approach enables the differentiation of strategies within the organization, adapting to the needs of the group of employees to whom these activities are directed, or even to the specific necessities of individuals, if needed. In practice, through the consideration of HR analytics, this thesis represents a first attempt to move towards

a “contingencies” theory of HR management, overcoming the “single factor” approach of previous empirical studies on the topic.

### **6.3 Managerial implications**

The findings of this dissertation also have important implications for practitioners. The most immediate and easiest to identify are those related to the diffusion of HR analytics within organizations. Despite the impact that the adoption of HR analytics can have not only on the human resource management of organizations, but generalizable to different aspects of business performance, there are still few companies that have been able to develop an in-house division dedicated to HR analytics, mainly multinational companies (Andersen, 2017). Moreover, so far it seems that, with few exceptions, the phenomenon is confined to a few industries, particularly the financial and technology sectors, as well as limited to a few geographic areas, with the United States and, to a lesser extent, the United Kingdom leading the way. Although these multinationals have achieved interesting results and have been able to create value through HR analytics activities, the situation in the vast majority of companies is quite different. In fact, these show a still immature approach to the topic, struggling as early as the implementation stages of HR analytics functions, still presenting obvious difficulties in providing robust descriptive analyses in a systematic manner (Levenson & Fink, 2017). In contrast, HR analytics remains a relatively unknown practice in most organizations, both within HR departments and in the rest of the enterprise. Generally, analytics projects are often seen as something additional, rather than basic. As a result, so-called "early adopters" are facing the issue of having to get people to understand what HR analytics is, what its purpose is, and how it can create value for the organization (van den Heuvel & Bondarouk, 2017).

In the majority of companies, HR departments are facing significant challenges in overcoming internal issues and evolving into a consultative role that can effectively support top management in the decision-making process (Dahlbom et al., 2019). These functions often operate with a service-oriented mindset focused on fulfilling immediate operational needs rather than strategically aligning with broader organizational goals. According to van den Heuvel and Bondarouk (2017), this lack of involvement in decision-making processes or perceived lack of credibility of HR

departments hampers the influence of HR analytics insights. As a result, only a small percentage of HR departments are capable of developing predictive models, and even fewer can create prescriptive models that recommend specific actions based on data analysis (Levenson & Fink, 2017). Contrarily, many organizations struggle to produce basic operational reports on their workforce due to the heterogeneous nature of their HR information systems. This diversity impedes advancements in measuring and analyzing more complex aspects of workforce management, such as providing reliable assessments of group or individual performance (Dahlbom et al., 2019).

However, overcoming this first conception does not always offer the ultimate solution to the problems encountered: often, in fact, the few organizations that are able to do so use such a large amount of data and models that are so complex as to make them difficult to understand and interpret, and there are still few tools that can simplify access to them even for the non-experts who would need them, particularly executives (Fernandez & Gallardo-Gallardo, 2021) and HR department members who are not part of the HR analytics team. Moreover, it may be the case that the results obtained from these analyses are in open conflict with the insights and experiences of executives, who, being unable to decipher the patterns behind these conclusions, may decide to reject them. Basing their decisions on the systematic use of data and analytics is indeed still new to many managers, who still rely heavily on their feelings and intuitions, showing many difficulties in understanding and accepting the application of HR analytics in the decision-making process (van den Heuvel & Bondarouk, 2017).

Demand for new insights regarding the workforce has reached a new all-time high in recent years and is now nearly universal. Indeed, in 2020, 97 percent of respondents to the annual Global Human Capital Trends survey conducted by Deloitte said they felt a need for additional information regarding some aspect of their workforce. However, only 56 percent of respondents say their organization has shown moderate or significant progress in this area over the past 10 years. In fact, although 83 percent say their organization is able to produce information on the condition of their workforce, only 11 percent are able to perform these activities in real-time, while 43 percent say they produce this information only on demand or

not at all. Thus, it is evident that while interest in HR analytics remains high, there exists a substantial gap between organizational goals and their current capabilities to effectively implement these practices. Some organizations are making notable strides in HR analytics, with significant investments aimed at the continuous advancement of their skills by acquiring more and more experience, as well as obviously the tools needed. However, many others have not yet standardized basic HR processes or modernized their HR information systems. As a result, their ability to analyze workforce data and provide valuable insights for decision-making remains constrained (Dahlbom et al., 2019). Indeed, since 2008, due to the global economic crisis, organizations have suspended many necessary investments in their IT facilities, an attitude further encouraged by the ever-increasing speed with which technological advances are occurring. Indeed, this makes investment increasingly risky, as new technologies may become obsolete even before they are actually implemented, with the result that members of organizations often find themselves operating in an outdated or otherwise inadequate IT environment (van den Heuvel & Bondarouk, 2017).

The push to generate more in-depth insights regarding the workforce often originates from higher corporate levels: in fact, more than half of the respondents to the survey administered by Deloitte (53 percent) say that leaders' interest in information regarding their workforce has increased over the past 18 months. Despite this, very often it is the senior executives of organizations themselves who do not expect significant advancements from HR analytics, being very skeptical about whether this type of activity can actually create value for the organization, consequently choosing to limit, if not even stop, investments in such activities (Dahlbom et al., 2019). According to van den Heuvel and Bondarouk (2017), this is due to the lack of awareness toward HR analytics, which remains an almost totally unknown practice within organizations or, in the few that are exceptions, is often viewed as an experimental activity of interest only to the HR department. As a result, it is rare for top management to take a direct interest in it, indeed often showing aversion to the application of these practices, as most managers consider it sufficient for the HR function to be able to provide standard metrics.

The same conclusions are also drawn from the annual surveys designed by KPMG

and referred to the future of HR in organizations, which are administered to more than 1,200 executive directors of HR departments. Significant overall are the results obtained in 2019, which once again show that although the majority of HRs (70 percent) recognize the need for transformation of their departments, only a little more than a third of them (37 percent) say they are "very confident" about HR's actual ability to develop the skills and competencies necessary for them to govern HR analytics activities. More importantly, only 20 percent of HR leaders believe that developing analytics activities will be one of their department's priorities in the next two years, and only 12 percent cite HR analytics as a top management priority. These figures are worrying, especially taking into consideration the fact that the support of senior managers is one of the main prerequisites for a successful implementation of HR analytics, as they are able to grant the team the necessary financial resources and political support (Peeters et al., 2020). While the former are indeed critical in investing in the acquisition of instrumentation, infrastructure, and personnel, by providing their political support, senior management sends a strong signal to other stakeholders, such as line managers and other human resource management department staff, that they fully support HR analytics. Consequently, the lack of this support increases the likelihood for the team to encounter resistance from stakeholders affected by HR analytics projects.

The demonstration of the potential positive impact of HR analytics on the heterogeneous practices that have been examined throughout the chapters of this thesis may thus be crucial to overcoming the skepticism of several organizational stakeholders towards this practice. The results obtained in our four studies may contribute to raising awareness about this tool, highlighting the benefits that HR analytics have been creating for early adopters. Demonstrating the positive impact of HR analytics across different industries and geographic areas may encourage a more heterogeneous set of organizations to adopt this tool, extending beyond the financial and technology sectors and beyond the US and UK. Hopefully, this will prompt more organizations to create an in-house division dedicated to HR analytics. Such a development could further integrate the HR department within the organizational leadership, thereby enhancing its credibility and legitimacy in contributing to devising and implementing the organizational strategy. Also, it

could be encouraged the collaboration between HR and other departments to leverage HR analytics for broader organizational benefits. This integration can facilitate data sharing and insights that drive improvements in various functions, including operations, marketing, and finance. Ultimately, a unified data strategy may be developed that incorporates HR analytics with other business analytics to create a comprehensive view of organizational performance, ensuring that insights from HR analytics, as well as from other analytical tools, are effectively utilized across the organization. This should further promote a culture of data-driven decision-making throughout the organization, encouraging managers to leverage HR analytics for more objective and effective management practices. The findings advocate for positioning HR as a strategic partner in organizational planning, highlighting the critical role of HR analytics in achieving strategic goals such as financial performance, innovation, and retention. The predictive analytics capacities of the tool will also allow for the utilization of HR data to forecast trends and potential challenges. This proactive approach can help in anticipating issues related to workforce management, talent acquisition, and employee retention, which may be useful to redefine not only the HR strategy, but also the overall organizational strategy. Additionally, incorporating HR analytics into the performance measurement framework allows for a holistic view of organizational health, capturing metrics such as financial performance, innovation, employee retention, and creativity. This approach supports a continuous improvement cycle, where HR analytics identifies areas for improvement and tracks the impact of interventions over time. Finally, optimizing resource allocation through HR analytics ensures that investments in human capital align with strategic priorities, delivering maximum value to the organization. By adopting these strategies, organizations can achieve better financial outcomes, higher levels of innovation and creativity, and improved employee retention and engagement, thereby leveraging HR analytics for comprehensive organizational success.

In substance, HR analytics may not only increase the effectiveness of the HR-related activities performed both within and outside the HR department, but it may serve as a key tool to consolidate the strategic function of the HR division. This transformation would reshape not only the perception of the HR department among

other organizational stakeholders but also the very own mindset and attitude of HR personnel, encouraging them to see themselves as business partners rather than as mere administrative staff.

#### **6.4 Limitations and avenues for future studies**

While this dissertation significantly enhances the current understanding of HR analytics' impact, it is not without limitations that merit consideration. However, these limitations also present opportunities for future research on this topic.

Firstly, this dissertation relies exclusively on cross-sectional survey research. Although this approach is essential and perhaps the most suitable for examining the effects of HR analytics, future researchers might consider alternative methodologies, such as longitudinal or experimental designs.

Secondly, all measures in our studies were based on self-reports from HR managers. While this is a common practice in HR analytics research (Falletta & Combs, 2021), it is important to acknowledge that individuals often respond based on their perceptions rather than objective reality (Lewin, 2013). This reliance on self-reports, as well as the cross-sectional design of our studies, may introduce common-method bias. To mitigate this risk, we adhered to questionnaire design recommendations by Podsakoff et al. (2003), ensuring participants that there were no right or wrong answers, protecting their anonymity, and using validated measures. Post-hoc statistical tests indicated that common-method variance was unlikely to be a significant issue in our first study. Furthermore, common-method bias is generally less concerning when interaction effects are observed (Podsakoff et al., 2003). Anyhow, future studies could benefit from incorporating other organizational stakeholders, such as employees or managers from different departments, to provide a more comprehensive perspective on HR analytics, given its ability to provide insights that may also be useful to other organizational stakeholders besides HR managers.

Moreover, three of the four studies focused solely on comparing organizations that have adopted HR analytics with those that have not, specifically examining the impact of a data-driven HR analytics approach. Future research should consider investigating whether the maturity level of HR analytics implementation influences the outcomes of the HR-related activities under investigation. Organizations with

advanced HR analytics capabilities might adopt different strategies to foster their HR-related practices, achieving higher levels of personalization which may ultimately reach the individual level. Additionally, future studies could explore the effectiveness of integrating HR analytics with emerging technologies such as artificial intelligence (Chang & Ke, 2024) and natural language processing (Guo et al., 2024). Particularly, artificial intelligence may leverage insights from HR analytics to develop individualized strategies (X. Huang et al., 2023).

Lastly, one potential limitation of this study is the risk of endogeneity due to spurious correlation between firm characteristics and the adoption of HR analytics. Specifically, mature firms with greater resources are more likely to implement advanced HR analytics practices (Andersen, 2017), which raises the concern that the observed relationships between HR analytics and the examined individual and/or organizational outcomes may be partly attributable to the firm's maturity rather than the analytics themselves. While this study attempts to isolate the effect of HR analytics, it is possible that larger or more established firms, by virtue of their resource advantages, are better positioned to adopt these practices. This could lead to a correlation between HR analytics adoption and improved people-related activities that may not fully reflect a causal effect. This potential source of bias must be considered when interpreting the results, as it suggests that part of the observed outcomes may be driven by underlying firm characteristics rather than solely by the adoption of HR analytics or, for study four, by the maturity level of organizations with the tool. While this potential bias does not diminish the value of HR analytics, it suggests that such a tool might be more accessible to firms with greater financial and organizational resources. Consequently, the positive effects of HR analytics may, in part, be shaped by the ability of mature firms to effectively leverage these tools. This raises important considerations for both future research and practice, particularly regarding the role of firm resources in facilitating HR analytics adoption and maximizing its benefits. Future studies may benefit from exploring how firms of different sizes and resource levels can adopt HR analytics in ways that generate comparable performance gains. In this manuscript, to account for potential endogeneity, several firm-specific control variables were included in the analysis. These controls aimed to isolate the impact of HR analytics from other factors that



may influence its effectiveness, including firm size (measured as the logarithm of sales) (Singh & El-Kassar, 2019), the number of employees (Do et al., 2018; Heffernan et al., 2016), company ownership (public vs private) (Do et al., 2018; Heffernan et al., 2016), industry (McCartney & Fu, 2022), and, for study four, firm age and organizational type (multinational vs domestic) (McCartney & Fu, 2022). Despite the comprehensive inclusion of these controls, none of them produced a significant effect on the outcomes under investigation. This suggests that, while firm characteristics such as size, age, and ownership structure are important, they do not appear to account for the relationship between HR analytics and the relationships under examination in this thesis. Nonetheless, the inclusion of these variables helps mitigate concerns about omitted variable bias and strengthens confidence in the robustness of the results.

## **6.5 Conclusion**

The objective of this thesis was to advance the academic knowledge regarding HR analytics by demonstrating, from a quantitative point of view, its ability to improve the effectiveness of HR-related organizational activities. The four studies included in the dissertation demonstrated that a data-driven approach enabled by HR analytics might increase the effectiveness of HR-related activities performed both within and outside the HR department, in terms of both employee level and organizational level outcomes. By doing so, the thesis provided empirical confirmation of the assumptions posed by the contingency theory of HRM, which states that for HR-related activities to be effective, these should be aligned with the specific organizational context. The insight provided by HR analytics enables the implementation of a data-driven approach that takes into account the specific characteristics of the organization and of the environment where it operates, thus fostering the efficacy of HR-related initiatives.

This dissertation thus stands as a fundamental contribution within the debate regarding HR analytics, able to offer a timely and accurate compendium of the main issues of interest inherent to the topic from both a theoretical-academic and practical-business perspective, offering numerous insights for further analysis.

In conclusion, we would like to further emphasize that the HR personnel should not

miss the important opportunity for professional growth presented by HR analytics. Despite the obvious challenges of adapting to this relatively recent tool, which to be completely exploited demands skills previously unrequired of department members, HR professionals must strive to establish their legitimacy in conducting HR analytics operations by developing the necessary competencies. HR analytics should not be perceived merely as an added complexity to existing duties, but rather as the long-awaited chance to solidify the strategic relevance of the HR department. This evolution aims to elevate HR to a level equal to, if not surpassing, other traditionally more esteemed functions. HR functions will thus have to assume command of operations, cultivating the necessary skills internally in order to overcome the traditional conception of their department and emerge as pivotal strategic partners for the organization.

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