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How to survive to social crises? An HR analytics data-driven approach to improve social sustainable operations' effectiveness

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

Abstract

Purpose – Despite the growing interest regarding companies' sustainability, its social dimension has mostly been neglected by academics and practitioners. Consequently, this study aims to address this issue by investigating if the adoption of human resource (HR) analytics can positively influence the impact of social sustainable operations practices (SSOP) on employees' motivation and engagement, and the effect of these last on organizational retention.
Design/methodology/approach – Data were collected through online questionnaires addressed to 281 HR managers of heterogeneous companies from Europe and analysed through a structural equation modelling (SEM) technique.
Findings – The findings confirmed the positive effect of SSOP on employee motivation and engagement, and of these last on employee retention. Furthermore, they confirmed that the usage of HR analytics positively moderates the relationship between SSOP and employee motivation and engagement.
Originality - This study contributes to both sustainable operations management and HR management literature streams. First, it adopts a multidisciplinary perspective that also considers evidence from HR management literature, allowing us to concentrate on the social dimension of sustainability. Second, it provides further insight regarding the adoption of a data-driven approach in relation to socially sustainable operations management. Finally, it contributes to HR analytics-related literature by also demonstrating its impact on organizational aspects not directly controlled by the HR department.
Keywords social sustainable operations management; HR analytics; employee motivation; employee engagement; employee retention; data-driven approach
Article classification Research paper

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 exacerbate 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 which 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 and 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 which are being experienced by the three components of sustainability, i.e., economic, environmental, and social

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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 SSOP, 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 and 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 and 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 and 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 and Heaton, 2016). Since, according to previous research, all these activities can be enhanced on the basis of HR analytics (Chalutz Ben-Gal, 2019; Falletta and Combs, 2021; van den Heuvel and Bondarouk, 2017; Tursunbayeva *et al.*, 2018), 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 *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 and 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, just 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 and El-Kassar, 2019).

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

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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.

Literature review and hypothesis

Social sustainable operations practices and HR benefits

The last decades have not been easy for companies as, due to increasingly dynamic market conditions, they had to rethink their strategies to handle their resources in a more sustainable way (Singh and 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 and 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

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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.

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

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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 and Jackson, 1987). The strategic fit between business and HR management strategies, therefore, becomes a powerful tool to enhance overall organizational performance (Katou and 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 behaviours align with the organization's objectives (Delery and 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 and 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 *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 and 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 on employees' concrete necessities (Falletta and 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 and 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;

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

HR benefits and employee retention

Employee retention strategies aim to ward off employees from abandoning their companies (Rombaut and Guerry, 2020). Retaining competent employees is extremely important for any organization (Carmeli and 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 and 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 1.

[INSERT FIGURE 1]

Research methodology

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 in the study. We selected European organizations that have been implementing SSOP for at least 3 years (Longoni and Cagliano, 2016). Participants were informed that their answers will be anonymous, confidential, and used exclusively for scientific research. Attention check and reverse-coded questions were inserted to assure 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

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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.

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 and 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 and Cagliano, 2016; Singh and 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 of 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, similarly 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.

Data analysis method

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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, similarly to previous studies (e.g. Chatterjee *et al.*, 2022; McCartney and 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 and 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).

Results

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 and 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).

Measurement 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 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 and Babin, 2016).

[INSERT TABLE 1]

Table 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 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.

[INSERT TABLE 2]

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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 β 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 ($\beta = .441$; $p < 0.001$), confirming Hypothesis 4. 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 and Cagliano, 2016), top management commitment to sustainability (Longoni and Cagliano, 2016; Singh and El-Kassar, 2019), and the number of employees of the organization (Akhtar *et al.*, 2019). None produced a significant effect.

[INSERT TABLE 3]

Discussion

The objective of this study was to empirically investigate the effect that an HR analytics data-driven approach guiding the adoption of SSOP has on the employees of organizations. Specifically, we demonstrated that the adoption of HR analytics activities has strengthened the impact of SSOP on employees' motivation and engagement and, finally, the positive effect of these last on organizational retention.

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 which also considers evidence from HR management literature. This uncommon approach allowed us to focus on social sustainability, which,

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despite being frequently deemed as crucial for sustainable development, has been far less considered than the environmental and the economic perspectives (Amrutha and Geetha, 2020). In fact, most previous studies typically investigated the impact of environmentally sustainable operations, or of green HR management, on corporate social sustainability, intended as the improvement of employee health and safety, equity, wellness, and well-being (Amrutha and Geetha, 2020), 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 and 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, similarly 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 and 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 and Fu, 2022), is still a minority, as most previous studies typically adopted a theoretical approach (Andersen, 2017).

Managerial implications

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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 and 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 and 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.

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 opinion of companies' employees and/or of managers from different departments. This is a common limitation for HR analytics studies, as they usually focus solely on the opinions of HR managers (Falletta and 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 be interesting to also conduct this research in different contexts to verify whether our findings are generalizable despite the specific geographical, political, and cultural context.

Conclusions

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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 for dealing 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 crises situations.

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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.

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

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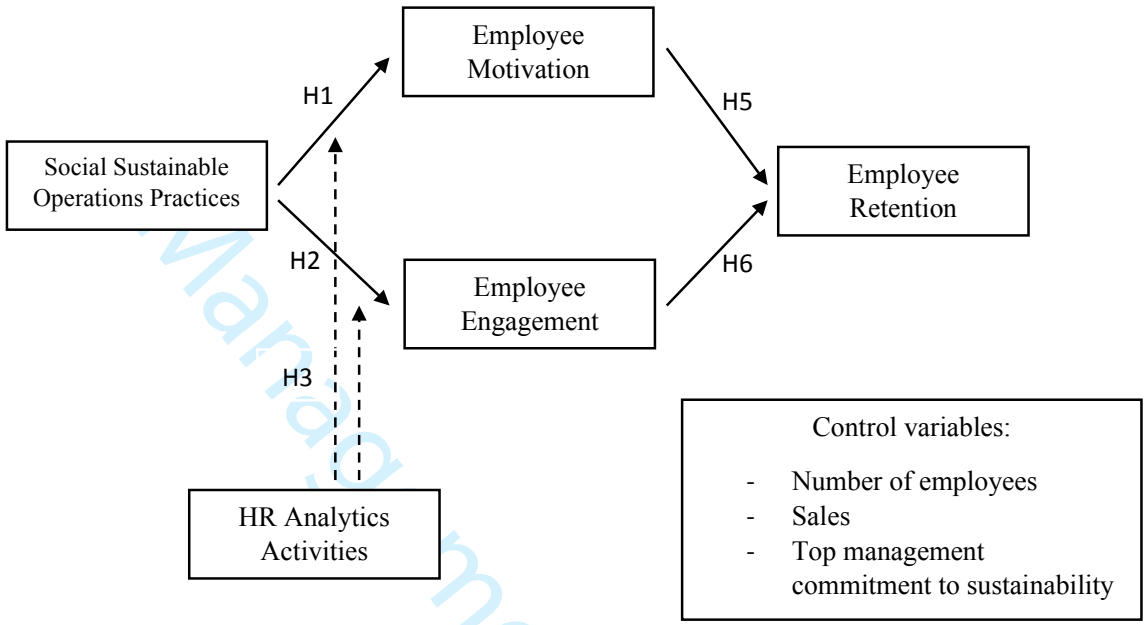
Figure 1 – Research model and hypotheses



Source: Authors' elaboration.

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Table 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		

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Table 2 – Mean, standard deviation and correlations for discriminant validity

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

Table 3 – Results of hypotheses testing

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

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This was the author accepted manuscript of the study:

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