Work and HRM in the 4.0 era: insights and research directions

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1. HR Department: a troubled way towards legitimacy

The practice and theory of Human Resource Management has made huge progress over the last century; now it has been recognized as a fundamental part of business and it has become the subject of a rich academic and practitioner literature (Kaufman, 2015). The role of the HRM department, previously known as personnel management, has also changed considerably from its origins. From a largely administrative function with very low impact, it has shifted to the present day, where it has the potential to be a source of competitive advantage (Pfeffer, 1997; Wright & Urlich, 2017,). However, the position and role of HR departments have been continuously debated in the HRM practice and literature (Roche & Teague, 2012). Given that human resources are seen as a critical source of sustainable advantage, one can assume that the HR department occupies the position of an important player in the organization. However, the respect and the attention paid to 'human resources' is not always translated into respect for the HR department.

One the one hand, the HR department is requested to assume a strategic role procuring, allocating, managing, developing and retaining employees and supporting the organizational performance. On the other, HR managers have failed both in acquiring this status of business partners and promoting balance among the workers, firm and social needs, and interests in accordance with the changing realities of the economy and the workforce (Kochan, 2004).

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Four decades ago, Karen Legge (1978) discussed the constraints and the uncertainties that limited the status and legitimacy of the personnel function. The core of Legge's argument was that personnel managers lacked the power to implement the proper managerial solutions. She presented three ambiguities in the personnel function, based on the research by Ritzer and Trice (1969). First, the ambiguity regarding the distinction between personnel management as a set of activities performed by all managers or as a specialist function performed by a specialized department. Second, the ambiguity regarding the difficulty to define and measure the unique contribution of the function. Third, the ambiguity concerning the position of personnel specialist as part of the management team, but with a privileged relationship with employees.

These ambiguities, combined with HR's lack of power, led to what Legge identified as the three vicious circles. Firstly, the lack of power and absence in decision making on people issues results in a situation where the problems are addressed whenever they arise, on a reactive basis. As a consequence, there is poor perception among senior line managers of the effectiveness of the personnel department, which, in turn, justifies its further exclusion from the strategic decision-making process. Secondly, the lack of success criteria and clear strategic priorities, forces the personnel function to respond to various demands coming from internal customers, which strengthens the perception of the function as a miscellaneous department, rather than a focused one. Thirdly, as the low status of the personnel function discourages new talent from joining it, it is difficult to change the function from within and overcome the vicious circles.

Legge's analysis pre-dated the advent of the so-called 'human resource management' and, in many respects, the supporters of the strategic partnering of the HR function would seem to address some of her main concerns. Nevertheless, the debate about the role of the HR department is still ongoing. In the last years, instead of being celebrated, HR people have been called 'poor cousins' (Wright, 2008, p. 1067) and 'compliance people' who excel in the art of 'administrivia'. HR has been described as the lowest status department in organizations (Guest & King, 2004). Nowadays, HR managers are still facing many of the problems identified by Legge and it appears that they have not yet seized the opportunity to become HR champions.

The economic scenario that HR managers endure today is rather different from the one faced by personnel managers in the 1970s. The ongoing digital transformation is a disruptive innovation that generates new business and social opportunities and, at the same time, challenges

traditional job designs. These challenges can result in both people and organizational change. Workers need to develop new competencies and capabilities, from technological expertise to social and emotional skills, as well as creative skills (Colbert, Yee & George, 2016). Organizations instead are challenged to redesign their structures and processes (Kane, Palmer, Phillips, Kiron & Buckley, 2016). Industry 4.0 is accelerating the relationship change between workers and machines. It is also transforming the time and space dimensions of work. Consequently, 9-to-5, five days per week jobs are likely to decline, and more varied forms of work are going to emerge. Full-time employment, which was the predominant way of working and living in the 20th century, seems to be getting progressively substituted by a wide variety of alternatives and more precarious work arrangements, thus forcing organizations to redefine and continuously change the architecture of their management practices to better cope with the increasing diversity of workforce (Klotz, 2016). From the employees' perspective, these changes bring about a growing sense of job insecurity and technological angst. They are influencing the quality of social interaction towards isolation and segregation (Turkle, 2011).

This scenario represents an interesting chance to re-read Legge's analysis 40 years after its publication. The aim is to understand whether (and how) the 4.0 scenario could represent an opportunity to overcome ambiguities and vicious circles, transforming the impact that HR specialists have on people, business and society at large (Strohmeier & Parry, 2014; Bondarouk & Brewster, 2016), and gaining power and legitimacy. Nonetheless, Industry 4.0 could become the further lost opportunity to demonstrate the HR's ability to truly offer a professional, valuable and credible contribution.

2. Industry 4.0: an overview

The term industry 4.0 first appeared in 2011 during a fair in Hannover (Germany), where a strategic government-led initiative aimed at supporting the shift toward a smart transformation of manufacturing technology was presented. The government named the future of manufacturing Industry 4.0, meaning that the more recent technological trends were enhancing the fourth imminent industrial revolution (Lasi, Fettke, Kemper, Feld & Hoffmann, 2014; Rojko, 2017). Industry 4.0 "*is a dynamic and integrated system for exerting control over the entire value chain of the lifecycle of*

products. Vertical and horizontal integration and fusion of the physical and the virtual worlds is at the heart of Industry 4.0" (Ghobakhloo, 2018: 924).

The German plan was the first of a series of notable initiatives that followed as a result of the critical importance of this transition for the competitiveness of a country in the global market. Industrial Internet was launched in late 2012 in the US. The French government adopted the claim "Industrie du Futur" as the title of the French industrial policy in 2015. In the same year, the initiative Made in China was born with the aim of leading Chinese industry on the innovation path and making it more sustainable (Rojko, 2017).

A bundle of advanced technologies forms the basic technical requirements of Industry 4.0. Cyber-Physical Systems (CPS) are acknowledged to be the technological drivers of Industry 4.0. These are composed of programmable machines, typically equipped with mobile agents and robots, able to collect and exchange real-time data. This allows them to make their own decisions based on machine learning algorithms, analytics results, and recorded successful past behaviors. Connected CPS blocks compose the manufacturing system in Industry 4.0. Besides Machine-to-Machine connection, CPSs offer multimodal interfaces for more effective Human-to-Machine collaboration, which is useful for performing some unstructured production tasks (Geisberger & Broy, 2015). Products have also become smart in factories 4.0. Sensors are embedded in objects so that they become data collection technologies with control and processing capabilities. This allows for the conversion of physical objects into digital things, able to provide information about their location, their current state, and the environmental conditions (Rojko, 2016). Similarly, they can control and optimize their production process and, consequently, their logistic path. During their lifecycle, smart products may potentially provide useful information about misuses, their wear state or breakdowns, thus promoting a deep change for maintenance services. The association of analog objects with digital components confers a digital identity to the former ones, therefore fostering the merging of the physical or real world with a data-based virtual one (Annunziata & Biller, 2015; Quint & Gorecky, 2015).

CPS blocks and smart objects provide data, exchange information and synchronize continuously by means of communication networks and internet protocols called industrial Internet of Things, which can efficiently deal with a continuous flow of huge amounts of data (big data). These data usually reside in a cloud storage, which raises a security issue (Hecklau, Galeitzke, Flachs & Kohl, 2016). The interoperability among CPS blocks

and smart objects, defined as the capability of systems to transact with other systems, can either occur within the factory boundaries or it can involve all actors in the company's value chain. To ensure a seamless integration of manufacturing and business processes, it is also necessary to develop standardized interfaces and open architectures, which encourage collaboration among different platforms. As a result, all components of Industry 4.0, i.e. human resources, smart products, smart factories, and any relevant technologies can connect, communicate, and operate together (Ghobakhloo, 2018; Gilchrist, 2016).

3. Work and HRM in the Industry 4.0 era

Industry 4.0 is challenging HRM in different ways. The shift towards the convergence of the physical and digital dimensions, the different nature of work and the unprecedented technological injection that Industry 4.0 is generating is transforming the organizations and their managerial systems. Both the ongoing and the potential transformation of HR empowered by emerging technologies seem likely to have a noteworthy effect on HR, so much so that the expression Smart Human Resources 4.0 (SHR 4.0) was coined. This indicates a concept that "*is evolving as a part of the overall 4th Industrial Revolution and* [is] *characterized by innovations in digital technologies such as Internet of Things, Big Data Analytics, and artificial intelligence (AI) and fast data networks such as 4G and 5G for the effective management of next-generation employees* (Sivathanu & Pillai, 2018, p. 7).

To further clarify the domain of SHR 4.0 and its implications, Sivathanu and Pillai (2018) provide an extensive framework of advanced HR practices supported by the technological infrastructure of Industry 4.0. These include: smart apps job posting; AI-driven résumé shortlists; automate initial screening; video-based interviews complemented by AI chat-bots' assistance in interpreting and validating candidate responses in real-time, thus reducing the interviewer's bias; augmented reality/virtual reality-based inductions as for on-boarding systems; AI assisted skill gap identification; virtual training anytime-anywhere; continuous performance feedback; skill data-driven compensation; employees' wellbeing apps with reference to development systems; analytics-driven attrition reduction; data-driven low performers identification tools in the case of off-boarding practices.

Moreover, the distinguishing traits of organizations that stem from Industry 4.0 (i.e. human-machine collaboration, open organizational

boundaries, centrality of cross-functional teams often composed of a mix of full-time employees, part-time staff, gig workers, anytime-anywhere collaboration) require specific managerial practices among which there are distinctive HR systems, such as multisource instant feedback, knowledge management and collaboration tools based on smart or social media technology, or composite rewarding systems that take into account individual performance along with different legal relationships between the company and its workers (Kiron & Spindel, 2019).

The smart convergence of cyber-physical stages of the value chain enabled by the Internet of Things provides opportunities to develop new HRM tools, but also to update the existing ones. As regards the changes occurring in HRM systems, recruitment and selection practices are examples of HR processes which are undergoing a deep transformation following the diffusion of social media and advancements in artificial intelligence. These changes enable a relevant progression in résumé screening, as well as the employment of intelligent machines to perform part of the selection process (van Esch, Black, & Ferolie, 2019). An emblematic example of new HR tools aided by new technologies is instead represented by the people analytics allowing for the prediction of employees' behaviors and decisions, such as intention to quit or organizational commitment. This supports a more informed workforce strategy. Thus, the first effect of Industry 4.0 on HR is the introduction of new HR tools or the transformation of existing HR practices. Both these adjustments go in the direction of an increased digitalization of HR.

4. Industry 4.0: Redemption or condemnation of HRM?

The previous considerations present a picture of the new growing 4.0 context that fosters the development of new tools and practices for the HR department and deeply challenges the way of working. In many ways, we may think these developments are positive ones. With Industry 4.0, computers and automation will work together in an entirely new way and, therefore, in manufacturing more humdrum and 'dull' activities could be performed by machines, while human tasks will be characterized by growing autonomy and empowerment at decreasing costs (Holland & Bardoel, 2016). On the other hand, detractors of the 4.0 revolution prophesy that smart machines will replace human work and that this will happen for all activities, not only routine ones, thus causing an unprecedented job loss and dramatic levels of unemployment.

The 4.0 scenario suggests new stimuli to reconsider the ambiguities identified by Legge 40 years ago, to understand the possible development trajectories, opportunities and challenges for the contemporary HR professionals.

The first ambiguity was about where the responsibility of human resource management lies. The new job design and smart HRM practices advocate for a higher devolvement of HR responsibilities to line managers (Reichel & Lazarova, 2013). Indeed, HR devolution allows supervisors to directly coordinate the development activities of their employees, and exchanging with them information in real time (Intindola, Weisinger, Benson, & Pittz, 2017). At the same time, there is also evidence that new technologies would enable HR professionals to centralize some HR activities, thus managing huge amounts of data about employees which could make them better informed and directly involved in people management processes (Marler & Boudreau, 2017). In this sense, in the new 4.0 scenario some HR activities are increasingly performed by all managers on a daily basis, though there are still other activities requiring specialized competences and accountability from the HR professionals (Isari, Bissola & Imperatori, 2019).

The HR department could become the crucial unit supporting old and new business leaders, employees, and the new digital (and not yet digital) workforces' shift to the 4.0 mindset. It needs to support the continuous learning, the development (and the identifications) of the proper competences and the re-skilling processes that are mandatory today. The HR department should do this by designing new forms of collaborations and open innovation projects together with educational institutions, such as universities and high schools, professional associations, and by also managing a more mixed and diverse workforce and different types of employment arrangements. Moreover, the HR department has a relevant potential role in preventing and managing the 4.0 drawbacks, such as people discomfort and obsolete competences at the individual level, inertia and loss of control at the organizational level, and growing unemployment and social inequality at the societal level (Bissola & Imperatori, 2018).

To sum up, in the Industry 4.0 scenario, the responsibility of human resource management lies (again) both in managers and in the HR department. Nevertheless, the HR department could have a higher impact and a more recognizable role due to the digital transformation of the way of working, the required continuous learning and design and implementation of the new smart HRM practices.

The second ambiguity that Legge highlighted concerns the difficulty for HR to quantify its contribution to the 'bottom line' (Hope-Hailey, Gratton, McGovern, & Stiles, & Truss, 1997). It seemed that such a burden could have been solved when both theory and practice emphasized the role of human resources as the core for competitive advantage (e.g.; Goshal & Bartlett, 1999). Human resource management was included among the managerial practices that could support organizational culture as coordination and control mechanisms (Barney, 1995); some studies focused on identifying sets of consistent HR practices, the so-called 'high performance work practices', that could generate and guarantee the workforce commitment and hence support their performance (e.g. Becker & Huselid, 1998; Pfeffer, 1997); others postulated the recognition of the centrality of managing employees as a premise to competitive advantage and consequently the positive impact on organizational performance (e.g. Becker & Gerhard, 1996; Wright & Boswell, 2002). Despite the high number of studies on this topic, the relevance of the obtained evidence has been largely criticized. The main critic is about the robustness of the relationship: the association is not always straightforward and consistent, and the causality of human resource management practices being at the basis of an increase in the organizational performance remains unclear. Moreover, it has been argued that both the measures of human resource management systems and organizational performance adopted in different studies are diverse, thus compromising the consistency of this body of literature (Guest & King, 2004). On the practitioner side, such evidence never gained much consideration despite the personnel management associations' endorsement, also because it was believed that a marked difference remained between the rhetoric and reality of HRM (Wright, 2008).

The technologies among those provided by the recent smart revolution allow the HR department to obtain bulks of objective detailed data to assess employees' performance regardless of their job and at all hierarchical levels, as it never happened before. Wearables, but also smart objects and programmable machines, with whom employees interact, offer data about employees' single actions that together form a very precise performance assessment.

A continuously growing data-processing capacity allows for the aggregation of great amounts of data that are automatically generated by intelligent objects during the work process in factories 4.0. As a result, these data offer a highly comprehensive measure of employee performance, which can detect all the different 'nuances' of individual work (Sivathanu

& Pillai, 2018). The unprecedented capacity of creating and processing data, known as big data, generates the evidence of the workforce participation to the organizational performance. This creates the opportunity to assess how the introduction of HRM practices (e.g. a new training program) affects firstly employee performance and, secondly, organizational performance, thus offering more chances to the HR department to analytically demonstrate its final impact on the company's results (Hecklau, Galeitzke, Flachs, & Kohl, 2016). Big data could then be adopted as the basis to develop analytics that may predict the consequences of introducing specific HR practices or the outcome of changes in people management policies (Kiron & Spindel, 2019).

The third ambiguity concerned the HR professionals who are called to represent both managerial and employee interests. In the past, HR failed to face this combined issue. In the last 20 years, HR professionals have been worried about 'partnering' with line managers and senior executives in developing human resource practices that supported the firm's competitive plans in order to demonstrate their strategic position. Recently, two phenomena have significantly affected employee trust in the HR department, especially in Europe. On the one hand, the increased flexibility and insecurity that characterize relations in the labor market; on the other, the internal reorganization of the HR function oriented towards achieving efficiency, and the simultaneous transformation of the function into business partners (Caldwell, 2008; Graham & Tarbell, 2006). New employees are becoming more flexible, but also more doubtful and skeptical towards their employment relationships and employers (McLean Parks and Kidder, 1994; Svensson, 2012). New HR professionals are becoming more aware and focused on strategic issues (Cascio, 2005; Caldwell, 2008), but they are also more isolated from employees due to outsourcing and the decentralization of HRM activities (Belcourt, 2006). These trends imply that the relationship between employees and the HR department is weakening, with a potential deterioration of trust in HR professionals. Results confirm that the HR professionals almost failed to challenge their top executives and, meanwhile, (perhaps precisely for this reasonb) they lost the employees' trust (Capelli, 2015; Marchington, 2015).

Though research is still controversial about this, scholars suggested that smart HRM practices could change the role of HR departments towards a more tactical partnership with line managers, thus allowing them to focus on more strategic issues (Ruel, Bondarouk, & Van der Velde, 2007). Some studies propose that e-HRM may assist the HR department in becoming strategic (Parry, 2006; Olivas-Lujan et al., 2007; Haines & Lafleur, 2008).

Furthermore, the primary justification for implementing e-HR technology is cost reduction, with very little evidence of the crucial role of the HR department (Marler, 2009; Marler & Fisher, 2013). On the employees' side, the new 4.0 scenario also facilitates their participation and opinion sharing, as a result of social media and the direct relationship between HR function and employees (e.g. e-learning, intranet and company forum, glassdoor) (Bissola & Imperatori, 2014). e-HRM practices are straightforward and individualized communication tools that are not supervisor-mediated and they enable employees to understand the HR philosophy and policy more clearly. They could contribute to the transparency of relations with the HR department, allowing employees to directly obtain information on people practices and systems and, given the current labor market conditions, make decisions with greater awareness. Research proved that e-HRM practices increase employee trust in the HR department both directly and through the enhancement of perceived procedural justice (Bissola & Imperatori, 2014).

To sum up, it seems that there is space both for a new HR strategic value and for a new social relationship between HR managers and employees, where the HR specialist could also manage a more direct and personalized relation owing to big data and HR analytics. Nevertheless, HR professionals need to demonstrate that they are able and ready to seize these opportunities.

5. HR credibility and power: exploiting the 4.0 transformation

Research and practice suggest that the ambiguities identified by Legge's analysis 40 years ago are here to stay, even though the new 4.0 scenario could offer new instruments and practices to withstand them and, more importantly, it could generate new possibilities for the HR professionals to gain credibility and power. The HR department could have a crucial role in helping people and organizations to face the ongoing digital transformation and the new ways of working. This can happen in two ways: firstly, by finding new solutions that allow HR people to demonstrate a close relationship between their activities and organizational success, following a 'conformist' innovation approach. Secondly, by attempting to change the evaluation criteria of organizational success and HR people contribution to it towards a new social and sustainable 4.0 scenario, thus enacting the so-called 'deviant' innovation approach.

Higher HR credibility and power will enable HR professionals to unhinge the three Legge's vicious circles. First, gaining credibility about

the centrality of the HR activities, as a consequence of the implementation of continuous learning, talent management, open innovation, may lead HR people to actively (not only re-actively) participate to the strategic decision-making process. Second, higher ability to demonstrate their success criteria due to people analytics and big data may lead HR people to identify, manage and effectively address people and business priorities. Third, acquiring credibility about the strategic and social impact of HR people and rebuilding trust in the HR department may lead to a higher HR professional status and a superior talents attraction within the HR community.

HR people need to restore their credibility by giving voice to the various workers, addressing the possible drawbacks of the new relationship between workers and machines in a creditable way, sustaining the continuous reskilling and upskilling of employees, managing the diverse stakeholders of the companies, and co-designing work solutions and innovation processes together with the manufacturing unit. There are few and isolated cases of exemplary companies that in the past successfully experienced similar situations during radical technological transformations: in Italy, Olivetti is one such example (Butera, 2019).

The deep transformation that the smart revolution together with Industry 4.0 is bringing, firstly within companies and secondly in the HR activity, seems to offer HR professionals the chance to escape the historical poor reputation and lack of power they have been suffering for decades (Galang & Ferris, 1997; Reichel & Lazarova, 2013). However, to seize this opportunity, HR professionals should drive their professional mindset towards a more evidence-based approach that allows them to fully benefit from the information generated by new technologies. HR specialists should become aware of the 4.0 revolution's potential: on the one hand, it could offer them the opportunity to demonstrate more clearly the contribution of HR to the organizational performance, aside from giving the HR function objective information that may support a more informed decision-making process (Bissola & Imperatori, 2018). On the other hand, it could overcome and subvert the actual paradigm of job design leading to the definition of work conditions that may potentially relegate employees to ancillary roles in the human-machine collaboration. Therefore, the opportunity for HR is currently two-fold: HR can benefit from more information in order to talk "the language of the business", thus making the importance of its contribution clearer. However, at the same time, it challenges the traditional approach to job design, therefore it requires searching for new strategies that lead job design towards a more human-centered direction (Bissola & Imperatori, 2019; Schneider, 2018).

HR can play the role of the main character in the Industry 4.0 challenge, if it implies a deep reconfiguration of HR competences. Besides leading the reskilling of employees within their companies, the HR community should invest in developing new training programs for HR people that combine an in-depth professional knowledge in the traditional HR domain with digital competences. These skills could facilitate them to request for more useful information and tools to the IT function, to interpret the information given, and become knowledgeable users of digital technologies (Hecklau et al., 2016). This would entail a considerable shift of the HR mindset that is currently being more strongly called upon to gain the trust of line managers and employees. The active role that HR professionals should play in job design, in the era of intelligent connected machines, requires them to complement their reskilling path with the in-depth knowledge of the manufacturing business process and its smart components (Bissola & Imperatori, 2019).

The reconfiguration of the competence profile would be the prerequisite for the mindset shift that is needed for HR to transform the 4.0 digital revolution in a chance to overcome its traditional lack of power and attempt to face the ambiguities and vicious circles that afflict the function's professional status.

6. The content of the special issue

This issue of Studi Organizzativi arose from the 7th International e-HRM Conference '*HRM 4.0 for Human-centered Organizations*' held in Milan at Università Cattolica del Sacro Cuore. The conference addressed cutting-edge smart HRM research and practice focusing on HRM for Industry 4.0 and combining stimuli and challenges from HRM, IT and Organization research domains. More details about the conference can be found in the Appendix. The editorial team of this special issue, considering the relevance of the topic and the need to encourage research in this domain and enlarge the debate, decided to open the call for papers to all interested authors, not only to conference participants. Four of the five articles of this special issue stem from studies that were presented at the 7th e-HRM Conference.

The articles included in the essays section of this special issue specifically address three topics of the Industry 4.0 transformation, which are currently attracting the attention of both theory and practice in the e-HRM domain. Two studies report about the smart technologies

implementation process, one contribution concerns the impacts and implications of an e-recruitment system as an example of the new digital HRM tools and how they are transforming HR practices, while the remaining two articles consider the new ways of working, the compulsory change in the working space, and the HR challenges these factors are generating.

In the first article, Bos-Nehles, Bondarouk, and Smit-Methorst adopt a case-study methodology to argue about the opportunities that arise when considering the interplay of social and material forms and spaces that shape e-HRM in order to conduct a sustainable and successful implementation process. The authors, consistently with their aim, titled their study "A Sociomateriality Perspective of Sustainable E-HRM Implementation". Evidence highlights that by providing social and material adaptations during the implementation process, users could interact with each other and technology, thus supporting acceptance and usage of the e-HRM system in the organization.

The paper "Do information systems play a crucial role in the relation between knowledge and work engagement of healthcare assistants?" by Galdiero, Martinez, and Pezzillo Iacono specifically refers to the healthcare environment and suggests that, in order to reach the most positive effects of the introduction of knowledge management systems, employee involvement and empowerment in implementation since the very beginning of the process are necessary. The positive effects are attained both in terms of shared information, employee satisfaction and work engagement, and efficiency of work procedure and service quality.

Useful aspects in designing e-recruitment tools emerge from the empirical study performed by Gritti, Lazazzara, and Della Torre. In their paper "Factors influencing e-recruitment usage: an analysis of the moderating effect of the applicant's job status", the authors report a quantitative survey they performed within a sample of 179 Italian job-seekers. Evidence suggests that perceived efficiency and the amount of available information positively influence the candidates' usage of e-recruitment systems. Additionally, they found that experienced workers are more willing to use such systems than inexperienced ones, even though the positive effect of the two relevant characteristics of e-recruitment tools is higher in the case of the unemployed and students.

The article "The 'Digitalised' employment relationship: can conversational practice help to alleviate technology-related pressure?" by Bakhshalian, Ahmadiyankooshkghazi, Elmi, & Reddington deals with organizations becoming a digital environment and discusses the drawback

of such transformation. Indeed, they argue that technology-driven pressures often come together with the temporal/spatial flexibility obtained through the digitalization of the organizational context. The authors collected data through an online survey that reached approximately 17,000 employees of the UK public sector and found that the quality of conversational practices, e.g. tolerance for mistakes, perceived fairness of performance management, emphasize the positive effect of the quality of technological systems in preventing technology-induced tensions. Such results contribute to the insight that digital and human components should be integrated in digital environments to maximize the benefits of the 4.0 revolution.

In the same vein, Vergine, Brivio, Fabbri, Gaggioli, Leoni, & Galimberti assert that digital disruption offers new possibilities of combining physical and digital elements in the same environment, but, contrary to the previous contributors, they focus on the conditions that can foster the introduction of technologies typical of Industry 4.0, such as robots, artificial intelligence, augmented reality, and sensors. The authors provide suggestions to effectively turn to a phygital (i.e. physical + digital) organizational environment, particularly focusing on components of phygital environments, such as HRM practices that could facilitate the transition to a phygital context, contents and rhetoric that could conveniently inform internal communication during the implementation process. To describe the transition to the phygital organizational setting, artificial intelligence technology is referred to as an exemplar smart technology.

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