

AperTO - Archivio Istituzionale Open Access dell'Università di Torino

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

This is a pre print version of the following article:

Original Citation:

Availability:

This version is available <http://hdl.handle.net/2318/1944714> since 2024-07-16T14:26:19Z

Published version:

DOI:10.1108/MD-06-2023-0973

Terms of use:

Open Access

Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.

(Article begins on next page)



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

Journal:	<i>Management Decision</i>
Manuscript ID	MD-06-2023-0973.R3
Manuscript Type:	Original Article
Keywords:	Social sustainable operations management, HR analytics, Employee motivation, Employee engagement, Employee retention, Data-driven approach

SCHOLARONE™
Manuscripts

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

1
2
3 sustainability (Raut *et al.*, 2019). In fact, whilst the first two have largely been considered both by
4 academics and practitioners (Massaroni *et al.*, 2015), the same cannot be stated for social
5 sustainability (Mani *et al.*, 2016). In particular, most companies disregarded SSOP, which are
6 practices aimed at improving employees' working conditions, health, and safety (Gimenez *et al.*,
7 2012). These are particularly relevant as they may influence HR benefits, namely 'the mechanisms
8 through which a workforce contributing to the firm's goals and strategy is developed' (Longoni and
9 Cagliano, 2016, p.1728). This is particularly true for employee motivation and engagement, which
10 several studies have demonstrated to be positively related to employee retention (e.g. Lee *et al.*,
11 2022).

12
13 This situation originates from the fact that organizations usually do not involve the HR department
14 when managing their sustainable operations, as this is often isolated from other departments due to
15 externalization (Bissola and Imperatori, 2014) or to its scant strategic influence (Dahlbom *et al.*,
16 2019). Furthermore, it is still widely believed that HR managers ground their choices on gut feelings
17 and impressions (Chalutz Ben-Gal, 2019; van den Heuvel and Bondarouk, 2017), despite the
18 organizational trend to increasingly adopt data-driven decision-making processes (Holsapple *et al.*,
19 2014). But, actually, this is a false myth, as HR departments are also increasingly adopting a data-
20 driven approach and increasingly relying on new digital technologies (Chalutz Ben-Gal, 2019;
21 DiClaudio, 2019; Minbaeva, 2017). Among them, HR analytics is considered one of the most
22 promising. Falletta and Combs (2021, p. 54) defined it as 'a proactive and systematic process for
23 ethically gathering, analyzing, communicating and using evidence-based HR research and analytical
24 insights to help organizations achieve their strategic objectives'. This is particularly relevant as,
25 according to recent literature, some HR activities – including communication, training and
26 development, hiring and selection, and reward systems – can improve the implementation of social
27 sustainable activities within organizations (Langwell and Heaton, 2016). Since, according to previous
28 research, all these activities can be enhanced on the basis of HR analytics (Chalutz Ben-Gal, 2019;
29 Falletta and Combs, 2021; van den Heuvel and Bondarouk, 2017; Tursunbayeva *et al.*, 2018), it is
30 reasonable to assume that HR analytics may enable the adoption of a more data-driven approach in
31 relation to SSOP.

32
33 However, some research gaps can be found. First, the most important and easily identifiable is that
34 the interest of practitioners and academics has mostly focused on environmental sustainability,
35 neglecting more social aspects (Mani *et al.*, 2016), as previously stated. Second, even if the
36 relationship between digital transformation and environmental sustainability is always more studied
37 (Bresciani *et al.*, 2021) and organizations are increasingly using digital technologies such as big data
38 analytics and the Internet of Things to cope with environmental sustainability, the adoption of a data-
39 driven approach in relation to SSOP management has often been considered as relevant but, in real
40 terms, almost totally neglected in the literature (Dao *et al.*, 2011; Del Giudice *et al.*, 2021; Feroz
41 *et al.*, 2021; Longoni and Cagliano, 2016; Mani *et al.*, 2020; Massaroni *et al.*, 2015; Raut *et al.*, 2019).
42 In fact, the impact of digital transformation in other related sustainability fields – apart from the
43 environmental one – has to be further explored in order to identify a common research agenda (Feroz
44 *et al.*, 2021). Last, many researchers have highlighted the necessity of a more holistic understanding
45 of the consequences of the use of big data in the decision-making process (e.g., Del Giudice *et al.*,
46 2021). Although several research found a positive association between organizational performance
47 and big data analytics, just a few papers examined big data analytics' potential contribution to
48 sustainable operations management (Raut *et al.*, 2019). This is due to the fact that it is still difficult
49 for organizations to acquire big data related to their sustainable practices, particularly for those
50 concerning their supply chain partners (Singh and El-Kassar, 2019).

51
52 To fill the highlighted gaps, the objective of this study is to answer the two following research
53 questions:
54
55
56
57
58
59
60

1
2
3 Q1: What is the effect of SSOP on the employees of organizations?

4
5 Q2: Can the adoption of an HR analytics data-driven approach improve SSOP effectiveness?

6
7 In order to answer them, we will investigate from an empirical point of view the impact that SSOP
8 have on HR benefits, namely employees' motivation and engagement and, consequently, the effect
9 of these last on organizational retention. Furthermore, and more interestingly, we will assess the
10 moderating effect of HR analytics on the relationship between SSOP and HR benefits.

11 The adoption of a multidisciplinary perspective, taking into account both sustainable operation
12 management and HR management literature, will allow us to offer our contribution to both streams
13 of literature. For the former, it will permit us to focus on the social side of sustainability,
14 differentiating this from most previous studies (e.g. Amrutha and Geetha, 2020); for the latter, it will
15 enable us to further expand the HR analytics field of action beyond the HR department's boundaries,
16 offering its contribution also when it comes to a hot topic like sustainability. This will also be
17 interesting for practitioners, as we will inform them of the positive effect that an HR analytics data-
18 driven approach can have on their employees.
19
20

21 **Literature review and hypothesis**

22 *Social sustainable operations practices and HR benefits*

23
24 The last decades have not been easy for companies as, due to increasingly dynamic market conditions,
25 they had to rethink their strategies to handle their resources in a more sustainable way (Singh and El-
26 Kassar, 2019). Moreover, customers are always more attentive toward sustainability-related topics,
27 which have consequently become crucial (and challenging) elements that companies are now
28 compelled to consider when dealing with customer attraction, satisfaction, and retention strategies
29 (Longoni and Cagliano, 2016). Recent events have drawn further attention to this issue. In fact, the
30 COVID-19 pandemic has also impacted the business management realm (Battisti *et al.*, 2022), as
31 organizations are being asked to link their objectives to sustainability, social responsibility, and
32 corporate ethics with an even stronger emphasis.
33
34

35 The interest regarding companies' sustainability is not a recent phenomenon. As early as 15 years
36 ago, Jabbour and Santos (2008) reported the need for a paradigm of development where economic,
37 social, and environmental sustainability had to be equally considered. Indeed, these sustainability
38 components can be considered crucial organizational aspects (Raut *et al.*, 2019) that transcend
39 organizational borders, demonstrating the importance of sustainable activities throughout the whole
40 supply chain (Mani *et al.*, 2016).
41

42 However, an important research gap can be identified: whilst the first two components of
43 sustainability have been thoroughly investigated, the same cannot be said for social sustainability
44 (Mani *et al.*, 2016). For Carter and Rogers (2008), this is due to the fact that the most widespread
45 definition of sustainability, i.e. the one proposed by the Brundtland Commission (World Commission
46 on Environment and Development, 1987) is rather extensive, making it difficult for organizations to
47 comprehend and concretely apply it. In fact, it defines sustainability as 'development that meets the
48 needs of the present without compromising the ability of future generations to meet their needs'.
49 Later, Mani *et al.* (2016, p.43) defined corporate sustainability as 'meeting the needs of today's direct
50 and indirect stakeholders without compromising its ability to meet the needs of future stakeholders'.
51 Consequently, according to them, it is very important for organizations to also focus on the social
52 side of sustainability, as it may enable companies to effectively manage the social matters related to
53 their operations in a way that allows their long-term survival.
54
55

56 On the contrary, the predominant focus on environmental sustainability led researchers and
57 practitioners to neglect more people-related sustainability matters. This is an important issue from a
58
59
60

1
2
3 social point of view, as the adoption of socially sustainable activities can reduce employees' agitations
4 and improve suppliers' ability to meet customers' demands (Mani *et al.*, 2016). Specifically, it may
5 be useful for organizations to implement SSOP, namely those activities aimed at the improvement of
6 employees' working conditions, health, and safety (Gimenez *et al.*, 2012). In fact, their
7 implementation may be crucial to improve the so-called HR benefits, i.e. 'the mechanisms through
8 which a workforce contributing to the firm's goals and strategy is developed' (Longoni and Cagliano
9 2016, p.1728).

10
11 In particular, SSOP have a strong potential to improve employees' motivation, defined as the
12 'willingness to exert high levels of effort toward organizational goals, conditioned by the effort's
13 ability to satisfy some individual need' (Robbins, 1993). As the implementation of SSOP will
14 improve employees' working conditions, this will give them the possibility to maximize their effort
15 toward organizational goals, as they will know that their organizations have made every effort to
16 provide them with the best possible working environment. Thus, employees will have the awareness
17 that their efforts will result not only in a positive output for their employers, but also in a positive
18 outcome for them. This has become even more crucial with the COVID-19 crisis, which clearly
19 highlighted the importance of protecting workers, especially those more exposed to risks (Carroll,
20 2021). Consequently, we posit the following hypothesis:

21
22
23 H1: The adoption of social sustainable operations practices is positively related to employee
24 motivation.

25
26 Furthermore, the adoption of SSOP may help organizations increase their employees' engagement.
27 Mowday *et al.* (2013, p.43) defined it as 'the relative strength of an individual's identification with
28 and involvement in a particular organization'. As early as 2003, Hendrick sustained that the
29 improvement of employees' working conditions through SSOP could not only reduce the absenteeism
30 rate and improve the production quality, but also eliminate, or at least reduce, those issues that usually
31 negatively impact employees' work satisfaction and commitment, as they are thought to improve the
32 social environment where the employees perform their tasks. By doing so, they increase employees'
33 confidence and cooperation, boosting their involvement in the organization and promoting an
34 atmosphere of trust (Roca-Puig, 2019), finally improving employees' engagement. We thus make
35 the following hypothesis:

36
37
38 H2: The adoption of social sustainable operations practices is positively related to employee
39 engagement.

40
41
42 *The moderating effect of HR analytics on the relationship between social sustainable operations*
43 *practices and employee motivation and engagement*

44
45 According to several authors (e.g. Bissola and Imperatori, 2014; Dahlbom *et al.*, 2019), the social
46 aspect of sustainability has been neglected due to the lack of involvement of the HR department when
47 dealing with sustainable operations. The HR department has been deemed as the most relevant when
48 dealing with social organizational sustainability (Pfeffer, 2010), as a mutual dependence relationship
49 exists between the most urgent social issues and organizations' HR strategies (Ehnert *et al.*, 2016).
50 Thus, a mutually influential relationship can be established between society's and organizations'
51 social dimension (Roca-Puig, 2019).

52
53 The recent social shocks also highlighted the necessity for organizations to manage their HR in a
54 more sustainable way from a social point of view (Parng *et al.*, 2021). Phenomena like the so-called
55 'great resignation' or the unexpected boost to remote working have placed further emphasis on the
56 importance of implementing SSOP to safeguard and increase employees' well-being (Aviso *et al.*,
57 2019). According to the contingency theory (Harney, 2016), the efficacy of organizational operations
58
59
60

1
2
3 aimed at improving employees' working conditions is influenced by their degree of fitness with the
4 main organizational features and with the context where the organization operates. Furthermore,
5 according to this theory, the key to the success of these operations lies in being able to align these
6 activities with the overall strategy of the organization (Wood, 1999). Consequently, companies that
7 effectively coordinate their HR management activities with their business strategy are more likely to
8 achieve better performance compared to those that do not (Huang, 2001). In fact, firms that effectively
9 combine business strategies and HR management strategies are typically better equipped to manage
10 resources efficiently, reducing operational costs and responding effectively to environmental
11 constraints and opportunities (Schuler and Jackson, 1987). The strategic fit between business and HR
12 management strategies, therefore, becomes a powerful tool to enhance overall organizational
13 performance (Katou and Budhwar, 2010). This notion of fit refers to the close linkage between HR
14 management and business strategies to retain and motivate employees, ensuring that their behaviours
15 align with the organization's objectives (Delery and Doty, 1996). All this makes contingency theory
16 one of the most suitable approaches for addressing HR management issues, as it helps to shed light
17 on the variations in motivating, engaging, and retaining employees based on their individual needs
18 (McGrandle, 2016). For instance, some employees find satisfaction in non-monetary rewards such as
19 meaningful work or a sense of self-worth, making financial incentives less influential in comparison
20 to organizations where pay is the primary motivator (Yao *et al.*, 2022).

21
22 Thus, to increase SSOP effectiveness, these have to be tailored to the specific environmental factors
23 the company is facing and to the overall organizational strategy (Balkin and Gomez-Mejia, 1987;
24 Harney, 2016). In order to do so, previous research suggested that it may be useful for organizations
25 to adopt a data-driven approach to guide them during the adoption and implementation of SSOP (Raut
26 *et al.*, 2019). In fact, several new technologies have been demonstrated to improve the impact of
27 corporate initiatives aimed at improving organizational sustainability, such as the Internet of Things
28 or the usage of big data analytics (Feroz *et al.*, 2021). Despite this, a significant research gap can be
29 found: whilst more and more research has been conducted regarding the impact of digital
30 transformation and new digital technologies on the environmental side of organizational
31 sustainability (Bresciani *et al.*, 2021), the same cannot be stated for its social dimension. In fact,
32 despite several researches having highlighted the need for adopting a data-driven approach to improve
33 the effectiveness of SSOP, empirical research on the topic has mostly been neglected (e.g. Del
34 Giudice *et al.*, 2021).

35
36 HR analytics could consequently improve SSOP effectiveness. In fact, its use can allow the adoption
37 of a data-driven decision-making process, as it can provide real-time insights regarding several HR-
38 related phenomena (Rasmussen and Ulrich, 2015), thus maximizing SSOP impact on HR benefits.
39 Through the analysis of the insight derived from HR analytics, organizations can implement SSOP
40 directly related to actual employees' priorities and necessities, thus tailoring these activities on
41 employees' concrete necessities (Falletta and Combs, 2021). Also, through the analysis of the actual
42 outcomes of SSOP, HR analytics can help in identifying both the areas where these activities are
43 producing the highest impact or, on the contrary, the areas where they are not being able to reach the
44 desired effect, thus allowing for their reinforcement and/or improvement (Levenson and Fink, 2017).
45 This may be very important in the long run, as this data-driven approach will enable organizations to
46 maintain the alignment between the overall organizational strategy and their SSOP, thus maximizing
47 the impact of the latter, according to the contingency theory (Harney, 2016). We consequently posit
48 the following hypotheses:

49
50
51
52
53
54
55 H3: HR analytics implementation positively moderates the positive relationship between social
56 sustainable operations practices and employee motivation;
57
58
59
60

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

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

1
2
3 IBM SPSS Statistics v.28 software was used to organize and process the data. It was used to derive
4 descriptive statistics and correlation among variables and to verify that data were normally
5 distributed, that multicollinearity was not an issue and to detect common method bias. Validity and
6 reliability assessment of the measurement model and hypotheses testing were conducted through
7 SPSS AMOS v.28. The SEM technique was used to simultaneously assess multiple statistical
8 relationships through visualization and model validation, similarly to previous studies (e.g. Chatterjee
9 *et al.*, 2022; McCartney and Fu, 2022). A covariance-based structural equation modelling (CB-SEM)
10 was chosen, as it has been indicated as the most appropriate for theory testing and confirmation in
11 deductive studies (Dash and Paul, 2021; Hair Jr *et al.*, 2017), as well as more suitable when dealing
12 with reflective variables (Hair *et al.*, 2019; Hair Jr *et al.*, 2017).
13
14

15 **Results**

16 *Normality, common method variance, and multicollinearity*

17
18 Before proceeding with the confirmatory factor analysis (CFA), the normality of the data was
19 assessed. As both skewness and kurtosis values of every item are within the recommended thresholds
20 of $-2/+2$ (George and Mallery, 2018), data are normally distributed. To avoid measurement errors, a
21 common factor loading all variables was produced to verify the presence of any influence of standard
22 method bias. After applying Harman's single factor, the sum of the squared percentage of variance
23 was 35.079%, lower than the commonly accepted threshold value (Harman, 1976; Podsakoff *et al.*,
24 2003). We can thus assert that the study does not present measurement issues related to common
25 method variance. Finally, we controlled the linear relation among independent variables to evade
26 overfitting issues and difficulties with the reliability of the model parameters' estimates. We assessed
27 the variance inflation factors (VIFs) to check for multicollinearity effect. As all values are lower than
28 2, with a tolerance greater than 0.10, the data did not present any multicollinearity effect (Alin, 2010;
29 Tandon *et al.*, 2021).
30
31
32

33 *Measurement validation: validity and reliability*

34
35 As all variables were taken from constructs established and accepted in theory (Kline, 2016), CFA
36 was performed to assess validity and reliability of the measurement model, and showed a satisfying
37 model fit (PCMIN/DF = 1.436; CFI = .945 ($>.92$); TLI = .935; RMSEA = .033). Convergent and
38 discriminant validity of the construct were assessed through factor loading, average variance
39 extracted (AVE), factors' correlation values and their descriptive statistics. Furthermore, the
40 reliability of our measurement means was tested through the composite reliability (CR) value
41 observation. The results provided in Table 1 show how scale items load satisfactorily onto each
42 construct, since individual items of each scale have a measurement model factor loading higher than
43 .35 (Hair *et al.*, 1995). AVE and CR are also above the commonly accepted threshold (.5 and .7
44 respectively) (Fink, 2003; Groves *et al.*, 2013; Zikmund and Babin, 2016).
45
46

47 [INSERT TABLE 1]

48
49 Table 2 shows the degree to which a measure diverges from another one whose underlying construct
50 is conceptually unrelated to it. As the square roots of AVE (in bold in Table 2) are higher than the
51 latent construct's correlation coefficients for any observed factor, all constructs and the related
52 variables meet discriminant validity standards. All the correlation outputs are significant at the level
53 .01 (2-tailed). The CFA thus confirms the adequacy of the measuring instrument and the
54 trustworthiness of the information collected.
55

56 [INSERT TABLE 2]

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,

1
2
3 despite being frequently deemed as crucial for sustainable development, has been far less considered
4 than the environmental and the economic perspectives (Amrutha and Geetha, 2020). In fact, most
5 previous studies typically investigated the impact of environmentally sustainable operations, or of
6 green HR management, on corporate social sustainability, intended as the improvement of employee
7 health and safety, equity, wellness, and well-being (Amrutha and Geetha, 2020), rather than on the
8 impact of SSOP on organizations' employees. Furthermore, the few empirical researches on the topic
9 typically presented mixed findings. For example, Longoni and Cagliano (2016) discovered a positive
10 association between SSOP and employees' motivation and retention. On the contrary, Kobayashi *et al.*
11 (2018) surprisingly found that when organizations also attempted to operationalize sustainability
12 from a social point of view, conflict could arise, both among the employees, who may have different
13 needs and perceptions, and externally, due to societal expectation once SSOP are established. More
14 recently, Zhu and Yang (2021) found a positive relationship between socially responsible financial
15 institutions and the commitment of their employees. Similarly, our study confirms the positive effect
16 of SSOP on organizations' employees, better clarifying their impact in terms of employees'
17 motivation, engagement, and retention.

18
19
20 Second, this study provided further insight regarding the adoption of a data-driven approach in
21 relation to social sustainable operations management. In fact, despite several digital technologies
22 having been implemented to deal with environmental sustainability (Feroz *et al.*, 2021), the impact
23 that these also have on social sustainability has often been considered relevant, particularly with
24 reference to data-driven solutions, but, in real terms, almost entirely neglected by previous literature
25 (Dao *et al.*, 2011; Del Giudice *et al.*, 2021; Feroz *et al.*, 2021; Longoni and Cagliano, 2016; Mani *et al.*,
26 2020; Massaroni *et al.*, 2015; Raut *et al.*, 2019). Among the few exceptions, both Raut *et al.*
27 (2019) and Zhu and Yang (2021) found a positive association between the usage of big data and
28 organizations' overall sustainable business performance. However, these studies only investigated
29 the direct impact of this technology on sustainability. On the contrary, we wanted to investigate if a
30 data-driven strategy would be able to improve the impact of organizations' initiatives aimed at
31 improving organizational social sustainability, similarly to the approach used by Del Giudice *et al.*
32 (2021) and our results confirmed this to be true. This study can thus be considered as an attempt to
33 move towards the common research agenda needed to finally consider sustainability from a holistic
34 point of view that, despite being largely requested by academics, practitioners, and institutions, is still
35 far from being reached (Feroz *et al.*, 2021).

36
37
38 Finally, this study contributed to the HR management literature related to HR analytics. In fact,
39 through the demonstration of HR analytics' moderating effect on the relationship between SSOP and
40 employee motivation and engagement, we showed that HR analytics can also offer its contribution to
41 a relatively recent new domain like social sustainability. To the best of our knowledge, no previous
42 research on the topic has been conducted. The only relatively similar study we found was the one by
43 Muhammad and Naz (2022), which found that HR analytics was able to positively moderate the
44 positive relationship between both employee engagement and employee retention and organizational
45 performance. We thus responded to the literature call to verify HR analytics' impact also on
46 organizational aspects not directly controlled by the HR department such as, in this case, SSOP
47 (Falletta and Combs, 2021). In addition, this study broadens the stream of empirical literature
48 regarding HR analytics' impact on organizational outcomes that, despite the increasing academic
49 interest (e.g. McCartney and Fu, 2022), is still a minority, as most previous studies typically adopted
50 a theoretical approach (Andersen, 2017).

51
52
53
54
55 *Managerial implications*
56
57
58
59
60

1
2
3 This study offers two main implications for practitioners. First, it provides useful information
4 concerning SSOP implementation that can be useful not only for organizations that are already
5 implementing these solutions, but also for companies that are willing to start doing so. This is
6 particularly important because, despite the fact that most firms indicate sustainability as one of their
7 priorities, most still neglect its social dimension (Mani *et al.*, 2016). Consequently, the demonstration
8 of SSOP's positive impact on organizations' employees can help convince practitioners of the validity
9 of these solutions, as better employee motivation, engagement, and retention levels may start a
10 virtuous cycle within the organization that may ultimately influence the overall organizational
11 performance (van der Togt and Rasmussen, 2017).

12
13 Second, our results can raise awareness of HR analytics, thus increasing its acceptance both within
14 and outside the HR departments. Indeed, even if the reputation of HR analytics has been continuously
15 improving (Minbaeva, 2017), it remains relatively unknown to the majority of practitioners (van den
16 Heuvel and Bondarouk, 2017). Demonstrating its potential benefits not only on the outcomes of
17 strictly HR management activities, but also on practices led from other departments, can further
18 increase its adoption.
19
20

21 *Limitations and future lines of research*

22
23 Despite its relevant contributions, this study presents some limitations. First, as we focused on the
24 difference between organizations that were already implementing HR analytics activities and others
25 that had not yet done so, we just considered the moderating effect of HR analytics implementation.
26 Future research could verify whether some difference also exists regarding organizations' maturity
27 level with this practice. According to McCartney and Fu (2022), three dimensions can be considered
28 when investigating the level of maturity of HR analytics within organizations: the quality of their
29 data; their analytical competency; and their strategic ability to act.
30

31 Second, it may be interesting to investigate the combined effect of SSOP and HR analytics on
32 organizational performance. In fact, we demonstrated SSOP's positive effect on HR benefits and,
33 according to Longoni and Cagliano (2016), this may lead to a competitive advantage. Similarly,
34 several researches have demonstrated that the use of a data-driven approach, and in particular of HR
35 analytics (DiClaudio, 2019; Tursunbayeva *et al.*, 2018), can positively impact organizational
36 performance from different perspectives. Thus, it could be reasonable to assume that the combined
37 effect of these practices can positively impact organizational performance.
38

39 Furthermore, our sample was composed only of HR managers. It could be interesting to conduct a
40 multilevel analysis also considering the opinion of companies' employees and/or of managers from
41 different departments. This is a common limitation for HR analytics studies, as they usually focus
42 solely on the opinions of HR managers (Falletta and Combs, 2021). However, as we demonstrated
43 that this practice can also support activities not directly led by the HR department, it would be
44 interesting to investigate the opinions of other stakeholders who could benefit from HR analytics
45 activities. Doing so would also allow future studies to move forward another limitation of our study,
46 i.e. the fact that we addressed our questionnaire to a single informant. In fact, although our analysis
47 demonstrated that no common method bias issues affected the result of our study, the inclusion of the
48 opinion of other organizational stakeholders may help in further increasing the validity and reliability
49 of our conclusions.
50
51

52 Finally, we only interviewed managers from European companies. It may be interesting to also
53 conduct this research in different contexts to verify whether our findings are generalizable despite the
54 specific geographical, political, and cultural context.
55

56 **Conclusions**

57
58
59
60

1
2
3 The contemporary context is increasingly complex for companies to interpret. Recent events, like the
4 COVID-19 pandemic and the global geopolitical tensions, have further complicated the situation,
5 with important consequences from both an economic and a social perspective. We believe that this
6 study can help companies deal with this scenario. In fact, through HR analytics, companies can
7 approach social challenges with a data-driven approach, thus maximizing the positive impact of their
8 SSOP on their employees. Furthermore, this approach may allow organizations not only to recognize,
9 but also to anticipate potential risks and challenges that they may have to face, whether they originate
10 from the internal organizational context or from the external environment. By leveraging the data and
11 the insight provided by HR analytics, organizations may adopt a proactive approach in dealing with
12 the actual and potential issues that may affect their workforce, thus being able to quickly plan, design,
13 and implement proper adjustments to maintain the continuity of the business. This will be crucial to
14 respond in a timely manner to the potential, and hardly predictable, social crises that could impact
15 organizations in the future, and may serve as the starting point for wider initiatives that could also
16 produce positive benefits to society in general.

17
18 From a more academic point of view, we believe that this study contributes to closing some important
19 gaps that were identifiable in academic literature. First, we focused our attention on the social
20 dimension of sustainability, which has historically been the least considered. However, in the actual
21 context, and even more in the future, this dimension will have to be considered with the same dignity
22 as environmental and economic sustainability, as organizations will have to promptly react to
23 potential social issues that may arise. Secondly, in a similar way, we investigated the impact of a data-
24 driven approach on the social side of sustainability, which will be crucial to identify a common
25 research agenda to properly deal with sustainability issues. Last, differently from most previous
26 studies, we investigated the impact of data analytics not on general organizational performance, but
27 rather we focused directly on its potential contribution to sustainable operations management.

28
29 In conclusion, we believe that this study can be a good starting point for both academics and
30 practitioners for dealing with sustainability from a holistic, data-driven perspective, an approach that
31 will become increasingly more necessary to answer to the challenges that will be posed by potential
32 future crises situations.
33
34
35
36
37

38 **References**

39
40 Aguinis, H., Gottfredson, R.K. and Joo, H. (2012), "Using performance management to win the talent
41 war", *Business Horizons*, Vol. 55 No. 6, pp. 609–616, doi: 10.1016/j.bushor.2012.05.007.

42
43 Akhtar, P., Frynas, J.G., Mellahi, K. and Ullah, S. (2019), "Big Data-Savvy Teams' Skills, Big
44 Data-Driven Actions and Business Performance", *British Journal of Management*, Vol. 30 No. 2, pp.
45 252–271, doi: 10.1111/1467-8551.12333.

46
47 Alin, A. (2010), "Multicollinearity: Multicollinearity", *Wiley Interdisciplinary Reviews:
48 Computational Statistics*, Vol. 2 No. 3, pp. 370–374, doi: 10.1002/wics.84.

49
50 Amrutha, V.N. and Geetha, S.N. (2020), "A systematic review on green human resource
51 management: Implications for social sustainability", *Journal of Cleaner Production*, Vol. 247, p.
52 119131, doi: 10.1016/j.jclepro.2019.119131.

53
54 Andersen, M.K. (2017), "Human capital analytics: the winding road", *Journal of Organizational
55 Effectiveness: People and Performance*, Vol. 4 No. 2, pp. 133–136, doi: 10.1108/JOEPP-03-2017-
56 0024.
57
58
59
60

- 1
2
3 Aviso, K.B., Chiu, A.S.F., Demeterio, F.P.A., Lucas, R.I.G., Tseng, M.-L. and Tan, R.R. (2019),
4 “Optimal human resource planning with P-graph for universities undergoing transition”, *Journal of*
5 *Cleaner Production*, Vol. 224, pp. 811–822, doi: 10.1016/j.jclepro.2019.03.213.
6
7 Balkin, D.B. and Gomez-Mejia, L.R. (1987), “Toward a contingency theory of compensation
8 strategy”, *Strategic Management Journal*, Vol. 8 No. 2, pp. 169–182, doi: 10.1002/smj.4250080207.
9
10 Bapuji, H., Patel, C., Ertug, G. and Allen, D.G. (2020), “Corona Crisis and Inequality: Why
11 Management Research Needs a Societal Turn”, *Journal of Management*, Vol. 46 No. 7, pp. 1205–
12 1222, doi: 10.1177/0149206320925881.
13
14 Battisti, E., Bresciani, S., Christofi, M. and Vrontis, D. (2022), “Guest editorial: Corporate social
15 responsibility and COVID-19 global crisis: managerial and financial perspectives in developed and
16 emerging countries”, *Management Decision*, Vol. 60 No. 10, pp. 2637–2641, doi: 10.1108/MD-10-
17 2022-202.
18
19 Bissola, R. and Imperatori, B. (2014), “The unexpected side of relational e-HRM: Developing trust
20 in the HR department”, edited by Emma Parry and Professor Stefan Strohmeier, *D.Employee*
21 *Relations*, Vol. 36 No. 4, pp. 376–397, doi: 10.1108/ER-07-2013-0078.
22
23 Bresciani, S., Huarng, K.-H., Malhotra, A. and Ferraris, A. (2021), “Digital transformation as a
24 springboard for product, process and business model innovation”, *Journal of Business Research*, Vol.
25 128, pp. 204–210, doi: 10.1016/j.jbusres.2021.02.003.
26
27 Carmeli, A. and Weisberg, J. (2006), “Exploring turnover intentions among three professional groups
28 of employees”, *Human Resource Development International*, Vol. 9 No. 2, pp. 191–206, doi:
29 10.1080/13678860600616305.
30
31 Carroll, A.B. (2021), “Corporate social responsibility (CSR) and the COVID-19 pandemic:
32 organizational and managerial implications”, *Journal of Strategy and Management*, Vol. 14 No. 3,
33 pp. 315–330, doi: 10.1108/JSMA-07-2021-0145.
34
35 Carter, C.R. and Rogers, D.S. (2008), “A framework of sustainable supply chain management:
36 moving toward new theory”, *International Journal of Physical Distribution & Logistics*
37 *Management*, Vol. 38 No. 5, pp. 360–387, doi: 10.1108/09600030810882816.
38
39 Chalutz Ben-Gal, H. (2019), “An ROI-based review of HR analytics: practical implementation tools”,
40 *Personnel Review*, Vol. 48 No. 6, pp. 1429–1448, doi: 10.1108/PR-11-2017-0362.
41
42 Chatterjee, S., Chaudhuri, R., Vrontis, D. and Siachou, E. (2022), “Examining the dark side of human
43 resource analytics: an empirical investigation using the privacy calculus approach”, *International*
44 *Journal of Manpower*, Vol. 43 No. 1, pp. 52–74, doi: 10.1108/IJM-02-2021-0087.
45
46 Dahlbom, P., Siikanen, N., Sajasalo, P. and Jarvenpää, M. (2019), “Big data and HR analytics in the
47 digital era”, *Baltic Journal of Management*, Vol. 15 No. 1, pp. 120–138, doi: 10.1108/BJM-11-2018-
48 0393.
49
50 Dao, V., Langella, I. and Carbo, J. (2011), “From green to sustainability: Information Technology
51 and an integrated sustainability framework”, *The Journal of Strategic Information Systems*, Vol. 20
52 No. 1, pp. 63–79, doi: 10.1016/j.jsis.2011.01.002.
53
54 Dash, G. and Paul, J. (2021), “CB-SEM vs PLS-SEM methods for research in social sciences and
55 technology forecasting”, *Technological Forecasting and Social Change*, Vol. 173, p. 121092, doi:
56 10.1016/j.techfore.2021.121092.
57
58
59
60

1
2
3 Del Giudice, M., Chierici, R., Mazzucchelli, A. and Fiano, F. (2021), "Supply chain management in
4 the era of circular economy: the moderating effect of big data", *The International Journal of Logistics
5 Management*, Vol. 32 No. 2, pp. 337–356, doi: 10.1108/IJLM-03-2020-0119.

6
7 Delery, J.E. and Doty, D.H. (1996), "MODES OF THEORIZING IN STRATEGIC HUMAN
8 RESOURCE MANAGEMENT: TESTS OF UNIVERSALISTIC, CONTINGENCY, AND
9 CONFIGURATIONS. PERFORMANCE PREDICTIONS.", *Academy of Management Journal*, Vol.
10 39 No. 4, pp. 802–835, doi: 10.2307/256713.

11
12 DiClaudio, M. (2019), "People analytics and the rise of HR: how data, analytics and emerging
13 technology can transform human resources (HR) into a profit center", *Strategic HR Review*, Vol. 18
14 No. 2, pp. 42–46, doi: 10.1108/SHR-11-2018-0096.

15
16 Ehnert, I., Parsa, S., Roper, I., Wagner, M. and Muller-Camen, M. (2016), "Reporting on
17 sustainability and HRM: a comparative study of sustainability reporting practices by the world's
18 largest companies", *The International Journal of Human Resource Management*, Vol. 27 No. 1, pp.
19 88–108, doi: 10.1080/09585192.2015.1024157.

20
21 Falletta, S.V. and Combs, W.L. (2021), "The HR analytics cycle: a seven-step process for building
22 evidence-based and ethical HR analytics capabilities", *Journal of Work-Applied Management*, Vol.
23 13 No. 1, pp. 51–68, doi: 10.1108/JWAM-03-2020-0020.

24
25 Feroz, A.K., Zo, H. and Chiravuri, A. (2021), "Digital Transformation and Environmental
26 Sustainability: A Review and Research Agenda", *Sustainability*, Vol. 13 No. 3, p. 1530, doi:
27 10.3390/su13031530.

28
29 Fink, A. (Ed.). (2003), *The Survey Kit*, 2nd ed., Sage Publications, Thousand Oaks, Calif.

30
31 George, D. and Mallery, P. (2018), "Reliability Analysis", *IBM SPSS Statistics 25 Step by Step*, 15th
32 ed., Routledge, pp. 249–260.

33
34 Gimenez, C., Sierra, V. and Rodon, J. (2012), "Sustainable operations: Their impact on the triple
35 bottom line", *International Journal of Production Economics*, Vol. 140 No. 1, pp. 149–159, doi:
36 10.1016/j.ijpe.2012.01.035.

37
38 Groves, R.M., Fowler, F.J., Couper, M.P., Lepkowski, J.M., Singer, E. and Tourangeau, R. (2013),
39 *Survey Methodology*, 2nd ed., Wiley, Hoboken.

40
41 Guaita Martínez, J.M., Martín Martín, J.M., Ribeiro Soriano, D.E. and Salinas Fernández, J.A.
42 (2021), "Social Sustainability on Competitiveness in the Tourism Industry: Toward New
43 Approach?", in Ferreira, J.J.M., Teixeira, S.J. and Rammal, H.G. (Eds.), *Technological Innovation
44 and International Competitiveness for Business Growth*, Springer International Publishing, Cham,
45 pp. 141–164, doi: 10.1007/978-3-030-51995-7_7.

46
47 Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1995), *Multivariate Data Analysis with
48 Readings*, 4th ed., Prentice Hall, Englewood Cliffs, N.J.

49
50 Hair, J.F., Sarstedt, M. and Ringle, C.M. (2019), "Rethinking some of the rethinking of partial least
51 squares", *European Journal of Marketing*, Vol. 53 No. 4, pp. 566–584, doi: 10.1108/EJM-10-2018-
52 0665.

53
54 Hair Jr, J.F., Matthews, L.M., Matthews, R.L. and Sarsted, M. (2017), "PLS-SEM or CB-SEM:
55 updated guidelines on which method to use", *International Journal of Multivariate Data Analysis*,
56 Vol. 1 No. 2, pp. 107–123, doi: <https://doi.org/10.1504/IJMDA.2017.087624>.

- 1
2
3 Harman, H.H. (1976), *Modern Factor Analysis*, 3d ed., rev., University of Chicago Press, Chicago.
- 4 Harney, B. (2016), “Contingency Theory”, *Encyclopedia of Human Resource Management*, Edward
5 Elgar Publishing, pp. 72–73, doi: 10.4337/9781783475469.
- 6
7 He, H. and Harris, L. (2020), “The impact of Covid-19 pandemic on corporate social responsibility
8 and marketing philosophy”, *Journal of Business Research*, Vol. 116, pp. 176–182, doi:
9 10.1016/j.jbusres.2020.05.030.
- 10
11 Hendrick, H.W. (2003), “Determining the cost–benefits of ergonomics projects and factors that lead
12 to their success”, *Applied Ergonomics*, Vol. 34 No. 5, pp. 419–427, doi: 10.1016/S0003-
13 6870(03)00062-0.
- 14
15 van den Heuvel, S. and Bondarouk, T. (2017), “The rise (and fall?) of HR analytics: A study into the
16 future application, value, structure, and system support”, *Journal of Organizational Effectiveness:
17 People and Performance*, Vol. 4 No. 2, pp. 157–178, doi: 10.1108/JOEPP-03-2017-0022.
- 18
19 Holsapple, C., Lee-Post, A. and Pakath, R. (2014), “A unified foundation for business analytics”,
20 *Decision Support Systems*, Vol. 64, pp. 130–141, doi: 10.1016/j.dss.2014.05.013.
- 21
22 Huang, T. (2001), “The effects of linkage between business and human resource management
23 strategies”, *Personnel Review*, Vol. 30 No. 2, pp. 132–151, doi: 10.1108/00483480110380316.
- 24
25 Jabbour, C.J.C. and Santos, F.C.A. (2008), “The central role of human resource management in the
26 search for sustainable organizations”, *The International Journal of Human Resource Management*,
27 Vol. 19 No. 12, pp. 2133–2154, doi: 10.1080/09585190802479389.
- 28
29 Jabeen, F., Kaur, P., Talwar, S., Malodia, S. and Dhir, A. (2022), “I love you, but you let me down!
30 How hate and retaliation damage customer-brand relationship”, *Technological Forecasting and
31 Social Change*, Vol. 174, p. 121183, doi: 10.1016/j.techfore.2021.121183.
- 32
33 Katou, A.A. and Budhwar, P.S. (2010), “Causal relationship between HRM policies and
34 organisational performance: Evidence from the Greek manufacturing sector”, *European Management
35 Journal*, Vol. 28 No. 1, pp. 25–39, doi: 10.1016/j.emj.2009.06.001.
- 36
37 Kline, R.B. (2016), *Principles and Practice of Structural Equation Modeling*, Fourth edition., The
38 Guilford Press, New York.
- 39
40 Kobayashi, K., Eweje, G. and Tappin, D. (2018), “Employee wellbeing and human sustainability:
41 Perspectives of managers in large Japanese corporations”, *Business Strategy and the Environment*,
42 Vol. 27 No. 7, pp. 801–810, doi: 10.1002/bse.2032.
- 43
44 Kundu, S.C. and Lata, K. (2017), “Effects of supportive work environment on employee retention:
45 Mediating role of organizational engagement”, *International Journal of Organizational Analysis*,
46 Vol. 25 No. 4, pp. 703–722, doi: 10.1108/IJOA-12-2016-1100.
- 47
48 Langwell, C. and Heaton, D. (2016), “Using human resource activities to implement sustainability in
49 SMEs”, *Journal of Small Business and Enterprise Development*, Vol. 23 No. 3, pp. 652–670, doi:
50 10.1108/JSBED-07-2015-0096.
- 51
52 Lee, C.C., Lim, H.S., Seo, D. (Josh) and Kwak, D.-H.A. (2022), “Examining employee retention and
53 motivation: the moderating effect of employee generation”, *Evidence-Based HRM: A Global Forum
54 for Empirical Scholarship*, Vol. 10 No. 4, pp. 385–402, doi: 10.1108/EBHRM-05-2021-0101.
- 55
56
57
58
59
60

1
2
3 Levenson, A. and Fink, A. (2017), "Human capital analytics: too much data and analysis, not enough
4 models and business insights", *Journal of Organizational Effectiveness: People and Performance*,
5 Vol. 4 No. 2, pp. 145–156, doi: 10.1108/JOEPP-03-2017-0029.

6
7 Longoni, A. and Cagliano, R. (2016), "Human resource and customer benefits through sustainable
8 operations", *International Journal of Operations & Production Management*, Vol. 36 No. 12, pp.
9 1719–1740, doi: 10.1108/IJOPM-11-2014-0564.

10
11 Mak, B.L. and Sockel, H. (2001), "A confirmatory factor analysis of IS employee motivation and
12 retention", *Information & Management*, Vol. 38 No. 5, pp. 265–276.

13
14 Mani, V., Gunasekaran, A., Papadopoulos, T., Hazen, B. and Dubey, R. (2016), "Supply chain social
15 sustainability for developing nations: Evidence from India", *Resources, Conservation and Recycling*,
16 Vol. 111, pp. 42–52, doi: 10.1016/j.resconrec.2016.04.003.

17
18 Mani, V., Jabbour, C.J.C. and Mani, K.T.N. (2020), "Supply chain social sustainability in small and
19 medium manufacturing enterprises and firms' performance: Empirical evidence from an emerging
20 Asian economy", *International Journal of Production Economics*, Vol. 227, p. 107656, doi:
21 10.1016/j.ijpe.2020.107656.

22
23 Markos, S. and Sridevi, M.S. (2010), "Employee Engagement: The Key to Improving Performance",
24 *International Journal of Business and Management*, Vol. 5 No. 12, pp. 89–96.

25
26 Marsden, D. and Richardson, R. (1994), "Performing for Pay? The Effects of 'Merit Pay' on
27 Motivation in a Public Service", *British Journal of Industrial Relations*, Vol. 32 No. 2, pp. 243–261,
28 doi: 10.1111/j.1467-8543.1994.tb01043.x.

29
30 Martin, E. (2005), "Survey Questionnaire Construction", *Encyclopedia of Social Measurement*, Vol.
31 13, Elsevier, pp. 723–732, doi: 10.1016/B0-12-369398-5/00433-3.

32
33 Massaroni, E., Cozzolino, A. and Wankowicz, E. (2015), "Sustainability in supply chain management
34 - a literature review", *Sinergie Italian Journal of Management*, Vol. 33 No. sep-dec, pp. 331–355,
35 doi: 10.7433/s98.2015.19.

36
37 McCartney, S. and Fu, N. (2022), "Bridging the gap: why, how and when HR analytics can impact
38 organizational performance", *Management Decision*, Vol. 60 No. 13, pp. 25–47, doi: 10.1108/MD-
39 12-2020-1581.

40
41 McGrandle, J. (2016), "Understanding Diversity Management in the Public Sector: A Case for
42 Contingency Theory", *International Journal of Public Administration*, pp. 1–12, doi:
43 10.1080/01900692.2015.1136942.

44
45 Minbaeva, D. (2017), "Human capital analytics: why aren't we there? Introduction to the special
46 issue", *Journal of Organizational Effectiveness: People and Performance*, Vol. 4 No. 2, pp. 110–118,
47 doi: 10.1108/JOEPP-04-2017-0035.

48
49 Mowday, R.T., Porter, L.W. and Steers, R.M. (2013), *Employee–Organization Linkages: The
50 Psychology of Commitment, Absenteeism, and Turnover*, Revised., Academic Press.

51
52 Muhammad, G. and Naz, F. (2022), "A moderating role of HR analytics between employee
53 engagement, retention and organisational performance", *International Journal of Business
54 Environment*, Vol. 13 No. 4, p. 345, doi: 10.1504/IJBE.2022.126370.

1
2
3 Mujtaba, M., Mubarik, M.S. and Soomro, K.A. (2022), “Measuring talent management: a proposed
4 construct”, *Employee Relations: The International Journal*, Vol. 44 No. 5, pp. 1192–1215, doi:
5 10.1108/ER-05-2021-0224.

6
7 Nirino, N., Petruzzella, F., Alam, G.M. and Campobasso, F. (2022), “Can sustainable practices
8 protect investors during financial market instability? A multi-sector analysis during the COVID-19
9 pandemic”, *Management Decision*, Vol. 60 No. 10, pp. 2875–2894, doi: 10.1108/MD-12-2021-1654.

10
11 Norris, J.I., Casa de Calvo, M.P. and Mather, R.D. (2020), “Managing an existential threat: how a
12 global crisis contaminates organizational decision-making”, *Management Decision*, Vol. 58 No. 10,
13 pp. 2117–2138, doi: 10.1108/MD-08-2020-1034.

14
15 Parng, Y.-J., Kurrahman, T., Chen, C.-C., Tseng, M.L., Minh Hà, H. and Lin, C.-W. (2021),
16 “Visualizing the hierarchical sustainable human resource management under qualitative information
17 and complex interrelationships”, *Management of Environmental Quality: An International Journal*,
18 Vol. 32 No. 6, pp. 1422–1447, doi: 10.1108/MEQ-04-2021-0086.

19
20 Peter, J.P. (1979), “Reliability: A Review of Psychometric Basics and Recent Marketing Practices”,
21 *Journal of Marketing Research*, Vol. 16 No. 1, pp. 6–17, doi: 10.1177/002224377901600102.

22
23 Pfeffer, J. (2010), “Building Sustainable Organizations: The Human Factor”, *Academy of*
24 *Management Perspectives*, Vol. 24 No. 1, pp. 34–45, doi: <https://doi.org/10.5465/amp.24.1.34>.

25
26 Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y. and Podsakoff, N.P. (2003), “Common method biases
27 in behavioral research: A critical review of the literature and recommended remedies.”, *Journal of*
28 *Applied Psychology*, Vol. 88 No. 5, pp. 879–903, doi: 10.1037/0021-9010.88.5.879.

29
30 Ramlall, S. (2004), “A Review of Employee Motivation Theories and their Implications for Employee
31 Retention within Organizations”, *Journal of American Academy of Business*, Vol. 5 No. 1/2, pp. 52–
32 63.

33
34 Rasmussen, T. and Ulrich, D. (2015), “Learning from practice: how HR analytics avoids being a
35 management fad”, *Organizational Dynamics*, Vol. 44 No. 3, pp. 236–242, doi:
36 10.1016/j.orgdyn.2015.05.008.

37
38 Raut, R.D., Mangla, S.K., Narwane, V.S., Gardas, B.B., Priyadarshinee, P. and Narkhede, B.E.
39 (2019), “Linking big data analytics and operational sustainability practices for sustainable business
40 management”, *Journal of Cleaner Production*, Vol. 224, pp. 10–24, doi:
41 10.1016/j.jclepro.2019.03.181.

42
43 Robbins, S.B. (1993), *Organizational Behavior*, 6th ed., Prentice-Hall, Englewood Cliffs, N.J.

44
45 Roca-Puig, V. (2019), “The circular path of social sustainability: An empirical analysis”, *Journal of*
46 *Cleaner Production*, Vol. 212, pp. 916–924, doi: 10.1016/j.jclepro.2018.12.078.

47
48 Rombaut, E. and Guerry, M.-A. (2020), “The effectiveness of employee retention through an uplift
49 modeling approach”, *International Journal of Manpower*, Vol. 41 No. 8, pp. 1199–1220, doi:
50 10.1108/IJM-04-2019-0184.

51
52 Sayyadi Tooranloo, H., Azadi, M.H. and Sayyahpoor, A. (2017), “Analyzing factors affecting
53 implementation success of sustainable human resource management (SHRM) using a hybrid
54 approach of FAHP and Type-2 fuzzy DEMATEL”, *Journal of Cleaner Production*, Vol. 162, pp.
55 1252–1265, doi: 10.1016/j.jclepro.2017.06.109.

1
2
3 Schuler, R.S. and Jackson, S.E. (1987), "Linking Competitive Strategies with Human Resource
4 Management Practices", *Academy of Management Perspectives*, Vol. 1 No. 3, pp. 207–219, doi:
5 10.5465/ame.1987.4275740.

6
7 Singh, S.K. and El-Kassar, A.-N. (2019), "Role of big data analytics in developing sustainable
8 capabilities", *Journal of Cleaner Production*, Vol. 213, pp. 1264–1273, doi:
9 10.1016/j.jclepro.2018.12.199.

10
11 Tandon, A., Dhir, A., Talwar, S., Kaur, P. and Mäntymäki, M. (2021), "Dark consequences of social
12 media-induced fear of missing out (FoMO): Social media stalking, comparisons, and fatigue",
13 *Technological Forecasting and Social Change*, Vol. 171, p. 120931, doi:
14 10.1016/j.techfore.2021.120931.

15
16 van der Togt, J. and Rasmussen, T.H. (2017), "Toward evidence-based HR", *Journal of*
17 *Organizational Effectiveness: People and Performance*, Vol. 4 No. 2, pp. 127–132, doi:
18 10.1108/JOEPP-02-2017-0013.

19
20 Tursunbayeva, A., Di Lauro, S. and Pagliari, C. (2018), "People analytics—A scoping review of
21 conceptual boundaries and value propositions", *International Journal of Information Management*,
22 Vol. 43, pp. 224–247, doi: 10.1016/j.ijinfomgt.2018.08.002.

23
24 Wood, S. (1999), "Human resource management and performance", *International Journal of*
25 *Management Reviews*, Vol. 1 No. 4, pp. 367–413, doi: 10.1111/1468-2370.00020.

26
27 World Commission on Environment and Development. (1987), *Our Common Future*, Oxford
28 University Press.

29
30 Yao, J., Marescaux, E., Ma, L. and Storme, M. (2022), "A contingency approach to HRM and firm
31 innovation: The role of national cultures", *Human Resource Management*, p. hrm.22149, doi:
32 10.1002/hrm.22149.

33
34 Zhu, X. and Yang, Y. (2021), "Big Data Analytics for Improving Financial Performance and
35 Sustainability", *Journal of Systems Science and Information*, Vol. 9 No. 2, pp. 175–191, doi:
36 10.21078/JSSI-2021-175-17.

37
38 Zikmund, W.G. and Babin, B.J. (2016), *Essentials of Marketing Research*, Sixth edition., Cengage
39 Learning, Australia.
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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.

1
2
3 Indicate to what extent do you agree with the following statements.

4 ENGA1: Involvement in the process of decision-making engages the employees of the company you
5 work for to contribute to the company's performance.
6

7 ENGA2: Effective communication regarding the clarity of their role and nature of work motivates
8 the employees of the company you work for to work with full dedication.
9

10 ENGA3: The company you work for trusts the integrity of talented employees, which encourages
11 them to work with full capacity.
12

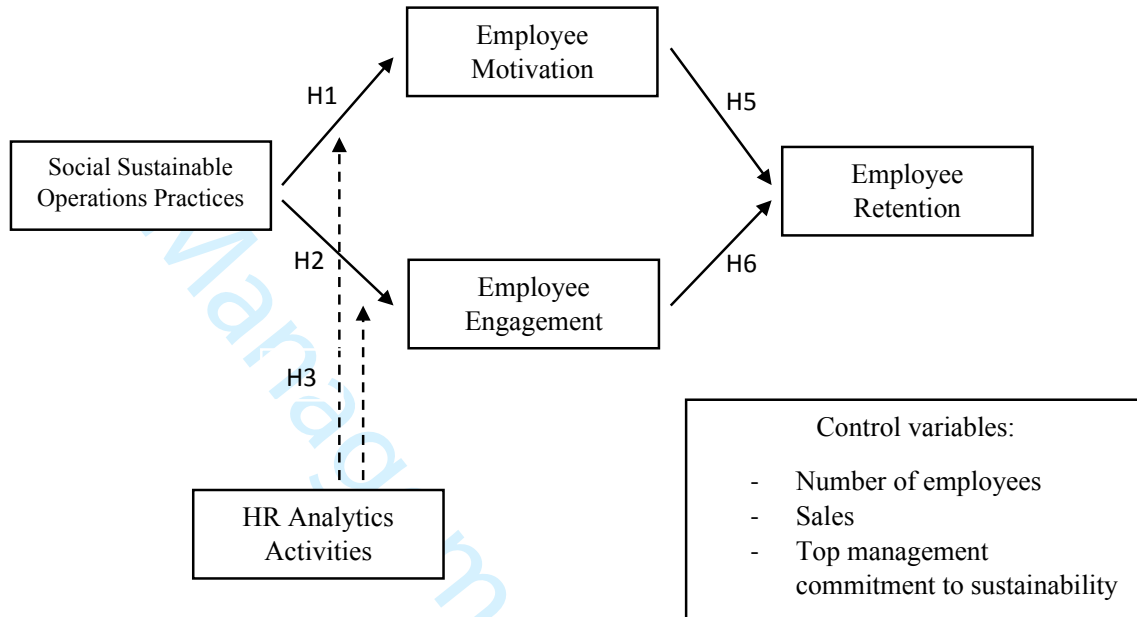
13 Indicate to what extent do you agree with the following statements.

14
15 RETE1: The company you work for provides career development opportunities to retain key
16 employees.
17

18 RETE2: Managerial support of the company you work for inspires its employees to continue their
19 job.
20

21 RETE3: The conducive environment of the company you work for motivates talented employees to
22 stay a shorter period [Reverse-coded].
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Figure 1 – Research model and hypotheses



Source: Authors' elaboration.

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		

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 \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

This was the author accepted manuscript of the study:

[Di Prima, C.](#), [Kotaskova, A.](#), [Yildiz, H.](#) and [Ferraris, A.](#) (2023), "How to survive social crises? An HR analytics data-driven approach to improve social sustainable operations' effectiveness", *Management Decision*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/MD-06-2023-0973>

This author accepted manuscript is deposited under a Creative Commons Attribution Non-commercial 4.0 International (CC BY-NC) licence. This means that anyone may distribute, adapt, and build upon the work for non-commercial purposes, subject to full attribution. If you wish to use this manuscript for commercial purposes, [please visit Marketplace](#)

DOI: 10.1108/MD-06-2023-0973

Date the article was accepted for publication: 10-Nov-2023