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Examining shared leadership dimensions through a social network approach: a case from tourism industry

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Abstract

Background: Shared leadership is regarded as a fundamental approach to complexity leadership theory in terms of adaptability and flexibility. It emerges from communication among team members in a complex environment and consists of three dimensions: task coordination, personal support, and information sharing.

Purpose: This study investigates shared leadership and its dimensions which are task coordination, personal support, and information sharing using social network analysis. By incorporating social network theory, the social and relational aspects of shared leadership can be revealed and emphasized.

Study design/methodology/approach: Social network analysis was used to test the hypotheses on the data collected from the employees of a tourism organization.

Findings/conclusions: The findings indicate that the individuals in task coordination, personal support and information sharing networks have a medium or low percentage of degree centrality in the social networks of their units or departments. The social networks of task coordination, personal support and information sharing have a high percentage of degree density when all individuals are treated as a total network and individuals in different departments and units as separate networks. This situation is led by the more balanced distribution of the power among the actors, dense communication between the members and intense network relations in task coordination, personal support and information sharing networks.

Limitations/future research: The present study focuses only on internal network relations. As a future body of work, the study could be expanded to include both external and internal network relations to provide a wider understanding of the shared leadership concept. As another future body of work, to reach more generalizable results, this study can be expanded with a meta-analysis that will be performed on the results obtained by applying the survey on other organizations and processing the data collected with social network analysis methods again.

Keywords

shared leadership, social network, task coordination, personal support, information sharing

Introduction

Recently, researchers have mainly focused on complexity leadership as a new paradigm. Organizations require different perspectives, including rapid response and self-adaptation processes, in contrast to traditional leadership, which has deficiencies in overcoming complexities (Imperial et al., 2016; Kumar, 2020; Lewin, 1999; Plowman & Duchon, 2008; Xu, 2023). Complexity leadership has emerged as a solution to this problem. It is defined as an interdependent process

based on the collaboration of individuals to achieve the organization's common goals (Gichuhi, 2021; Lichtenstein et al., 2006; Wu, Cormican & Chen, 2020). According to this viewpoint, it is not only about authority and control, but also about encouraging decision-making participation through connection and integration (Rosenhead, Franco, Grint & Friedland, 2019; Wheatley, 1996).

Shared leadership is regarded as a fundamental approach for complexity leadership theory in terms of adaptability and flexibility (Clarke, 2013; Evans, Sanner & Chiu, 2021; Singh, Del Giudice, Tarba & De Bernardi, 2019). Shared leadership differs from traditional leadership perspectives in that it is viewed as a collection of social relationships based on task coordination, personal support, and information sharing (D'Innocenzo, Mathieu & Kukenberger, 2016; Hackman & Wageman, 2004). Similarly, social network theory recognizes and investigates social relationships among actors, which can be analyzed using social network analysis (Liu, Sidhu, Beacom & Valente, 2017; Yılmaz & Tuzlukaya, 2023).

The interconnectedness of individuals is at the core both for shared leadership and social network theory (Castellano, Chandavimol, Khelladi & Orhan, 2021; Liu et al., 2017; Uhl-Bien, 2006; Yılmaz, 2023). The network emerging as a result of the interdependent connections contains a high level of complexity. Therefore, leaders must be aware of complexities found in the network (Avolio, Walumbwa & Weber, 2009; Denis, Langley & Sergi, 2012; Rosenhead et al., 2019; Yawson & Jonson-Kanda, 2018). Despite the fact that shared leadership is based on the study of social relationships in a network, there are few studies that look at shared leadership through the perspective of social network theory. By incorporating social network theory, the social and relational aspects of shared leadership can be revealed and emphasized. Therefore, the current study investigates the relationship between network ties and shared leadership dimensions.

The rest of the article is organized as follows. First, theoretical background that includes shared leadership, social network theory and shared leadership dimensions is provided. Then, the methodology of the research is explained by focusing mainly on data collection and data analysis. The findings are also presented at the end of methodology section. The article is concluded by discussing and commenting on the results in the last sections.

1. Theoretical background

1.1. Shared leadership

Shared leadership describes the shared interactive power among team members in a complex environment (Döös & Wilhelmson, 2021; Hoch, 2014; Imam & Zaheer, 2021; Mendez & Busenbark, 2015; Shu, 2018). It is an interdependent and dynamic path taken by actors with the goal of guiding the organization to success (Barnett & Weidenfeller, 2016; Brown & Gioia, 2002; Gronn, 2002).

The studies that have been published in the literature to examine shared leadership include the ones that are listed as follows: The effect of shared leadership on team performance (Burke et al., 2006; Fausing, Jeppe Jeppesen, Jonsson, Lewandowski & Bligh, 2013; Hoch & Kozlowski, 2014; Xu, Ghahremani, Lemoine & Tesluk, 2022), team proactivity (Erkutlu, 2012), team effectiveness (Fausing et al., 2013; Wang, Waldman & Zhang, 2014), trust among the members (Drescher, Korsgaard, Welpe, Picot & Wigand, 2014; Klasmeier & Rowold, 2020), team development (Morgeson, 2005), organizational outcomes (Small & Rentsch, 2010), organizational effectiveness and performance (Nazir & Shah, 2014), individuals' creativity and innovation in a team (Dong, Bartol, Zhang & Li, 2016). The relationship between shared leadership and social capital is also revealed (Joo, Lim & Kim, 2016; Moore, Payne, Autry & Griffis, 2016; Zhang & Cheng, 2015).

Other studies on shared leadership can be also found in the literature (Love, Ika, Matthews & Fang, 2021). Erkutlu (2012) examined the relation between team proactivity and shared leadership by conducting research on 105 instances of teamwork in a commercial bank in Turkey. The findings revealed the positive impact of shared leadership on team proactivity (Siangchokyoo & Klinger, 2022). Furthermore, a meta-analysis approach was used to assess the effect of shared leadership on team effectiveness (Sinha, Chiu & Srinivas, 2021; Wang et al., 2014). The study discovered that team effectiveness correlates with shared leadership positively in organizations (George, Gibson & Barbour, 2022; Wang et al., 2014; Wu & Cormican, 2021). Drescher et al. (2014) investigated the relationship between shared leadership and teamwork in terms of trust. The findings revealed that shared leadership plays a prominent role in developing trust among the members and shared leadership has a positive

relationship with team performance (He & Hu, 2021). The impact of shared leadership on organizational connections was also examined (Mihalache, Jansen, Van den Bosch & Volberda, 2013; Zeier, Plimmer & Franken, 2018). The findings showed that shared leadership contributes to ambidexterity by empowering decision-making process, providing a collectivist approach and strengthening the flow of information among members. Another topic investigated in the literature is the relation between shared leadership and social capital. The findings emphasized the importance of leadership sharing among team members in increasing trust and cooperation among members (Han, Yoon, Choi & Hong, 2021; Zhang & Cheng, 2015). In this context, Hoch (2012) stated that shared leadership is a vital component to integrating members into their teams in organizations and leadership sharing empowers members' innovative behavior in the workplace.

1.2. Social network theory

A social network is a complex network of connected people, organizations, or other elements where connections are made and kept up through different kinds of interaction like communication, association, or common interests. These networks are the underlying framework through which information, resources, and influence travel, and they can appear in a variety of contexts, such as online platforms or actual communities. The social and professional dynamics of individuals and groups within social networks are shaped by the flow of ideas, support, and collaboration that social networks facilitate. Understanding how connections and relationships affect people's opportunities, behaviors, and decision-making processes in a particular setting requires a critical analysis of social networks.

Actors are viewed as embedded within social networks of interconnected relationships that provide them with opportunities and create constraints (Kenis & Oerlemans, 2008). When focused on the social network relationships between the actors, it is also necessary to examine the variety of purposes that various types of relationships serve (Kenis & Oerlemans, 2008; Woods, Galbraith & Hewitt-Dundas, 2019). In this context, two fundamental measurements can be listed as degree centrality and degree density. Degree centrality indicates how close the nodes or actors are to the center of the network. The individual who has the highest percentage of relationships is the most central one (Mayo, Meindl & Pastor, 2003; Tahmasebi & Askaribezayeh, 2021). Degree centrality can be calculated separately for individuals, as well as it can be formulized as a single value for the entire network by using the values calculated for individuals to provide an overview of the degree centrality of individuals in the network. In the second case, it is called network degree centrality or network centralization (Cao & Smith, 2021). Degree density refers to the current number of occurred links between individuals in the network and subgroups (clusters) divided by the sum of the number of links that have occurred and may occur in a network (Brass, 2022; Opper & Burt, 2021; Small, 2007). It mainly concentrates on the quantity of connections inside subgroups or clusters as well as between individuals in the network. It is determined by dividing the total number of links that have occurred and may occur within the network by the number of links that now exist between these entities (Brass, 2022; Opper & Burt, 2021). Given that there are more connections than prospective connections, a higher degree density value denotes a more intensive level of interactions between network actors. A higher degree density value indicates that the relationship between the actors in the network are more intense (Alberti, Belfanti & Giusti, 2021).

1.3. Shared leadership and social network

Studying shared leadership through the perspective of social network theory may offer a deep understanding of relationships because it concentrates on the social ties developed during the shared leadership process (Carter, DeChurch, Braun & Contractor, 2015; Shu, 2018).

Several studies have been conducted on the intersection of social network theory and shared leadership. This study is also interested in shared leadership based social network investigation. Carson, Tesluk and Marrone (2007) used social network analysis to investigate the relationship between shared leadership and team performance. According to the findings, there is a positive relationship between shared leadership and team performance.

Small and Rentsch (2010) also conducted a study using social network analysis and found that team harmony and member trust are important factors in increasing revenue. Members' interaction can be classified into three categories: task coordination, personal support, and information sharing. In a complex environment, interactions and communication among team members result in

shared leadership (Barnett & Weidenfeller, 2016; Clarke, 2013; Mendez & Busenbark, 2015; Pearce & Conger, 2003).

Task coordination refers to the connections and communication that occur during the completion of a task. Task coordination is required to lead individuals toward the organization's common goals in a synergistic manner (Susandy & Prasetyo, 2019; Wang, Han, Fisher & Pan, 2017). The breakdown of collectivism among members is unavoidable in the absence of task coordination (Wang et al., 2017).

Personal support is the most effective way to foster mutual understanding and strengthen weak ties. Personal support is based on actors' attempts to assist other members of the network (Kock, Mayfield, Mayfield, Sexton & De La Garza, 2018). Personal support allows actors to share knowledge and power, potentially resulting in a stronger network relationship (Kock et al., 2018).

Sharing information is also important for distributing power among actors and improving shared leadership (Szilagyi, 2017; Vandavasi, 2020). Information dissemination within the team, in particular, reduces the need for top-down decision-making hierarchy, distributes leadership power among actors, and facilitates shared leadership activities (Ali, Wang & Boekhorst, 2023; Szilagyi, 2017). In terms of communication and decision-making processes, a task coordination network is a decentralized organizational structure. It reveals who coordinates and collaborates with whom in a network to generate knowledge. The decentralized structure, distribution of tasks and related decision-making processes among individuals enable members to participate in organizational activities more collaboratively and to reduce their centralized positions. From the standpoint of a social network, the explained situation means that members' degree centralities should be low, respectively. Furthermore, it is reasonable to expect members to establish numerous relationships with others. The excess in the number of relationships results in a higher degree density percentage for the entire network as well as for subnetworks of each department. As a result, the first two hypotheses of this study are as follows:

Hypothesis 1a: *Task coordination generates a low percentage of network degree centrality.*

Hypothesis 1b: *Task coordination network has a high percentage of degree density.*

Organizations strive to create the ideal community in which members interact cooperatively and consistently in terms of who supports whom and how they support one another. (Susandy & Prasetyo, 2019). Personal support within the network demonstrates that the relationship between members is based on more than just tasks, it also helps to prevent weak nodes. From social network perspective, the explained situation means degree centralities should not be high because ties are distributed through the network. In addition, it is anticipated that members will form variety of bonds by supportive relationships. The variety of bonds results in a high percentage of degree densities across the entire network as well as within each department and leads to the following hypotheses:

Hypothesis 2a: *Personal support generates a low percentage of network degree centrality.*

Hypothesis 2b: *Personal support network has a high degree density percentage.*

The last dimension of shared leadership is information sharing, which represents the flow of knowledge and information among individuals as well as determining the information sharing network (Massari, Giannoccaro & Carbone, 2021; Susandy & Prasetyo, 2019). The explained situation implies that degree centralities in social networks should be low. Furthermore, it is expected that members will form numerous relationships with one another, resulting in high degree densities across the entire network. As a result, the following are the final hypotheses:

Hypothesis 3a: *Information sharing generates a low percentage of network degree centrality.*

Hypothesis 3b: *Information sharing network has a high degree density percentage.*

2. Methodology

2.1. Research design

The main aim of this study is to investigate shared leadership and its dimensions through social network analysis. Thus, social network analysis is used to reveal the actors' positions and degree densities of the related dimensions within whole network. A tourism-related organization with various departments allows us to conduct network research and answer research questions. In terms of their characteristics related to service industry, tourism organizations have highly complex structures. Also, all of the employees are fundamental and essential in the quality, production and delivery of services included in tourism sector due to its nature that requires social relations and direct contact with people for each

member of the organization (Sifolo, 2020). This situation also leads to distribution of leadership elements to organizational members instead of concentrating authority and power on the one hand, respectively. Therefore, a social network analysis in such an organization and its related departments can help to answer the hypotheses.

2.2. Data collection

Data for this study were gathered from the nine departments of the pre-selected organization. To do that, the following stages are observed:

a) To collect data, an ego-centric approach is used, in which each ego is asked to declare and describe his/her directly related contacts (Burt, 1984; Knoke & Yang, 2008).
b) Data was collected from 98 respondents.
c) In the survey, the participants were asked to declare their partners for task coordination, personal support, and information sharing.
d) Also, numbers of weekly contacts with declared partners for the aforementioned activities were asked.

The survey questions are as follows:

1. Which of your partners do you coordinate tasks with him/her regarding the work?
2. Which of your partners do you exchange information with him/her in the workplace?
3. Which of your partners do you get personal support or advice with him/her regarding the work?

2.3. Data analysis

Social network analysis is used for data analysis. To perform social network analysis, UCINET software (Borgatti, Everett & Freeman, 2002) is utilized. The variables measured are degree centrality and degree density. Each measured relationship is assumed as symmetrical.

Degree density is the ratio of total existing ties to all possible ties (Bruggeman, 2008). The resulting value takes a value between 0 and 1. If the degree density is close to 1, the density is high. The density of a network can give information about how quickly information spreads between nodes. A high value of density indicates that the actors are inextricably linked (Degenne & Forse, 1999). In this study, degree density values between 0 and 0.5 is considered as low.

Degree centrality, as Everett and Borgatti (2005) stated, is one of the fundamental analysis dimensions in network analysis. The degree centrality of any actor located in the network is calculated by the number of its connections, and is a significant criterion that can indicate the importance of the actor for the network. It is critical to determine which group the actors with high degree values belong to, as such determination can provide information about the number of network elements connected, the power of the actor, the degree of activity, and its importance. If degree centrality is high, shared leadership has a lower level (Hanneman & Riddle, 2005; Sparrowe, Liden Wayne & Kraimer, 2001). If the degree density value is low, shared leadership is at a higher level due to more homogenous distribution of the relations between actors. Degree centrality values can be expressed for actors separately, or it can be calculated as a single value for the entire network by using the degree centrality values of each actor in order to give an insight about the entire network. The degree centrality value of entire network can also be called network degree centrality or network centralization. In this study, degree centralities are calculated for the entire network as well as for each cluster (i.e., departments are regarded are subgraphs of the whole network). The number of weekly contacts with the partners is used to assess the strength of the relationships. For task coordination, personal support, and information sharing relations in the organization, social network maps are prepared and all the aforementioned parameters are calculated, separately. In this study, degree centrality values between 0 and 0.5 is considered as low.

3. Results

Through social network survey, answers from 98 out of 130 participants were collected from 9 departments. Table 1 and Table 2 provide some background information about the participants.

Table 1 Participant demographics

Age	Number of participants	Years of experience
26-30	50	2-6
30-37	40	4-10
40-45	5	5-12
46-50	3	8-13

Source: the authors

Table 2 Departmental distribution of the participants

Department (abbreviation)	Number of participants
Management (M)	1
Assistance of management (AM)	1
Secretary (S)	3
Finance department (FD)	10
Human resources and personal affairs department (HRD)	18
Managerial employee departments (MED)	28
Maintenance and information systems (MIS)	18
Auditing and review department (ARD)	14
Accurate searches and development department (ARDD)	55

Source: the authors

3.1. Task coordination network analysis

Figure 1 shows the map of the task coordination network with clusters as departments including the degree of weak and strong ties. Due to the nature of their operations, the management, management assistance, and secretary departments are categorized as a single cluster.

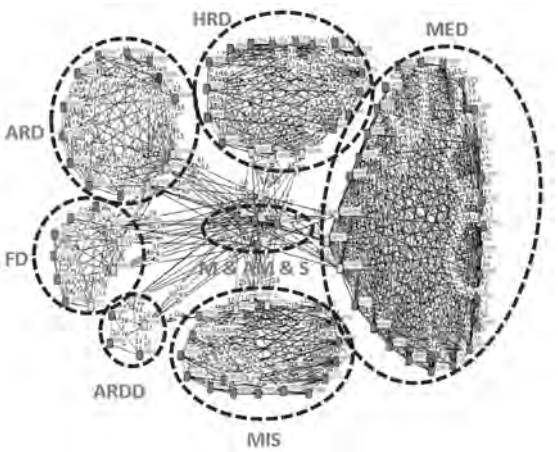

Figure 1 Social network map of task coordination network
Source: the authors

As shown in Figure 1, management and secretary departments are connected to all other clusters. The employees of auditing and review department, finance department, accurate searches department, maintenance and information department, human resources department, and managerial employee department are connected to other departments by their head of departments. Table 3 and Table 4 give the calculated network parameters.

Table 3 Network parameters of the task coordination network with symmetric relations

Parameter	Degree	NormDegree	Share
Mean	18.98	19.37	0.01
Std. dev.	6.64	6.77	0.00
Network degree centrality	13.70%		
Blau heterogeneity	1.15%		

Source: the authors

Table 4 Degree density parameters of the task coordination network

Department	Degree Density
HRD	97.38%
MED	95.53%
MIS	100%
ARD	100%
FD	100%
ARDD	100%
M&AM&S	97.38%
Number of ties of entire network	1794
Number of possible ties of entire network	9506
Degree density of entire network	18.87%

Source: the authors

The network degree centrality of task coordination network is 13.70% and Blau heterogeneity is 1.15%. These values support Hypothesis 1a, which states that task coordination leads to a low network degree centrality. Also, degree density for the entire network is 18.87%, which is a low value. On the other hand, according to the shared leadership approach, individuals should be evaluated according to their specific roles in the network. If clusters (departments) are examined separately, degree densities are very high, 1 or very close to 1. The values for the clusters support Hypothesis 1b, which claims the social network of task coordination will have a high degree density value.

3.2. Personal support network analysis

Figure 2 shows the map of the personal support network with clusters as departments including the degree of weak and strong ties. Due to the nature of their operations, the management, management assistance, and secretary departments are categorized as a single cluster.

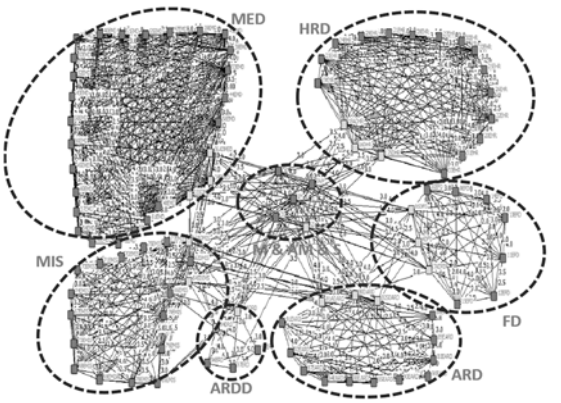

Figure 2 Social network map of personal support network
Source: the authors

As shown in Figure 2, management and secretary departments are connected to all other clusters. The employees of auditing and review department, finance department, accurate searches department, maintenance and information department, human resources department, and managerial employee department are connected to other departments by their head of departments. Table 5 and Table 6 give the calculated network parameters.

Table 5 Network parameters of the personal support network with symmetric relations

Parameter	Degree	NormDegree	Share
Mean	15.71	16.04	0.01
Std. dev.	5.92	6.04	0.00
Network degree centrality	17.14%		
Blau heterogeneity	1.17%		

Source: the authors

Table 6 Degree density parameters of the personal support network

Department	Degree Density
HRD	87.90%
MED	74.11%
MIS	51.63%
ARD	69.23%
FD	82.22%
ARDD	100%
M&AM&S	100%
Number of ties of entire network	1501
Number of possible ties of entire network	9506
Degree density of entire network	15.79%

Source: the authors

The network degree centrality of personal support network is 17.14% and Blau heterogeneity is 1.17%. These values support Hypothesis 2a that claims personal support leads to a low network degree centrality. Also, degree density for the entire network is 15.79%, which is a low value. On the other hand, according to the shared leadership approach, individuals should be evaluated according to their specific roles in the network. If clusters (departments) are examined separately, degree densities are high, 1 or higher than 50%. The values for the clusters support Hypothesis 2b that claims the social network of personal support will have a high degree density value.

3.3. Information sharing network analysis

Figure 3 shows the map of the information network with clusters as departments including the degree of weak and strong ties. Due to the nature of their operations, the management, management assistance, and secretary departments are categorized as a single cluster.

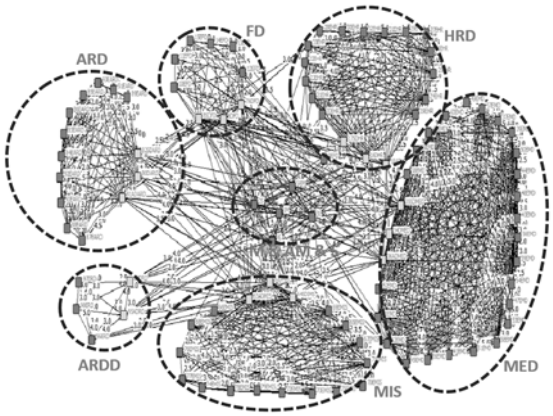

Figure 3 Social network map of information sharing network
Source: the authors

As shown in Figure 3, management and secretary departments are connected to all other clusters. The employees of auditing and review department, finance department, accurate searches department, maintenance and information department, human resources department, and managerial employee department are connected to other departments by their head of departments. Table 7 and Table 8 give the calculated network parameters.

Table 7 Network parameters of the information sharing network with symmetric relations

Parameter	Degree	NormDegree	Share
Mean	22.86	23.32	0.01
Std. dev.	8.99	9.17	0.00
Network degree centrality	35.93%		
Blau heterogeneity	1.18%		

Source: the authors

Table 8 Degree density parameters of the personal support network

Department	Degree Density
HRD	92.40%
MED	92.72%
MIS	100%
ARD	100%
FD	100%
ARDD	100%
M&AM&S	100%
Number of ties of entire network	1987
Number of possible ties of entire network	9506
Degree density of entire network	20.90%

Source: the authors

The network degree centrality of information sharing network is 35.93% and Blau heterogeneity is 1.18%. The calculated value supports Hypothesis 3a that claims information sharing leads to a low network degree centrality. Also, degree density for the whole network is 20.90%, which is a low value. On the other hand, according to the shared leadership approach, individuals should be evaluated according to their specific roles in the network. If we examine clusters (departments) separately, degree densities are very high, 1 or very close to 1. The values for the clusters support Hypothesis 3b that claims the social network of information sharing will have a high degree density value.

4. Discussion

Shared leadership is an approach that regards leadership as a distributed mechanism among the members to achieve organizational goals, compatible with complex leadership paradigm unlike the traditional view. According to shared leadership, leading power is shared among the actors. It emerges from interactions and communication among the individuals in the organization. These interactions and commination consist of three dimensions which are task coordination, personal support and information sharing. Despite the fact that these dimensions are shared with the network innovation concept and suitable to be investigated by social network analysis, such a study does not exist in the current literature (Avolio et al., 2009; Denis et al., 2012; Liu et al., 2017; Rosenhead et al., 2019; Uhl-Bien, 2006, Yawson & Jonson-Kanda, 2018). This research bridges the gap by applying social network analysis methods to shared leadership dimensions.

The findings of this study reveal that each individual in task coordination networks, personal support networks, and information sharing networks has a medium or low network degree centrality. The reason for the given situation is the distribution of the relationships among the actors instead of focusing on specific members. Furthermore, degree densities of clusters of task coordination, personal support, and information sharing networks are high. The high percentage is led by dense communication between the members. Moreover, strong ties are observed as the dominating ties in these networks due to intense relationships.

The network degree centrality values of task coordination, personal support, and information sharing networks are lower than medium. The network degree densities of these networks are low across the board, but they are high within each cluster. When nodes can participate in network innovation through their clusters, lower degree densities for the entire network are expected, but higher densities for the clusters. Furthermore, due to stronger communications and interactions arising from shared leadership processes, the ratio of strong ties to weak ties is higher in all of the aforementioned networks.

Conclusion

The present study fills the given gap and contribute theoretically and methodologically by implementing social network analysis into shared leadership concept. Additionally, dimensions of shared leadership are examined and revealed with social network analysis as another contribution of the present study.

The present study has also some managerial implications. First, the quality and density of communication among clusters of the organizations may be increased in order to develop the percentage of degree density. Second, the relationships and power can be distributed more evenly instead of concentrating on specific actors and clusters. In this way, coordination among the members will be empowered, personal support will increase and information will be disseminated within the organization. Therefore, organizations can be able to benefit from the advantages of sharing leadership explained in the literature (Drescher et al., 2014; Erkutlu, 2012; Fausing et al., 2013; Imam, 2021; Spedding, Brough, Hawkes & Chan, 2023; Wang et al., 2014) such as higher performance, more collectivism, increased trust, and higher effectiveness. Tourism organizations, due to their uncertain and complex environments, always searches for best solutions and adaptations. The results of this study provide that, it is

significant to integrate the shared leadership for achieving the pre-defined goals and objectives. Specifically, for survival in such environments, tourism organizations can benefit from shared leadership and can agree upon such characteristics as empowerment, engagement, support and so forth.

With the present study, the shared leadership dimensions and their reciprocals in social network theory can be investigated and analyzed. On the other hand, the present research focuses only on internal network relations. As the future work, the study could be expanded as including both external and internal network relations to provide a wider understanding of the shared leadership concept.

This research has some limitations, on the other hand. Social network theory and its analysis methods have different approaches than traditional and statistical methods (Sözen, 2012). Unlike statistical methods that aim to produce valid and generalizable information for the entire universe with the data collected from a limited number of universe samples, the sample data collected for social network analysis directly constitute the its own entire universe. Therefore, social network analysis, which draws a general framework in this way, recreates its own universe within each network definition, again. Although this situation limits the generalizability of the results, it provides researchers with higher level of insights. As another future work, in order to reach more generalizable results, this study can be expanded with a meta-analysis that will be performed on the results obtained by applying the survey on other organizations and processing the data collected with social network analysis methods again.

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Digitalization of HRM for strategic human resource management orientation – logistic regression and dominance analysis approach[1]

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Abstract

Background: According to the contemporary HRM theory, strategic human resource management (SHRM) orientation, as a company's philosophy of aligning human resource management (HRM) policies and practices with an organizational strategy for maximizing organizational results, is considered the highest level of a company's HRM development. At the same time, one of the trends in HRM is the digitalization of HRM activities, following the global trend of adopting digital tools for increasing individual and organizational efficiency and effectiveness. The question that consequently arises is whether the digital component entered the SHRM perspective, in other words, whether SHRM orientation could exist without digitalization of HRM endeavours.

Purpose: The paper strives to provide answers, both theoretically and empirically, to the following central and three supporting research questions: CRQ = Is digitalization of HRM contributing to the strategic HRM orientation of a company?, SRQ1 = Are digital HRM practices positively related to the SHRM orientation?, SRQ2 = Are some digital HRM practices more relevant for the SHRM orientation than others?, and SRQ3 = If the relationship between digital HRM practices and SHRM orientation does exist, which digital HRM practice is the most relevant one for SHRM orientation?

Study design/methodology/approach: To provide empirically based answers to research questions, we utilized the CRANET 2021 dataset, covering 4495 organizations with more than 200 employees from 38 countries worldwide. We used nine indicators for revealing the existence of digital HRM (manager self-service, employee self-service, HRIS, algorithm-based HRM, HR analytics, telework, digital learning, social media recruitment, social media selection) and five indicators for determining the SHRM orientation (HR manager's membership in the management board or equivalent; involvement of HR manager in the development of business strategy; existence of written HRM strategy; HR to employee ratio, the level of HR department performance evaluation). SHRM orientation was determined using K-Means cluster analysis, and relationships between variables were analysed using correlation analysis, multiple logistic regression and dominance analysis (DA).

Findings/conclusions: Correlation analysis revealed that all indicators of digitalization of HRM processes have a positive and a significant relationship with SHRM orientation, implying that digital HRM practices are relevant for SHRM orientation. The results of logistic regression indicated that the usage of manager self-service, algorithm-based HRM, HR analytics, telework, digital learning and social media selection increase the probability of organizations' SHRM orientation more than other explored indicators. The results of DA demonstrate that the most important digital HRM practices for the SHRM orientation is digital learning.

Limitations/future research: As CRANET dataset is limited in its variables of digital HRM and indicators of SHRM orientation, further research is needed to confirm our findings.

[1] Extended version of the paper presented at Strategic Management and Decision Support Systems in Strategic Management SM 2023 scientific conference.

Keywords
strategic HRM, strategic HRM orientation (SHRM), digitalization of HRM, digital HRM practices, CRANET, logistic regression, dominance analysis (DA)

Introduction

Strategic human resource management (SHRM), as the alignment of human resource management (HRM) goals, strategies and activities with organizational strategy to achieve organizational goals, is considered to be the ultimate stage in the evolution of HRM according to the contemporary theory (Poloski Vokic, 2016). Namely, the contribution of well-designed and implemented HRM activities to organizational performance has been documented numerous times (e.g., Collins & Clark, 2003; Jackson et al., 2014; Schuler & Jackson, 2005). In other words, managers today face the challenge of balancing the demands of achieving organizational goals and enhancing employee-centric outcomes (Malik et al., 2023). Consequently, HRM combined with the strategic orientation should be more successful in achieving organizational strategic goals (e.g., Chow et al., 2013).

At the same time, technological development and information and communications technology (ICT), as components of the modern business environment, influence the development of many business areas, including the HRM function which is "not 'spared' by new ways of performing activities and tasks" (Berber et al., 2018, p. 22). Nowadays, there is almost no HRM activity that has not been digitalized. The digitalization of HRM has evolved significantly over the years, starting with the digitalization of HR administration, data collection and data analysis, which has been facilitated by the implementation of human resource information systems (HRISs). The subsequent phase involved the digitalization of HR planning and job analysis, and the use of digital tools for recruitment and e-learning. As the digitalization of HRM progressed, the more advanced functionalities were included, such as online testing and video interviewing, online performance goal setting and evaluation, as well as manager and employee self-service. Today, HRM digitalization is advancing towards algorithm-based HRM and the usage of artificial intelligence (AI) in HRM (Prikshat et al., 2023).

On the one hand, the SHRM literature emphasizes the importance of the integration between HRM and strategy to attain superior performance (Chow et al., 2013), and on the other hand digital economy has become a matter for HRM (Febrianti & Jufri, 2022). Therefore, it is interesting to analyse whether digitalization of HRM is an important element of SHRM orientation. As Lepak and Snell (1998, p. 229) indicated two decades ago, "as firms continue to push the limits of IT to achieve organizational objectives, we would encourage SHRM researchers to examine how IT can function not only as a cost-reducing tool but as an asset that helps better control and coordination across organizational boundaries". Similarly, Meijerink et al. (2021) recently suggested that future research should answer the question of what will happen to organizations that are still in the process of becoming digital. Accordingly, the question that needs to be answered is whether SHRM orientation could exist without digitalization of HRM endeavours – in other words, whether the digital component is essential for the SHRM perspective. Therefore, our central research question is: CRQ = Is digitalization of HRM contributing to the strategic HRM orientation of a company?, while three supporting research questions are: SRQ1 = Are digital HRM practices positively related to the SHRM orientation?, SRQ2 = Are some digital HRM practices more relevant for the SHRM orientation than others? and SRQ3 = If the relationship between digital HRM practices and SHRM orientation does exist, which digital HRM practice is the most relevant one for the SHRM orientation?

Moreover, studies on the consequences of digital HRM are limited and mainly focused on its influence on users' attitudes and behaviours or on HRM-related outcomes such as HRM service quality and HRM effectiveness (Zhou et al., 2021). Studies on the role of digital HRM for the SHRM orientation are even scarcer. Therefore, we strive to fill this research gap. Answers to our research questions are rooted in the theory of comprehensive SHRM perspective that integrates the best from universalistic, contingency, configurational and contextual approach to SHRM (e.g., Martin-Alcazar et al., 2005). Namely, Martin-Alcazar et al. (2005) suggest that the integrative explanation of SHRM could be useful as a reference framework for future research in the field of SHRM as it could foster the analysis of concrete HRM topics, such as certain policies or practices, in this case digital HRM practices.

In the theoretical background part of our paper, we shortly define concepts of SHRM orientation and HRM digitalization, as well as present the existing reflections and findings on the relationship between digital HRM and SHRM. In the empirical part of our paper, we explore the aforementioned relationship using variables from the CRANET 2021 database.

1. Theoretical background

1.1. Strategic human resource management orientation

According to Marler (2009), there are two overarching strategic perspectives related to SHRM. The first perspective indicates that SHRM contributes to an organization's competitive advantage when it fits or is in vertical alignment with firm-level business strategies. In this context, achieving a competitive advantage is contingent on whether HRM policies and practices fit the firm's overall business strategy. The second perspective is rooted in the well-known Resource-Based View (RBV) which focuses on strategic resources and capabilities within the firm as sources of competitive advantage (e.g., Barney 1991; Prahalad & Hamel, 1994). According to this view, the HR function holds the potential to produce human resources and organizational capabilities pivotal for achieving and maintaining a competitive edge of an organization.

As Chow et al. (2013) explain, not only is an organization's strategic orientation a vehicle that transforms the value of human capital into superior firm performance, but it also plays a critical role in linking HRM to performance. Consequently, the SHRM orientation encompasses three aspects needed for achieving coordination and integration between HRM systems and organizational goals achievement. It usually starts with HRM practices being designed to be strategic, meaning that they are critical for organizational outcomes. According to Wright and McMahan (1992), HRM practices are strategic when the pattern of planned human resource deployments and activities enables an organization to achieve its goals. The second aspect implies that HR professionals are becoming more aware and focused on strategic issues (Bissola & Imperatori, 2014). It is they who have to master the theory and practice of formulating and implementing organizational strategies. In other words, they need to possess the knowledge and skills that enable them to engage in discussions of organizational vision, values, purpose and intent (Ulrich, 1998). The final aspect points towards the strategic role of the HR department in the company, referring to its mandatory participation in strategic decision-making. As strategic partners, as Ulrich named this potential role of the HRM function back in 1997 (Ulrich, 1997), HR professionals have 'a seat at the table' when any kind of business decision is made (Jackson et al., 2014).

Already a decade ago, researchers accentuated that the environmental turbulence increased the importance of SHRM, which positioned the HR department as a potent powerhouse for strategic management (e.g., Azmi, 2014), and demanded from HR practitioners both functional and strategic competences (e.g., Lo et al., 2015). Moreover, unlike some topics (e.g., total quality management, business process reengineering etc.) that have obtained faddish status in HRM over the years, SHRM has achieved staying power (Lengnick-Hall et al., 2009). It has also been a prominent area of research in the HRM field for over three decades (Cooke et al., 2021). Today, researchers disclose that SHRM practices decrease employees' emotional exhaustion (Mansour, 2023). Next, they are considered crucial for fostering employees' learning orientation and enhancing their learning competences (Arunprasad et al., 2023), which are recognized as vital capabilities for the Knowledge age we live in. Moreover, the SHRM approach has the potential to improve dynamic capabilities and promote greater innovation of enterprises (Ho et al., 2023). Consequently, it is nowadays widely accepted that the SHRM orientation is a relevant stakeholder in an organization's success (e.g., Chawla et al., 2023; Haque, 2021).

1.2. Human resource management digitalization

HRM digitalization refers to the usage of digital technologies for supporting or conducting HRM activities. Lepak and Snell (1998) were the first to write about the role and impact of IT on structural integration within HRM, and developed their famous three-part typology: (1) operational aspect – IT streamlining HRM operations and alleviating much of the administrative burden, (2) relational aspect – IT increasing the timeliness and service levels by providing managers and employees with remote access to HR databases and information, and increasing their ability to connect with other parts of the corporation as well as outside service providers, and (3) transformational aspect – IT enabling people to communicate across geographic

boundaries and share information, eliminating barriers of time and space. Afterwards, researchers (e.g., Berber et al., 2018; Bissola & Imperatori, 2014; Parry & Strohmeier, 2014; Ruël et al., 2004; Strohmeier & Kabst, 2014) used this typology as the basis for writing about different types of HRM processes that can be ICT-based, resulting in the terminology of operational, relational and transformational e-HRM. In this context, it is important to note that although the term e-HRM is largely used as a synonym for digital HRM, the concept of digital HRM is broader as it refers to any kind of digitalization of HRM, while e-HRM involves the use of web-based technologies for providing services regarding HRM (Berber et al., 2018).

Today, many transactional (processing, controlling) and transformational (motivational, developmental) digital HRM solutions are employed, as systematized in Table 1.

Table 1 Standard transactional and transformational HRM activities supported by digital HRM solutions

	HRM activities	Examples
Transactional HRM activities	HRM data collection	attendance registers, electronic work diaries
	HRM data recording	personal data databases, work performance data databases
	HRM data computing	payroll/benefits processing
	HRM data analysing	HR analytics
	HR planning	workforce modelling
	job analysis	job analysis software
	recruitment	online recruitment through specialized and organizational websites, social media platforms, online applications
Transformational HRM activities	selection	online testing, video interviewing, chatbot interviewing, applicant tracking system, algorithmic selection decisions
	performance management	online performance goal setting, online performance evaluation, digital career management systems, digital talent management systems, onboarding chatbots
	training and development	video learning, online learning, e-learning, online assessment
	work design	algorithmic work distribution, remote work solutions, online communication and collaboration, manager self-service, employee self-service
	internal communication	digital information provision, electronic newsletters, Intranet
	employee well-being	online attitudes assessment, online psychological support, online workout programs

Source: the authors

As already revealed a decade ago (e.g. Parry, 2011; Parry & Tyson, 2010), a large proportion of transactional HRM activities is delivered exclusively or greatly by software solutions rather than HR administrators, making the transactional HRM 'technology-intensive' compared to its 'labour-intensive' characteristic from the past. Nowadays, digital work platforms, virtual HRM assistants, automated HRM decision making, algorithmic HRM, and the usage of big data and AI in HRM (e.g., Kurek, 2021; Meijerink et al., 2021; Ulatowska et al., 2023; Waldkirch et al., 2021; Walkowiak, 2023) make the transformational HRM even more 'technology-intensive'. Eventually, all this leads to either reducing the number of employees in HR departments or to reducing HR department's role into a strategic partner one.

The abovementioned applications of HRM digital solutions imply that organizational investments in the digitalization of HRM processes could be grouped into efficiency- and effectiveness-based ones. Firstly, ICT was used for accelerating, simplifying and monitoring HRM activities, reducing HR administration costs and errors, as well as improving internal information sharing. Moreover, soon it became evident that the usage of ICT in HRM results in a better quality of services provided, improved work collaboration and smarter HRM decisions. It is digital HRM solutions that reduce administrative burden, increase the speed of realization, optimize procedures and lower costs (e.g., Berber et al., 2018; Strohmeier & Kabst, 2014). They also support HRM operations which leads to productivity increases (e.g., Berber et al., 2018; Parry, 2011; Parry & Tyson, 2010; Strohmeier & Kabst, 2014) and generates insights into crucial HRM issues that improve the quality of HR-related decisions (e.g., Bissola & Imperatori, 2014; Meijerink et al., 2021; Strohmeier & Kabst, 2014; Zhou et al., 2021). Positive outcomes of the adoption of digital HRM systems are as well increased transparency of HRM policies and

greater trust in the HR department (e.g., Bissola & Imperatori, 2014; Burbach & Royle, 2014). As the final outcome, the digitalization of HRM processes supports organizational strategy, and consequently has an effect on organizational performance (e.g., Bondarouk & Ruel, 2013; Febrianti & Jufri, 2022; Parry & Tyson, 2010; Parry & Strohmeier, 2014; Ruel et al., 2007; Strohmeier & Kabst, 2014; Zhou et al., 2021). It can be summarized that "HRM digitalization has the potential to simplify and enrich, steer and support, and shorten and speed up the pursuit of organizational and employee goal accomplishment" (Bondarouk et al., 2017, p. 114).

1.3. Human resource management digitalization for the strategic leverage

As already mentioned, studies relating digitalization of HRM to SHRM are rare, especially empirical and quantitative ones. To date, studies have not yet provided solid evidence that digital HRM solutions have a part in the SHRM orientation of an organization. For example, upon the literature, Ruel et al. (2004) highlight that improving HRM's strategic orientation is one of the three types of e-HRM goals, together with improving administration and efficiency, and improving client orientation and service. However, after exploring five large international companies they concluded that links between the e-HRM content and the overall HRM strategy are not clear. Nevertheless, authors stressed that the most important e-HRM effect seemed to be the strategic integration of HRM with the company strategy, structure and culture.

Afterwards, Ruel et al. (2007) analysed the relationship between e-HRM assessment and HRM effectiveness through a quantitative study conducted in the Ministry of Internal Affairs of the Netherlands. Their e-HRM assessment included job relevance, quality of applications and ease of use, while HRM effectiveness was measured by more efficient HRM processes, higher level of service delivery and better strategic contribution. The results showed that the quality aspect of an e-HRM application has a positive and significant effect on HRM effectiveness, which, according to authors, will lead to decreased costs, improved HRM service level and the elevation of the HR department to the role of a strategic partner. However, this study has been conducted in one public organization, and it is debatable if HRM effectiveness can be used as a proxy of SHRM orientation.

By composing a theoretical model, Marler (2009) concluded that a primarily administrative HR function is unlikely to become more strategic with the addition of e-HRM. However, only one year after, using ten case studies from a range of UK organisations, Parry and Tyson (2010) provided some evidence for the strategic impact of e-HRM through enabling HRM to support the organisation in achieving its strategic goals by improving efficiency and effectiveness. As the evidence of the transformational impact of e-HRM, they offer the finding that the usage of e-HRM allows HR staff to have more time and information to support the organisation in achieving its strategic objectives. One year after, Parry (2011), using 2003 CRANET data, supported the hypothesis that organizations where HR function plays a more strategic role are more likely to implement e-HRM. However, this was supported for the 'use of e-HRM' but not for the 'sophistication of e-HRM'. Based on previous research, she argues that the use of e-HRM is associated with the transformation of the HR function into a more strategic one, allowing more time to be dedicated to delivering the organizational strategy by changing the focus from administrative to HRM activities that have a strategic relevance. However, her empirical data were not suitable for testing this premise.

Results from the exploratory study conducted by Bondarouk and Ruel (2013) in a governmental organization indicated that e-HRM alone is not sufficient to transform the HR function into a strategic partner. The research revealed that e-HRM could lead to strategic reorientation if certain conditions such as the integration of modules and the willingness and readiness of users to acquire new skills are met. Though, the research was conducted as a single case study in which HRIS has been implemented only 15 months before the analysis. Additionally, the strategic orientation was measured only by the perception of HR roles by different employee groups, not by any objective SHRM indicator.

Newer research is neither without limitations. For example, L'Ecuyer and Raymond (2023) demonstrated that the firm's e-HRM capabilities are strategic capabilities which determine its competitiveness. However, research they conducted involved only industrial small and medium-sized enterprises (SMEs). Theres and Strohmeier (2023) conducted a meta-analysis, and they found no more than medium-sized associations between digital HRM and

organizational performance as the ultimate SHRM goal. Moreover, although authors provided some evidence that digital HRM constitutes a successful endeavour which could meet performance expectations, they underlined that the research in the area should be continued and intensified.

Presented findings signal that there is still much to be revealed about the role of digitalized HRM processes in the SHRM orientation of an organization, especially through the field research, which encouraged us to empirically assess the issue on a large-scale data set.

2. Methodology

2.1. Data and sample

In our analysis we used global data from the 2021 CRANET research. The CRANET research is the largest and most representative research of HRM practices in the world. It is a multi-country, multi-time-point survey undertaken regularly over the past 30 years by a collaborative network of scholars from over 40 countries (Parry et al., 2021). It analyses developments in HRM in a national, cross-national, and quasi-longitudinal way to extend the range of internationally comparable evidence about policies and practices in the field (Parry et al., 2011). The CRANET research enables the comparison of HRM policies and practices in a large number of countries across the globe and allows the examination of trends and changes in HRM over the years (Lazarova et al., 2008).

In the CRANET research, a unit of analysis is an organization, and the highest-positioned individual in the HR department is responsible for answering the questionnaire. The CRANET questionnaire explores HRM policies and practices through a set of common questions and covers all important areas – general HRM characteristics, resourcing practices, employee development, compensation and benefits, and employee relations and communication. For this analysis, parts of the questionnaire related to the digital HRM and SHRM orientation were used.

Our analysis includes 4,495 organizations with more than 200 employees from 38 countries worldwide. 67.4% of organizations in the sample are from the private sector, 20.5% from the public sector, 4.8% from the non-for-profit sector and 3.5% with mixed ownership. Regarding the number of employees, 37.8% of organizations in the sample have between 200 and 500 employees, 22.5% from 500 to 1000 employees, 18.7% from 1000 to 2500 employees, and 21.0% have more than 2500 employees.

2.2. Measures

Digital HRM indicators. To assess the existence of digital HRM in the organization, all indicators that exist in the CRANET database related to the digitalized way of performing HRM activities were considered. The following nine indicators are used: (1) usage of manager self-service, (2) usage of employee self-service, (3) usage of HRIS, (4) usage of algorithm-based HRM, (5) usage of HR analytics, (6) presence of telework, (7) existence of digital learning, (8) social media recruitment and (9) social media selection. All digital HRM variables were ordinal (variables 1 to 5 and variable 7 were measured on a scale from 0 = 'not at all used' to 3 = 'used to a very great extent'; variable 6 was measured on a scale from 0 = 'not used' to 4 = 'used for more than 50% of employees; variables 8 and 9 were recoded to the scale from 0 = 'not used for any group of employees' to 2 = 'used for both managers/professionals and clericals').

SHRM orientation indicators. In order to assess the organization's SHRM orientation, we extracted variables from the CRANET database using three criteria: that it is a typical SHRM indicator (e.g., Fitz-enz, 1998; Ulrich et al., 2017), that the indicator has already been used in previous SHRM research (e.g., Parry, 2011; Poloski Vokic, 2016.), and that, of course, it is available in the CRANET database. The following nine indicators are used: (1) membership of HR manager in the management board or equivalent, (2) involvement of HR manager in the development of business strategy, (3) existence of written HRM strategy, (4) HR to employee ratio, and (5) existence of HR department performance evaluation. All SHRM variables were binary variables (0 = not the case / not present, 1 = the case / present), including the HR to employee ratio (1 = if the value was 1% or higher).

2.3. Data analysis

The first step of the analysis was the cluster analysis, which was performed by using SHRM indicators to differentiate two groups of organizations according to their SHRM orientation. K-means clustering was used, as one of the most common non-hierarchical, partitioning techniques which attempts to minimize the within-cluster sums-of-squares error and finds clusters that are externally isolated and internally cohesive

(Cormack, 1971; Steinley & Brusco, 2008). Cluster analysis resulted in 56.3% of organizations in cluster 1 (organizations which do not have the SHRM orientation) and 43.7% of organizations in cluster 2 (organizations which do have the SHRM orientation). Clusters were used as a binary variable of SHRM orientation. Next, correlation analysis (Spearman's rank correlation coefficients), multiple logistic regression and dominance analysis were performed for revealing the relationship between various digital HRM indicators and the SHRM orientation. Statistical analysis was performed with IBM SPSS Statistics 25.

3. Results

Table 2 presents correlations between nine indicators of digital HRM and the existence of SHRM orientation within the organization.

Table 2 Correlations between digital HRM practices and SHRM orientation

	1	2	3	4	5	6	7	8	9	10
Manager self-service		.658**	.427**	.408**	.390**	.244**	.319**	.080**	.144**	.247**
Employee self-service	.658**		.440**	.380**	.359**	.282**	.345**	.094**	.155**	.229**
HRIS	.427**	.440**		.394**	.504**	.221**	.318**	.036*	.127**	.204**
Algorithm-based HRM	.408**	.380**	.394**		.571**	.163**	.290**	-.023	.226**	.224**
HR analytics	.390**	.359**	.504**	.571**		.164**	.328**	.004	.188**	.261**
Telework	.244**	.282**	.221**	.163**	.164**		.340**	.132**	.105**	.237**
Digital learning	.319**	.345**	.318**	.290**	.328**	.340**		.122**	.156**	.281**
Social media recruitment	.080**	.094**	.036*	-.023	.004	.132**	.122**		.198**	.077**
Social media selection	.144**	.155**	.127**	.226**	.188**	.105**	.156**	.198**		.157**
SHRM orientation	.247**	.229**	.204**	.224**	.261**	.237**	.281**	.077**	.157**	

Source: the authors

The correlation analysis revealed that all indicators of digital HRM processes are positively and significantly related with the existence of SHRM orientation. In other words, digital HRM practices are more present in organizations with the SHRM orientation compared to organizations without it.

To investigate which digital HRM practices predict the SHRM orientation better, we conducted a multiple logistic regression, and the results are presented in Table 3.

Table 3 Logistic regression analysis of digital HRM practices as predictors of SHRM orientation

Predictors	β (SE)	Wald	Exp (β)	Model summary	
Constant	-1.08 (0.12)	13.387	0.341**	Omnibus test of model coefficients – χ^2, df	498.62**, 9
Manager self-service	0.22 (0.06)	0.877	1.247**	Hosmer and Lemeshow test – χ^2, df	14.69, 8
Employee self-service	0.06 (0.06)	1.281	1.057	Cox and Snell R^2	0.17
HRIS	0.06 (0.05)	8.283	1.061	Nagelkerke R^2	0.24
Algorithm-based HRM	0.19 (0.07)	36.297	1.214**	-2 log likelihood	2679.70
HR analytics	0.36 (0.06)	39.779	1.433**		
Telework	0.24 (0.04)	40.716	1.277**		
Digital learning	0.32 (0.05)	1.128	1.379**		
Social media recruitment	-0.06 (0.06)	15.256	0.942		
Social media selection	0.28 (0.07)	80.276	1.318**		

Source: the authors

The Omnibus test of model coefficients and the Hosmer and Lemeshow test indicate a good model fit. The Omnibus test of model coefficients indicates that the logistic regression model performed to determine the effects of various HRM digitalization indicators on the likelihood that an organization has a SHRM orientation was statistically significant (χ^2 = 498.68; df = 8; p <

.01). The Hoshmer and Lemeshow test that assesses whether predictions made by the model fit with observed group memberships was insignificant (χ^2 = 14.69, df = 8; p = .066), which indicates that the data fit the model well. Cox and Snell R^2 and Nagelkerke R^2 reveal that the model is explaining between 17.0% and 24.5% of the variance in the SHRM orientation. Finally, the -2 log likelihood for the model is high (2679.70), which as well indicates that the model fits a dataset.

Results of the logistic regression, more precisely, significant odds ratio values (1.247 < Exp (β) < 1.433 p < .01), demonstrate that manager self-service, algorithm-based HRM, the usage of HR analytics, telework, digital learning and social media selection predict an organization's SHRM orientation more than other digital HRM indicators explored. When looking at odds ratios, it is visible that according to the results of logistic regression, digital HRM practices most important for the SHRM orientation are the usage of HR analytics (Exp (β) = 1.433), digital learning (Exp (β) = 1.379) and social media selection (Exp (β) = 1.318). In other words, organizations which use HR analytics to a greater extent have 43.3% more probability of having a SHRM orientation, those that use digital learning to a greater extent have 37.9% more probability of having a SHRM orientation and those that use social media selection for selecting a wider range of employees have 31.8% more probability of having a SHRM orientation.

However, when determining the importance of predictors, the most precise approach is to determine the relative importance of predictors. Dominance analysis (DA) reveals the individual contributions of the predictors in relation to each other within a selected model (Azen & Budescu, 2006), and predictors are compared in pairwise fashion across all subset model, which establishes a hierarchy of levels of dominance (Budescu, 1993). DA is particularly useful when there is a large number and a high level of multicollinearity among predictors, as well as when the predictors collectively explain a medium or large proportion of the variance in the dependent variable (Kumar et al., 2009).

The results of the average contribution of independent variable on SHRM orientation by level and its general dominance are presented in Table 4.

Table 4 Dominance analysis of digital HRM practices as predictors of SHRM orientation

Level	Manager self-service	Employee self-service	HRIS	Algorithm-based HRM	HR analytics	Telework	Digital learning	Social media recruitment	Social media selection
0	0.069	0.062	0.127	0.064	0.076	0.101	0.214	0.005	0.022
1	0.038	0.032	0.099	0.036	0.046	0.080	0.187	0.003	0.014
2	0.022	0.017	0.085	0.021	0.030	0.068	0.171	0.002	0.010
3	0.014	0.009	0.079	0.013	0.022	0.060	0.160	0.001	0.008
4	0.009	0.005	0.075	0.009	0.017	0.054	0.152	0.000	0.007
5	0.006	0.003	0.074	0.007	0.014	0.048	0.145	0.000	0.005
6	0.005	0.002	0.073	0.005	0.012	0.043	0.139	0.000	0.005
7	0.004	0.001	0.072	0.004	0.010	0.039	0.133	0.000	0.004
8	0.003	0.001	0.071	0.003	0.009	0.034	0.128	0.000	0.004
General dominance	0.019	0.015	0.084	0.018	0.026	0.059	0.159	0.001	0.009

Source: the authors

DA revealed the dominant role of digital learning in its association with the SHRM orientation compared to other predictors. First, the average dominance of digital learning is greater than average dominance of other predictors on the 0 level (R^2_0 = 0.214). Next, and crucial, the general dominance for digital learning is considerably greater than the general dominance for any other predictors ($G_{\text{digital learning}}$ = 0.159).

4. Discussion

4.1. Theoretical implications

Previous research suggested that the use of digital HRM can help the HR function to increase its value by becoming more strategic (e.g., Bondarouk & Ruel, 2013; Parry, 2011; Parry & Tyson, 2010, Ruel et al., 2004; Ruel et al., 2007). Moreover, it has been elaborated that integrating the concept of digitalization into HRM goes beyond simply aligning digital technologies with pre-established

HRM strategies, but encompasses formulating and implementing HRM strategies that are based on the potential of digitalization to create value for an organization (Strohmeier, 2020). However, the evidence on the relationship between digital HRM practices and SHRM orientation, especially empirically based, is still inadequate, as emphasized by Bondarouk et al. (2017) and Theres and Strohmeier (2023). Moreover, there is a lack of quantitative and larger-scale empirical research in the field. Finally, previous studies showed that the digitalization of HRM could have transformational outcomes (e.g., Parry, 2011; Parry & Tyson, 2010; Ruel et al., 2007), but opposite conclusions are as well present in the literature (e.g., Bondarouk & Ruel, 2013; Marler, 2009; Ruel et al., 2004). All this raises the need for further exploration of the topic.

Consequently, our research adds to the discussion by empirically positioning digital HRM practices as an important element of SHRM orientation. Our results, based on a large-scale global data set, revealed that each digital HRM practice explored (manager self-service, employee self-service, HRIS, algorithm-based HRM, the usage of HR analytics, telework, digital learning, social media recruitment, social media selection) is positively and significantly related with an organization's SHRM orientation (SRQ1).

Moreover, up to date to the best of our knowledge, there were no studies which compare the contribution of various digital HRM practices to an organization's SHRM orientation. The logistic regression analysis we conducted revealed that six out of nine practices explored – manager self-service, algorithm-based HRM, the usage of HR analytics, telework, digital learning and social media selection – are more relevant for having a SHRM orientation. Moreover, the odds ratios showed that practices aligned the most with an organization having a SHRM orientation are the usage of HR analytics, digital learning and social media selection. Organizations which have those practices have a higher probability of strategically oriented HRM (SRQ2).

The revealed importance of the usage of HR analytics is in line with the newest research on HR professionals' competencies (e.g., Ulrich et al., 2021). Namely, HR professionals are nowadays required to make decisions and solve problems based on the most relevant information. HR analytics, as the supreme stage of the transactional HRM activity of data manipulation, is therefore indispensable. Furthermore, the utilization of digital tools when selecting employees and ensuring learning has drastically increased in the last decade, and this trend has been additionally accelerated by the COVID-19 pandemic. Namely, digital HRM technologies support especially the management of vital HRM activities such as selection and learning (Kurek, 2021).

Furthermore, the dominance analysis revealed that the most relevant digital practice for a SHRM orientation is digital learning (SRQ3). This is in line with the notion that accelerated development of technologies such as AI and the widespread implementation of remote work are enhancing the importance of digital learning (Sayed al Mnhrawi & Alreshidi, 2023). Traditional modes of learning have been surpassed by the flexibility, accessibility and scalability offered by digital learning platforms (Lin et al., 2017). External factors, together with the importance of rapid knowledge absorption in the Knowledge age, positioned digital learning as a cornerstone in SHRM orientation.

Altogether our research implies that the digitalization of HRM contributes to the SHRM orientation of a company (CRQ). Digitalization of HRM goes alongside with making an organization's HRM policies and practices strategic, which results with the alignment of the HRM function with business objectives and consequently organizational performance.

4.2. Practical implications

Given the rapid development of technology, organizations must be informed about the importance of HRM digitalization for the positioning of HR function as a strategic partner. The findings of our research indicate that organizations need to pursue the latest trends in the field of digital HRM to obtain or retain the SHRM orientation. However, to enhance the SHRM orientation through the digitalization of HRM processes, organizations must be ready for digital HRM solutions, and managers and employees should acquire new technical and analytical skills (e.g., Bondarouk & Ruel, 2013; Parry, 2011). Therefore, the role of HR department is to foster the HRM digitalization, which includes training managers and employees to use e-HRM solutions, encouraging them to engage in further HRM digitalization, and ensuring that HRM digitalization processes are aligned with organizational needs. More precisely, HR professionals should identify tasks and roles that could be digitalized, and they have to constantly provide support in uncertainties associated with

digitalization (Parry & Battista, 2019). With such a comprehensive approach, HRM digitalization will have a transformational impact, observable through the existence of SHRM orientation and its gains.

Furthermore, our results imply which HRM digitalization processes organizations should focus on to achieve the maximal SHRM orientation. Manager self-service, algorithm-based HRM, HR analytics, telework, digital learning and social media selection are the best options to begin with while digitalizing HRM practices, as those practices are standard practices in organizations with a SHRM orientation, implying that they increase the probability of HR function having a strategic position and strategic results in an organization. However, if organizations decide to digitalize one practice at a time to enhance their SHRM orientation, our research suggests that they should start with digital learning, as this practice proved to be the most relevant to support it. Namely, in times when there is a clear need for continuous, flexible, and efficient learning, contemporary e-learning systems and practices provide high adoption, smooth usage, high satisfaction, and close alignment with the current practices of an enterprise (Giannakos et al., 2022).

4.3. Limitations and future research

Limitations of our analysis arise from the CRANET data specifics. First, although CRANET data was used previously for the assessment of HRM digitalization (e.g., Berber et al., 2018; Parry, 2011; Strohmeier & Kabst, 2014) and SHRM orientation (e.g., Rimac Bilusic, 2022; Szierbowski-Seibel et al., 2019), the CRANET questionnaire collects selected digital HRM and SHRM indicators. Moreover, CRANET measures are relatively simple (Parry, 2011). A further limitation of the CRANET methodology is the problem of common method variance, as variables are collected from a single source (a representative of the organization). However, Berkery et al. (2017) argued that the CRANET methodology is following all techniques which are suggested to minimize common method bias, such as psychological and methodological separation of criterion and predictor variables. Precisely, as the validity of single-source measures depends on the expertise of the source responding to the questions and the clarity of items comprising the survey (e.g., Berkery et al., 2017; Huselid & Becker, 2000), the CRANET questionnaire was asked to be completed by the most senior HR professional in the organization (the presumption of the strongest expertise), and only factual (not subjective) data was collected. To assure that questions were specific and clear, questionnaires were piloted in each country of data collection.

Despite numbered limitations, our analysis contributes to both fields explored – digital HRM and SHRM orientation, as it was conducted on a large-scale international dataset. However, because of the utmost relevance of the strategic approach towards HRM policies and practices for contemporary organizations, as well as the need to accept the 21st century digitalization command of the HRM area, further research using different sampling frames, and HRM and SHRM variables is desirable. For example, as the SHRM research establishes that achieving sustainable competitive advantage is better facilitated by deploying a cohesive set of HRM practices than relying on individual practices in isolation (Fu et al., 2015), our research lays the ground for future investigations of 'bundles' of digital HRM practices that can be identified as combinations of practices most beneficial for organizations.

Conclusion

The objective of our study was to shed further light on the relationship between HRM digitalization and SHRM orientation. The results indicate that HRM digitalization is important for achieving the ultimate stage in the evolution of HRM – the SHRM orientation. For that, the one most relevant digital HRM practice is digital learning, while the usage of manager self-service, algorithm-based HRM, HR analytics, telework, digital learning and social media selection is also highly beneficial for the SHRM orientation of a company. Our study provides empirical support for the relevance of HRM digitalization for strategic HRM outcomes, as well as gives insights into digital HRM practices that could be considered a priority while digitalizing HRM.

Declarations

Availability of data and materials

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The effects of the compensation system on job satisfaction and turnover intention of employees in the Republic of Serbia

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Abstract

Background: The motivation for researching the effects of the compensation system on job satisfaction and the turnover intentions, as well as the mediating role of job satisfaction between the compensation system and the turnover intention, was due to the insufficient number of studies of the proposed model in the Republic of Serbia.

Purpose: refers to the review of theoretical and empirical knowledge so far, the creation of a conceptual framework and the implementation of the analysis itself on the collected sample with the aim of determining the effects of influence on the mentioned variables and giving recommendations to employers on how they can positively influence job satisfaction and reduce turnover intentions.

Methodology: consists of theoretical and empirical research. The theoretical part refers to the review of previous research by other authors who examined the effects of the displayed variables based on which the conceptual framework of the research was set. The empirical part refers to conducting an analysis on a sample of 100 employees in the Republic of Serbia. The analysis was carried out using the Partial least squares structural equation modelling (PLS-SEM) method, using the SmartPLS software.

Findings: the main findings of the research indicated that there are direct positive effects of the compensation system on job satisfaction and turnover intention, and that job satisfaction has an indirect effect on the relationship between the compensation system and the turnover intention of employees.

Limitations: refer to the small number of respondents as well as the insufficient number of research in the Republic of Serbia within the proposed model.

Recommendations for future research refer to collecting a larger number of respondents as well as determining the effects on other attitudes such as work engagement, employee commitment and employee behaviour such as innovative work behaviour and employee performance.

Keywords

compensation system, job satisfaction, turnover intentions, employee attitudes, Republic of Serbia

Introduction

Gabčanová (2011) emphasizes that employees represent the most important resource of any organization. Workforce refers to the set of knowledge, skills and abilities of employees that are necessary for the implementation of defined work activities of the company in order to achieve the goals of the organization (Flores, Xu & Lu, 2020). Raid & Alzoubi (2021) emphasize that human resources must be managed efficiently and effectively, which leads to the success of the organization. The attitudes and performance of employees in the organization are the result of the influence of many factors. Employee motivation refers to the reasons for the achieved performance,

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dedication to work, and satisfaction of the employee in the work he performs (Stevanović & Belopavlović, 2011). Compensation is an effective instrument for motivating and harmonizing the interests of employees and capital owners (Malynovska et al., 2022). The reward in human resource management is compensation for work, that is, the employee's performance at work. Basic salary is the main type of compensation for an employ's work. Stimulations on various grounds and benefits intended for employees are part of the compensation package that affects the personal status of the employee.

Pay satisfaction indicates a positive or negative perception of pay and implies satisfaction with the level and structure of compensation (Ashraf, 2020). Satisfied employees will be less absent from work. Sometimes even a satisfied employee must be absent from work. Several factors make a dissatisfied employee come to work anyway, such as the fear of losing his job, responsibility to colleagues at work or to the client (Brown & Sessions, 1996). The existence of turnover intention is a prerequisite for someone to leave a job or organization (Mustika et al., 2021).

Factors that influence employees' turnover intentions are related to job satisfaction, job stress, organizational culture, little opportunities for career advancement, organizational commitment, inflexible work, earnings, and advancement opportunities. Employees' turnover intentions are seen as the possibility for employees to leave the job, that is, as a logical step after experiencing dissatisfaction (Aburumman et al., 2020; Wicaksono, Amin & Solihin, 2021).

The research consists of four parts. In the first part, the terms compensation system, job satisfaction and turnover intentions were defined, as well as the presentation of the previous results of theoretical and empirical research on the direct effects of the compensation system on job satisfaction and turnover intentions, as well as the mediating role of job satisfaction in the relationship between the compensation system and turnover intentions. Based on the presented research results of other authors on this topic, research hypotheses were set up and tested in the third part. The second part refers to the research methodology, within which the explanation of the way the questionnaire was created and the collection of samples on which the research was carried out in the next part, as well as the presentation of the sample, was made. The third part refers to the presentation of research results. The research was carried out using the SmartPLS program for data processing. During the analysis, the PLS-SEM method was used to determine the effects. The fourth part presents the discussion of the obtained results. The authors summarized the most important results obtained from the analysis in the third part and confirmed the stated hypotheses accordingly. The fourth part is followed by concluding remarks, in which the authors summarized the key segments of the research, compared previous research and the results of other authors with the results obtained. This is followed by a presentation of the limitations of the work as well as suggestions for future research.

1. Theoretical background

Gašić, Berber & Slavić (2023) emphasize that compensation system include all forms of financial income, services, and benefits that the employee can achieve based on his work in the organization. According to Salisu, Chinyio & Suresh (2015) compensation provides income to employees and represents an important cost item for the employer. If the owners of the capital perceive monetary expenditures or compensations paid and given in another form as an investment, they can expect quality work, dedication, desired achievement, and improvement of the organization's operations from the employees (Jevtić, Vladimirović & Jevtić, 2022). Berber et al. (2017) emphasize that compensation is a systematic approach to providing benefits to employees. Compensation represents the evaluation of achievement for all the work, time, and effort that the employee provides to the organization (Winda, Nayati & Arik, 2017; Gunawan & Gunawan, 2019). Mahato & Kaur (2023) emphasize that implementation of the compensation system provides continuity that encourages the employees to do their work without tension so that they can achieve their goals. With the reward system, it is necessary to harmonize and ensure the achievement of the employees' various individual needs and the organization's set goals (Vidaković, 2012).

According to Rahman and Syahrizal (2019), job satisfaction is considered a strong determinant turnover intention. According to Riyanto, Endri & Herlisha (2021), job satisfaction is a positive emotion of employees that arises from work experience. Job satisfaction refers to the feelings of employees towards certain situations in the workplace (Riyanto, Endri & Herlisha, 2021). Job satisfaction can be measured based on the feelings

and emotions of employees (Mira, Choong & Thim, 2019). Job satisfaction can refer to the pleasant and positive emotional state employees experience towards the company and the job and is explained by comparing actual and expected results (Koo, Yu, Chua, Lee & Han, 2020). Job satisfaction is a pleasant emotional state that results from the evaluation of one's job and work experience. The result is employees' perception of how important their work is (Agustine & Nawangsari, 2020). Job satisfaction is the evaluation of the job, i.e., the extent to which the job satisfies the needs of the employee (Sugiono & Nurhasanah, 2022). Compensations improve the performance, motivation, loyalty and satisfaction of employees in the organization (Gunawan & Gunawan, 2019). Organizations should focus on employee well-being, which can affect job satisfaction, but also employee loyalty to the organization (Sudiarditha, Susita & Kartini, 2019; Murtiningsih, 2020, p. 36). Job satisfaction is viewed as an attitudinal indicator that shows how much people enjoy their jobs and is positively related to employee well-being and job performance (Alwali & Alwali, 2022).

Turnover intentions are defined as the conscious and deliberate intention of the individual to leave the job and is described as the last in a series of cognitions that precedes withdrawal from the job (Hom, Lee, Shaw & Hausknecht, 2017). Several factors influence the turnover intentions, such as low pay, inflexible work, and little opportunities for career advancement, but above all it affects job satisfaction. Thus, job satisfaction can negatively affect employees' turnover intentions, because the higher the level of job satisfaction, the lower the turnover intentions of employees (Wicaksono et al., 2021). A high level of turnover intention causes losses to the organization in terms of time, finance, efficiency, and effectiveness which leads to a decline in employee performance (Asriani & Riyanto, 2020; Chen et al., 2023). Turnover intention is divided into three main components, such as thinking about leaving work, unwillingness to look for a new job, and actual absence (Aburumman et al., 2020).

1.1. Relationship between compensation system, job satisfaction and turnover intentions

Within this part, the results of previous theoretical and empirical research by other authors on this topic will be presented to determine the effects so far and accordingly set research hypotheses that will be tested in the empirical part.

1.1.1. Relationship between compensation system and job satisfaction

The review of the authors' previous research is found in the following sources:

Koo et al. (2020) examined how emotional rewards (compliment, opportunity, empowerment and recognition) and material rewards (promotion, certificate, incentive and special leave) affect job satisfaction, burnout, as well as the mediating role of job satisfaction and burnout on affective commitment, performance at work and turnover intention in the hotel sector. The results of the multiple regression analysis showed that emotional and material rewards and their dimensions are important for the formation of affective commitment, work performance and turnover intention. In addition, the findings indicate that job satisfaction and burnout play a full/partial mediating role within the proposed theoretical framework. The positive impact of emotional and material rewards on job satisfaction was determined.

Agustine & Nawangsari (2020) conducted a PLS-SEM analysis on a sample of 137 employees at PT Naiaka Era Husada Bekas Clinic where they found that the compensation system has a positive effect on job satisfaction (β=0.660, p=0.000).

Hartono, Efendi & Nurwati (2021) indicated on a sample of 120 employees that an adequate compensation system and motivation has a significant positive impact on job satisfaction and performance. In addition, it was determined that job satisfaction has a positive effect on employee performance.

The results of Ali & Anwar (2021) indicate that there is a strong and positive correlation between compensation and incentive as a motivational element and job satisfaction.

Ramlah, Sudiro & Juwita (2021) analysed the role of the compensation system and stress at work on the turnover intention of 106 employees who have been working for a year, as well as the mediating role of job satisfaction on relationships. The results indicated that the compensation system has a positive and significant effect on job satisfaction of employees.

Arora (2022) determined on a sample of 395 IT employees in India who work remotely and with the help of the SmartPLS 2.0 program that there is a significant relationship between the compensation system and job satisfaction, and in

addition, performance and job satisfaction ratings, training and development, and job satisfaction.

Illahi, Fahmy & Syahrul (2022) determined on a sample of 70 employees that the compensation system has a positive statistically significant effect on job satisfaction among employees.

Based on the presentation of previous theoretical and empirical results on the topic of the impact of the compensation system on job satisfaction, the first research hypothesis is put forward:

H_1: The compensation system is positively related to job satisfaction.

1.1.2. Relationship between compensation system and turnover intentions

Agustine & Nawangsari (2020) conducted a PLS-SEM analysis on a sample of 137 employees at PT Naiaka Era Husada Bekas Clinic, where they determined that the compensation system causes a positive effect on turnover intention (more precisely, it reduces intentions to leave) (β= -0.427, p= 0.001).

The purpose of the Purba & Ruslan (2020) study was to analyse the effect of compensation systems, career development, and job satisfaction on the intentions to leave of 156 employees. The results showed that the compensation system, career development and job satisfaction together (simultaneously) negatively and significantly influence on turnover intention.

Ramlah, Sudiro & Juwita (2021) analysed the role of the compensation system and stress at work on the turnover intention of 106 employees who have been working for a year, as well as the mediating role of job satisfaction on the relationships. The results indicated that the compensation system has a negative and significant effect on turnover intention.

Drawing on social exchange theory, Ohunakin & Olugbade (2022), examined the impact of the compensation system of 372 employees in 5-star hotels in Nigeria on turnover intention and job performance. Hierarchical multiple regression indicated that the compensation system reduces turnover intentions and improves employee performance.

Based on the presentation of previous theoretical and empirical results on the topic of the impact of the compensation system on turnover intention, the second research hypothesis is put forward:

H_2: The compensation system is negatively related to turnover intentions.

1.1.3. The mediating role of job satisfaction on the relationship between compensation system and turnover intentions

Koo et al. (2020) determined that employee satisfaction mediates the relationship between emotional rewards (compliment, opportunity, empowerment, and recognition) turnover intention as well as material rewards (advancement, certificate, incentive, and special leave) and turnover intention. Emotional and material rewards have a positive effect on job satisfaction and, accordingly, employees in the hotel sector do not want to leave their jobs (reduce turnover intention).

Agustine & Nawangsari (2020) conducted a PLS-SEM analysis on a sample of 137 employees at the PT Naiaka Era Husada Bekas clinic where they determined that satisfaction mediates the relationship between the compensation system and the turnover intention (β=-0.271, p=0.008).

Ramlah, Sudiro & Juwita (2021) analysed the role of the compensation system and stress at work on turnover intention of 106 employees who have been working for a year, as well as the mediating role of job satisfaction on the relationships. The results indicated that the compensation system has a negative and significant influence on turnover intention, stress at work has a significant positive effect on turnover intention, and job satisfaction can play a significant mediating role.

Based on research on a sample of 70 employees, Illahi, Fahmy & Syahrul (2022) found that job satisfaction can mediate between the compensation system and employees' turnover intention.

Aman-Ullah et al. (2023) examined whether the compensation system has an impact on turnover intention of healthcare workers, as well as the mediating role of job satisfaction in the relationships. The results of research using SPSS and SmartPLS programs on the cause of 600 doctors determined that the compensation system significantly affects employee retention and reduces turnover intention. The results also confirmed the mediating effect of job satisfaction on the relationship between the compensation system and employee retention, as well as the compensation system and employee turnover intentions.

Based on the presentation of previous theoretical and empirical results on the topic of the mediating role of job satisfaction on the

relationship between compensation system and turnover intention, the third hypothesis is put forward:

H_3: Job satisfaction has a positive mediation effect in the relationship between the compensation system and turnover intentions.

2. Research methodology

The methodology is made up of two parts; the first part refers to the explanation of how the questionnaire was created and how the sample collection process was carried out, while the second part refers to the presentation of the research sample.

2.1. The questionnaire

The authors created an electronic questionnaire in order to collect the necessary sample for the research and to test the set hypotheses. The questionnaire consisted of 4 parts. The first part refers to control questions related to gender, age structure, level of education and position in the company. The second part was related to issues related to performance evaluation and compensation system. This part consisted of 8 questions (Boo net al., 2011). The third part of the question refers to the assessment of job satisfaction and consisted of 5 questions (Morgeson & Humphrey, 2006), while the last part related to the assessment of the turnover intention and consisted of four questions (Chen & Francesco, 2000). For research and measurement, a Likert scale was used, ranging from 1 to 5, where 1 represents the statement "strongly disagree", 2 "disagree", 3 "undecided"; 4 "agree" and 5 "strongly agree" (Joshi, Kale, Chandel & Pal 2015). Respondents were able to answer the questions at any time, wherever they were, using their mobile devices.

2.2. The sample

A questionnaire relating to the relations between the compensation system, the satisfaction of the work and the intentions of the departure was completed by 100 employees in the territory of the Republic of Serbia. Data collection was performed from March to May 2022. Table 1 represents the structure of the sample according to the semi, in years, the education and position of the employee in the company. The sample consisted mainly of female respondents (64%), younger employees aged 25 to 34 years (35%), with completed four-year academic studies (40%), in professional positions in the organization (58%).

Table 1 Sample characteristics

Sample characteristics	Number of respondents	%
Gender		
Male	36	36%
Female	64	64%
Age structure		
Less than 25	33	33%
25 - 34	35	35%
35 - 44	14	14%
45 - 54	10	10%
More than 55	8	8%
Level of education		
High school	15	15%
Three years of vocational studies	20	20%
Bachelor's degree	40	40%
Master's degree	23	23%
Ph.D.	2	2%
Position in the company		
Manager	10	10%
Professional worker	58	58%
Administrative worker	22	22%
Manual worker	10	10%

Source: the authors

3. Research results

To present the results of research on the existence of relations between the compensation system, job satisfaction and turnover intentions, as well as the mediation role of job satisfaction on the relationship between compensation system and turnover intentions the statistical software tools SPSS IBM statistics and SmartPLS 3 were used. To adequately determine the relations between the observed variables, the PLS-SEM analysis was performed. During the research we will use structural equation modelling with partial least squares (PLS-SEM) to test the proposed model. PLS-SEM is a method based on the analysis of complex interrelated relationships between constructs and indicators (Becker, Cheah, Gholamzade, Ringle & Sarsted, 2023). PLS path models have two sets of linear equations: a measurement model (outer model) and a structural model (inner model). While the external model specifies the relationship between the construct and its observed indicators, the internal model refers to the relationships between the constructs (Gašić & Berber, 2023).

This research has two sets of linear equations: measurement model (outer model) – specifies the relationship between the construct and its observed indicators (formative/reflective construct) and structural model (inner model) – specifies the relationship between the construct (compensation

system on job satisfaction and turnover intentions as well as mediation role of job satisfaction on the relationship between compensation system and turnover intentions). For the first, we start with analysis of the measurement model (outer model) and after that with structural model. Table 2 shows descriptive statistics for each of the observed variables.

Table 2 Descriptive statistics for observed variables

	Number	Minimum	Maximum	Mean	Std. Deviation
Compensation system	100	1,25	5	3,17	1,02
Job satisfaction	100	1,00	5	4,01	0,89
Turnover Intentions	100	1,00	5	2,66	1,08

Source: the authors

As part of the first part of the analysis, the results of measuring reflective constructs within the set model, where it is necessary to analyse the external load of indicators for each variable within the model, but also reliability, convergent validity, and discriminatory validity. In Table 3, the external load of the indicator for each variable in the set model is displayed. As stated by Grubor, Berber, Aleksić & Bjekić (2020); Berber, Slavić & Aleksić (2020) loads below 0.708 should be excluded from further analysis. According to Berber et al. (2022) loads between 0.4 and 0.7 should be kept in the model, only if other indicators are not removed. Within the first step of analysis of the results obtained, the COM8 indicator is turned off.

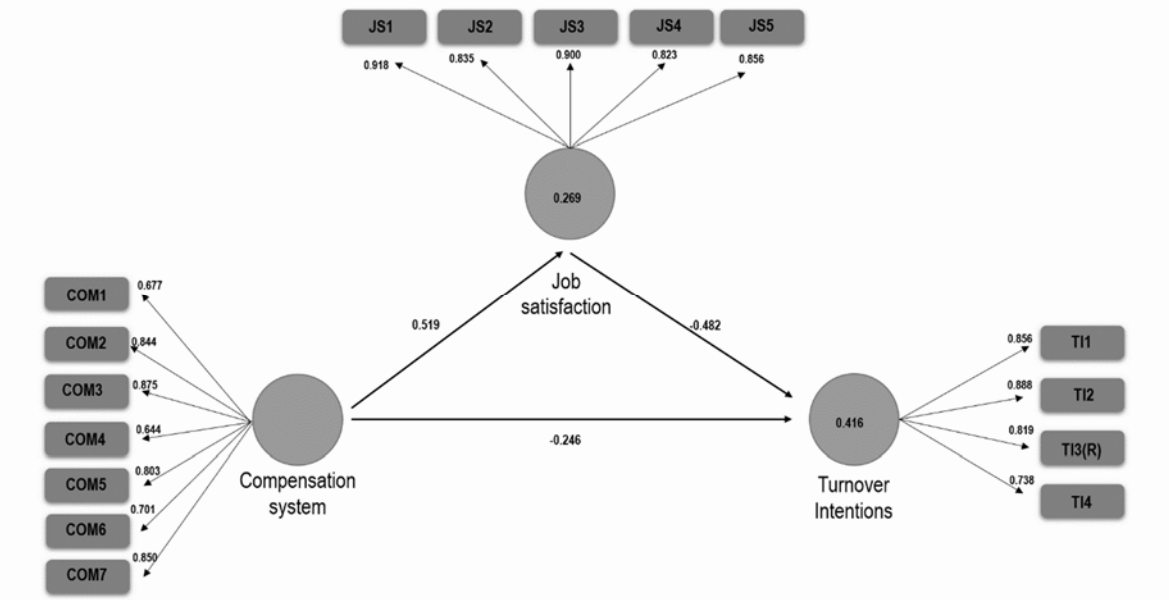

Figure 1 Path coefficient estimates
Source: the authors

Table 3 Reflective indicator loadings

Items	Compensation system	Turnover Intentions	Job Satisfaction
COM1	0.677		
COM2	0.844		
COM3	0.875		
COM4	0.644		
COM5	0.803		
COM6	0.701		
COM7	0.850		
TI1		0.856	
TI2		0.888	
TI3(R)		0.819	
TI4		0.738	
JS1			0.918
JS2			0.835
JS3			0.900
JS4			0.823
JS5			0.856

Source: the authors

Table 4 represents Internal consistency and convergent validity, which is measured with Cronbach's alpha, Composite reliability and Average variance extracted (AVE). According to Gašić & Berber (2021), the limit value for Cronbach's Alpha is 0.6. Convergent validity is achieved for all constructs from the model, because the values of Cronbach's Alpha are higher than 0.60. According to Gašić & Berber (2023), the recommended threshold value for composite reliability is 0.7. Composite reliability is between 0.80 and 0.95 for each construct from the model, while the average variance extracted (AVE) is greater than 0.5, as well as stated Berber et al. (2020) and Salis et al. (2015).

Table 4 Internal consistency and convergent validity

	Cronbach's alpha		Composite reliability		Average variance extracted (AVE)	
	Values	Criterion	Values	Criterion	Values	Criterion
Compensation system	0.887	> 0.6 (Gašić & Berber, 2021)	0.912	> 0.7 (Gašić & Berber, 2023)	0.601	> 0.5 (Berber et al., 2020; Salis et al., 2015)
Turnover Intentions	0.845		0.896		0.684	
Job Satisfaction	0.919		0.938		0.752	

Source: the authors

According to Berber et al. (2022), discriminating validity can be determined based on cross-loading, Fornell-Larcker and Heterotrait-monotrait - HTMT criteria (stricted criterion). The analysis of cross-burdens, which is an assessment of discriminant validity at the indicator level, is presented in Table 5. The observed model has adequate discriminant validity if any indicator of a certain construct is poorly correlated with other constructs, i.e., if the load of the indicator is greater than any cross-burden (Grubor et al., 2021). In Table 5, it is evident that the load of each indicator is larger than any other construct in the same column or row.

Table 5 Discriminant validity – Cross-loadings

	Compensation system	Turnover Intentions	Job Satisfaction
COM1	**0.677**	-0.238	0.314
COM2	**0.844**	-0.463	0.410
COM3	**0.875**	-0.365	0.394
COM4	**0.644**	-0.358	0.263
COM5	**0.803**	-0.369	0.496
COM6	**0.701**	-0.307	0.333
COM7	**0.850**	-0.513	0.523
TI1	-0.419	**0.856**	-0.566
TI2	-0.328	**0.888**	-0.465
TI3(R)	-0.520	**0.819**	-0.541
TI4	-0.337	**0.738**	-0.415
JS1	0.394	-0.456	**0.918**
JS2	0.405	-0.433	**0.835**
JS3	0.417	-0.513	**0.900**
JS4	0.354	-0.377	**0.823**
JS5	0.590	-0.730	**0.856**

Source: the authors

AVE for each construct is greater than its square correlations with other constructs (Grubor et al., 2021). Fornell-Larcker criterion is filled if the first construct is larger than another construct. Based on Table 6, it can be concluded that discriminant validity using Fornell- Larker's criteria is satisfied.

Table 6 Discriminant validity – Fornell – Larcker criterion

	Compensation system	Turnover Intentions	Job Satisfaction
Compensation system	0.775		
Turnover Intentions	-0.496	0.827	
Job Satisfaction	0.519	-0.610	0.867

Source: the authors

Table 7 shows the Heterotrait-monotrait - HTMT approach that can overcome potential deviations in terms of discriminant validity and therefore the most accurate indicator of discriminant validity. The limit value is 0.9 (Franke, & Sarstedt, 2019). As values below 0.9 are in the table, this indicates that discriminant validity is achieved in this criterion.

Table 7 Discriminant validity - Heterotrait-monotrait - HTMT

	Compensation system	Turnover Intentions	Job Satisfaction
Compensation system			
Turnover Intentions	0.547		
Job Satisfaction	0.537	0.647	

Source: the authors

The results shown in Table 8 represent a multicollinearity analysis, with VIF values in most cases below 3. The limit value for VIF is 3 (Hair et al., 2014). According to Shams, Niazi & Asim (2020) the limit value is 5, while Hair et al. (2019) accept values of less than 10. However, there are cases such as COM2, COM3, JS1, and JS3, which have values above 3 and they are accepted by the authors who accept VIF values of 5.

Table 8 Multicollinearity testing of indicators - VIF

Items	VIF
COM1	2.416
COM2	3.613
COM3	3.254
COM4	1.508
COM5	2.576
COM6	1.768
COM7	2.628
TI1	2.207
TI2	2.828
TI3(R)	1.768
TI4	1.574
JS1	4.910
JS2	3.694
JS3	3.954
JS4	2.893
JS5	2.166

Source: the authors

R^2 shows that changes in job satisfaction with 26.9% caused by compensations, while other unexplored factors account for 73.1%. 41.6% of changes in intentions to leave are caused by compensations.

Table 9 Coefficients of determination of the construct

Variable name	R-square
Turnover intentions	0.416
Job satisfaction	0.269

Source: the authors

To test the structural model, a bootstrapping analysis was performed. Subsamples were randomly drawn observations from the original data set (with replacement). The subsample was used to estimate the PLS path model. The process was repeated until many random subsamples (e.g., 5000) were generated. Estimates from bootstrapping subsamples were used when determining standard errors for PLS-SEM results.

The last step refers to the analysis of the relationship between the independent variable and the dependent variables, i.e., the compensation system, job satisfaction, and turnover intentions, as well as the mediating role of job satisfaction in the relationship between compensation system and turnover intentions.

Table 10 Statistical significance testing - direct and specific (mediator) indirect effect

	β	St. deviation	T statistics	*p*-values	Hypothesis
Compensation system → Job Satisfaction	0.519	0.063	8.175	0.000	H_1: Accepted
Compensation system → Turnover Intentions	-0.246	0.087	2.831	0.005	H_2: Accepted
Compensation system → Job Satisfaction → Turnover Intentions	-0.250	0,047	5,374	0.000	H_3: Accepted

Source: the authors

Table 10 includes the mean value, standard deviation, t-statistics, and *p*-value to confirm or refute the set hypotheses. Based on the obtained results, it can be concluded that there is a positive and statistically significant relationship between compensation and job satisfaction (β=0.519, T=8.175, *p*=0.000), a negative and statistically significant relationship between compensation and turnover intention (β=-0.246, T=2.831, *p*=0.005). When it comes to the mediating role of job satisfaction in the relationship between compensation and intentions to leave, i.e., the indirect influence of compensation on turnover intention, through mediation a negative and statistically significant relationship is determined, the indirect influence of compensation on intentions to leave (β=0.250, T=5.347, *p*=0.000).

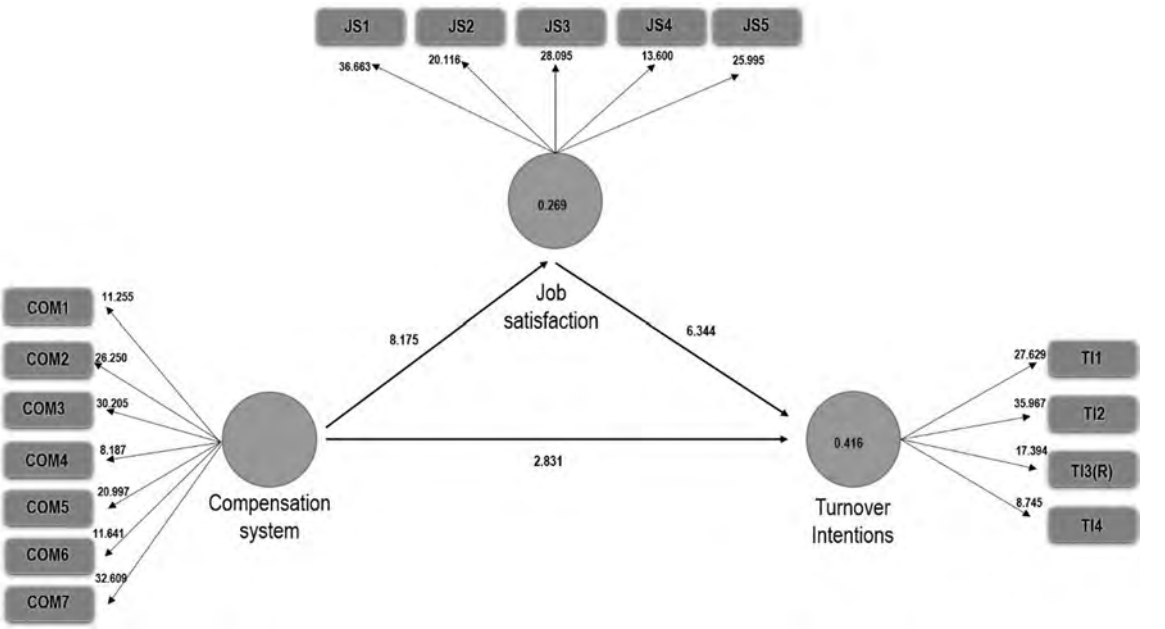

Figure 2 The path model with bootstrapping results
Source: the authors

4. Discussion

In the third chapter, data analysis was performed using the SmartPLS data processing program. When analysing the data, the PLS-SEM model (partial least squares structural equation modelling) was used. Descriptive statistics for observed variables were presented, and then an analysis of the external model was performed using indicator loadings, validity and reliability of the reflective construct, discriminant validity (cross-loadings, Fornell-Lacker criterion and HTMT strict criteria), and VIF. After the analysis of the external model, the authors analysed the internal (structural) model where they examined the direct effects of the compensation system on job satisfaction and intention to leave, as well as the mediating role of job satisfaction in the relationship between the compensation system and intention to leave 100 (mostly highly educated, young, and professional) employees in Serbia. By analysing the internal model, it was determined that the compensation system has direct positive effects on job satisfaction (β=0.519, *p*=0.000), thus

confirming the hypothesis H_1: "The compensation system is positively related to job satisfaction". The positive effect of the reward system on job satisfaction was also confirmed in the works of Koo et al. (2020), Agustine & Nawangsari (2020), Hartono, Efendi & Nurwati (2021), Ali & Anwar (2021), Ramlah, Sudiro & Juwita (2021), Arora (2022), and Illahi, Fahmy & Syahrul (2022). Analysis of the impact of the reward system on the intention to leave revealed a significant negative relationship between the observed variables (β=-0.246, p=0.005), which represents a positive effect because employees do not want to leave their jobs and accordingly H2 is confirmed: "The compensation system is negatively related to turnover intentions". The negative significant relationship was also confirmed in the works of the authors: Agustine & Nawangsari (2020), Purba & Ruslan (2020), Ramlah, Sudiro & Juwita (2021), and Ohunakin & Olugbade (2022). Analysing the mediating role of job satisfaction in the relationship between the compensation system and turnover intention, it was determined that job satisfaction mediates the said relationship, employees who are satisfied with the compensation system will not want to leave their job (β=0.250, p=0.000). Partial mediation occurs. Accordingly, H_3 was also confirmed: "Job satisfaction has a positive mediation effect in the relationship between the compensation system and turnover intentions". The significant negative mediating role of job satisfaction in the relationship between the compensation system and the intention to leave was also confirmed in the works of Koo et al. (2020), Agustine & Nawangsari (2020), Ramlah, Sudiro & Juwita (2021), Illahi, Fahmy & Syahrul (2022), and Aman-Ullah et al. (2023).

Conclusion

Compensation systems are an integral part of the relationship between the organization and employees. Researchers have long viewed compensation systems as an effective way to attract talented employees to an organization (Uwimpuhwe, Mushabe & Bally, 2018). Advances in organizational research suggest that a full understanding of the outcomes of compensation systems requires an examination of their social, psychological, and moral effects (Bloom, 2004). In addition to the compensation system, job satisfaction and turnover intention were analysed as one of the attitudes of employees. Job satisfaction is reflected in the employee's positive feeling towards the completed task. Employees will feel confident and enthusiastic through this value (Amin, 2021), while turnover intention refers to the employees' intention to leave their jobs and move to another organization (Guzeller & Celiker, 2020). Based on the theoretical and empirical research of other authors about the given relations, the authors created a conceptual research framework and set research hypotheses. The aim of the work was to determine the effects of the compensation system on job satisfaction and turnover intention, as well as the mediating role of job satisfaction between the compensation system and turnover intention of 100 employees in the Republic of Serbia. An electronic questionnaire was created based on standardized questions that the respondents had the opportunity to answer at any time, wherever they were. Based on the collected sample, it can be noted that it is a younger, highly educated population, employed in the positions of professional workers. To determine the effects between the observed variables, the authors used the PLS-SEM model. The first part of the analysis was related to the testing of the external model (reflective-reflective model). After determining that the external model was valid, the authors moved on to test the internal model. The analysis was conducted using bootstrap analysis. Bootstrapping analysis is used to assess the statistical significance of parameters in PLS-SEM (Memon et al., 2021). The analysis determined that the compensation system causes positive effects on job satisfaction and turnover intention, as well as that there is a partial mediation of job satisfaction on the relationship between the compensation system and turnover intention in the Republic of Serbia. According to the obtained results, all three research hypotheses were confirmed.

Limitations refer to a relatively small number of scientific and professional works by authors on the effects of the compensation system on job satisfaction and the intention to leave, as well as the mediating role of job satisfaction in the relationship between the reward system and the intention to leave employees in Serbia. In addition to the above, the small number of employees used as a sample in this research should also be highlighted.

Recommendations for future research: It is necessary to perform an analysis of the mentioned effects on a larger sample as well as a focus on a specific sample in terms of age structure (e.g. analysis of the effects of the y generation, or another), specific sector, position in the company,

etc., perform analysis using moderators (e.g. determine effects in relation to gender, age, level of education, etc.), conduct additional research on other employee attitudes and behaviours such as work engagement, commitment, innovative work behaviour, employee performance, work-life balance, etc.

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Evaluating the nexus of HRM and sustainability in green supply chains: a comprehensive literature review

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Abstract

Background: Sustainability is paramount across all fields, especially in supply chains. The role of human resources is crucial in achieving organizational sustainability standards. However, the impact of human resources on supply chain sustainability has been underemphasized.

Purpose: This paper explores the critical nexus between Human Resource Management (HRM) and sustainability within green supply chains, identifying gaps in the current body of knowledge and emerging trends.

Study design/methodology/approach: A systematic literature review was conducted, emphasizing sustainability in supply chains and its intersection with HRM's "green" aspects. Web of Science and Scopus databases served as the primary sources. The research involved documentation and content analysis, leading to the development of guidelines for future studies.

Findings/conclusions: The study reveals a significant yet underexplored interaction between green HRM and supply chain sustainability. It highlights the need for more focused research in this area, providing a foundational framework for future studies.

Limitations/future research: The study primarily focuses on the conceptual linkage between HRM and green supply chains, suggesting the need for empirical research to further validate and expand upon the findings. Future research should investigate specific HRM practices that effectively contribute to sustainable supply chains.

Keywords

green human resources, sustainability, supply chains, systematic literature review, bibliometric analysis

Introduction

Companies are responsible for the environment and their communities in today's business landscape. Their social obligation is to lead in preserving the environment and maintaining a natural balance. This responsibility requires businesses to align their operations and management strategies with environmental concerns and actively engage with their customers and society to achieve this goal. Adopting green management and green management approaches by the businesses' concept of environmental sustainability would ensure the conservation of the natural environment and make the world more livable. Although the idea of "sustainable

development" takes its place in the literature, the concept of "sustainable" is defined by Heinberg and Lerch (2010) as "that which can be maintained over time." Another definition of sustainability offered by Chapin, Torn and Tateno (1996) is "the ability of ecological systems to maintain their functions, processes, and productivity in the future."

Sustainability is inherently a collaborative endeavor involving multiple stakeholders and interconnected activities. It draws upon various frameworks and approaches, including the triple bottom line model, systems thinking, resource-based strategies, corporate responsibility and stakeholder theory. Within the intricate tapestry of sustainability, one constant remains—the pivotal role of human beings in driving and shaping sustainability efforts to varying degrees.

Over time, sustainability has been applied to disciplines such as economics, marketing, tourism and management, resulting in new concepts. Sustainability, associated with human resource management (HRM) since the 2010s, is changing HRM's perception. Throughout history, human resource practices have been referred to as personal affairs, personnel management, human resource management, and strategic HRM. Understanding Strategic HRM has increased the strategic significance of human resources, elevating the importance of HR practices for organizations to a new level.

According to the strategic management approach, human resources is a strategic tool that gives a competitive advantage. The concept of "what employers want" is fundamental in this view, and the firm is accountable to its shareholders (Kramar, 2014). However, as the sustainability concept has been applied to HRM, it has been understood that the problem of the classic view is not as significant as the problem of "what do employees need" and "what do society/external stakeholders wish" (Prins, Beirendonck, Vos & Segers, 2014).

While sustainable human resource management (HRM) strongly emphasizes achieving financial goals, it equally underscores the importance of considering the broader impacts of organizational policies on society and the environment. In essence, sustainable HRM seeks a harmonious convergence of financial success with the subjective well-being of stakeholders (Mariappanadar, 2014). Within this synergy, organizations achieve success across multiple dimensions—organizational, social, economic, and ecological. Sustainable HRM is committed to enhancing employee welfare by mitigating the adverse effects of rigid organizational structures on individuals.

The success of these efforts seems possible with the support of human resources, which is also the focal point of the sustainability activities carried out by businesses. The unit that can provide the help of human resources in an organized manner, the HRM unit, is an essential driving force in sustainability efforts.

Environmental challenges in businesses stretch back to the 1990s, when environmental management systems such as ISO 14001, the world's most widely used environmental management system, were developed. With this growing trend, the number of green organization studies has expanded, and it has been recognized that to become a green company, organizations require the assistance of HRM practices such as training, performance evaluation, and rewarding mechanisms (Jabbour & Sousa Jabbour, 2016).

As society's ecological awareness expands, organizations must shoulder greater responsibility for their environmental impact. This heightened awareness has triggered interest and research on green management and environmentally responsible organizations (Farrukh, Raza, Ansari, & Bhutta). A review of studies on GHRM reveals that green human resources management, green recruitment (Pham & Paillé, 2019), green personnel procurement and green candidate selection (Adjei-Bamfo, Bempong, Osei & Kusi-Sarpong, 2020), green employees, green employee behavior, and corporate social responsibility (He, Morrison & Zhang, 2021), and environmental sensitivity are emphasized. The concept of green is added to traditional HRM practices.

Due to these challenges, organizations were forced to shift their supply chains (SC) into a more environmentally friendly structure and adopt sustainable supply chain management because of environmental awareness, public pressures, and legal regulations in almost every field. These conditions have led organizations to design less polluting production systems, reduce waste, manage environmental risks, and act socially responsibly.

Accordingly, some research questions were formed to uncover the insights and shed light on pertinent domains:

Q1. Which channels are connecting GHRM, SC, and sustainability?

Q2. Who are the most influential actors in the GHRM, SC, and sustainability domains?

Q3. What are the major and guiding topics for GHRM, SC, and sustainability?

Q4. Where is the GHRM and sustainability of SC research heading?

These questions will bring out a clear understanding of the nature of GHRM, SC, and sustainability concepts' relations. As a result, giving a visual representation of the current situation will provide valuable knowledge to the scientific community. The study's sections are as follows: an overview of GHRM and SC concepts, methodology, findings, and discussion. The paper concludes with offerings to future researchers.

1. Literature review

1.1. Green human resources management

Nowadays, organizations must focus on social and environmental issues and economic and financial factors to continue their activities. Sustainable human resources management has become one of the fundamental business strategies in organizations where the human resources department plays an active role in creating an ecological culture to deal with these issues (Ahmad, 2015). The basis of green human resources management, which is relatively new in business literature, is based on environmental activities to protect the environment and the future. Green human resources management is vital in adapting environmental practices to organizational policies and procedures. Green human resources management could ensure that ecological sustainability policies are implemented by increasing employees' loyalty and making better contracts in line with the environmental policies of the enterprises by raising the training and awareness of the personnel in this aspect. Human resource management is the department responsible for managing and developing employees in the enterprise. With the advantage of having an essential role in achieving the social responsibility goals of enterprises, human resources managers can increase the enterprise's positive effects while reducing the business's negative impact on society and the environment (Rezaei-Moghaddam, 2016). The green human resource goals are accomplished and developed by each employee's commitment and responsibility in the actions carried out to ensure the enterprise's sustainability (Rani & Mishra, 2014). Green human resources practices can provide more effective and lower costs, better employment contracts, and higher organizational commitment (Jyoti, 2019). In addition, green human resources incorporate environmentally friendly management practices for the sustainable use of resources. Examples include flexible working hours, teleconferencing, recycling, online education, and energy-efficient workspaces (Bangwal & Tiwari, 2015).

Views on the GHRM literature can be broadly categorized into three groups. The common feature of these groups is long-term and durable results for sustainability. Although the authors describe sustainability and its relationship with HRM in different ways, these groups are categorized according to the outputs of these approaches. The first focuses on economic outcomes and creating a *sustainable competitive advantage*. Known as 'talent generation,' this group focuses on the internal effects of HRM policies. Accordingly, GHRM should focus on "long-term business successes rather than short-term corporate goals" and positive employee outcomes (Wilkinson, Hill, & Gollan, 2001). The second group is *improving social and ecological health*. This group focuses on broader performance outcomes related to economic, ecological, or social issues. Accordingly, HRM practices ensure the achievement of desired financial goals by contributing positively to environmental and social/human outputs (Branco & Rodrigues, 2006). These external outputs are related to human and social issues such as family community well-being, employee health, government policies, and expenditures (Mariappanadar, 2014). The third group, *communicators*, connects management practices, including ecological and social outcomes and HRM practices (Kramar, 2014).

Although GHRM is a new concept in literature, it has received increasing attention recently. Traditional HRM functions are reinterpreted and defined with an environmentalist consciousness and a green perspective, together with the concept of HRM, which has found a domain of expansion, mainly under sustainable HRM. In this regard, the roles of GHRM are explained in the literature as follows.

Green job analysis: The GHRM function is used to restructure businesses by long-term environmental goals, to assign responsibilities and duties related to environmental protection to each work step and the employee who performs that

step, and thus to bring more environmentally friendly job descriptions and business processes to the enterprise (Chaudhary, 2019).

Green recruitment: It recruits qualified employees who are equipped and sensitive to carry out environmentally friendly business processes and practices determined by businesses in line with green business analysis and business designs (Pham & Paillé, 2019). The first prominent dimension of green recruitment is the selection of candidates with high environmental awareness; the second is the creation of an environmentally friendly employer image by using the ecological image in reputation management, and the third is the determination of green criteria to make the business attractive for employees with environmental sensitivity (Tang, Chen, Jiang, Paillé & Jia, 2018).

Green education and development: The adoption and internalization of the strategic goals set forth by the businesses is a requirement for success, and it is the goal of all environmental education and development initiatives undertaken by the company to ensure that its employees readily adopt its environmental policies and practices, put them into practice, and even develop habits out of them (Teixeira, Jabbour, Sousa Jabbour, Latan & Oliveira, 2016).

Green talent management is a further idea related to green development. Green talent management actively encourages the growth and retention of green talent by boosting employee engagement through effective and efficient leadership practices, effective communication, inclusivity in decision-making, institutional support for employee well-being, and motivating green talent team members to develop clear ecological initiatives to advance environmental sustainability. It is a concept that conveys the actions taken in support of and with a purpose toward this path (Joshi & Dhar, 2020).

Green performance management: The term refers to the setting by the enterprise of environmental and sustainability-focused, continuously updated green targets, measuring whether these targets are achieved or not, removing the factors that make it difficult or hinder achieving the green targets in line with this measurement, and encouraging the elements that support achieving the green targets. The GHRM function focuses on preserving and sustaining the competencies acquired in reaching green targets (Luu, 2020). To create green performance indicators, a set of green performance evaluation criteria that considers environmental events, environmental responsibilities, lowering carbon emissions, and communicating ecological concerns and policies must be established for all members of an organization (Tang et al., 2018).

Green wage management: To fill the green jobs it has created in line with the goals it has determined in line with the strategic objectives of the enterprise and ensure the continuity of their motivation in line with environmental goals, green wage management is the management function of the wages, tangible rewards, and intangible rewards that the company applies to attract and retain the green-collar employees that it plans to hire or that it has already acquired (Jamal et al., 2021).

1.2. Sustainable supply chains

The supply chain encompasses all activities and information flows associated with the production and transformation of products, from the raw material stage to the end user (Londe & Masters, 1994). Supply chain management (SCM) integrates these activities through improved supply chain relationships to achieve a sustainable competitive advantage. SCM includes planning, sourcing, production, and distribution logistics. Contrary to traditional SCM, which focuses on economic and financial business performance, sustainable supply chain management (SSCM) is characterized by explicitly integrating environmental or social objectives that extend the economic dimension to the triple bottom line approach [25]. From a microeconomic perspective, SSCM emerged from bringing together the three pillars of sustainability (economic, social, environmental) with core business practices such as procurement, logistics, information management, and marketing (Morali & Searcy, 2013). Sustainable supply chain management refers to coordinating and managing material, information, and capital flows among businesses along the supply chain while considering the goals of the three sustainable development pillars resulting from stakeholder and customer needs. Members of sustainable supply chains are expected to uphold social and environmental standards, retain their competitiveness by satisfying client needs, and adhere to all applicable economic standards to remain a part of the chain (Seuring & Müller, 2008). Organizations are being held increasingly accountable for the economic, social, and environmental effects of their internal operations and the actions of their suppliers

(Koberg & Longoni, 2019). Supply chains are inherently complex structures (Vafadarnikjoo, Tavana, Chalvatzis & Botelho 2022) because they force companies to find efficient solutions for numerous sustainability issues at various upstream and downstream channel levels to satisfy each party's demands while enhancing the overall sustainability performance of all supply chains (Altintas & Trick, 2014; Vidal & Croom, 2018).

A sustainable supply chain management approach can be found in a supply chain's purchasing, production, distribution, packaging, and logistical procedures. Therefore, the reliability of the first link in sustainable supply chain management depends on whether the material being purchased is recyclable or reusable and satisfies environmental design specifications, as well as whether the provider qualifies within the category of a "green supplier" (Zhu, Sarkis & Lai, 2008).

The last link of the sustainable supply chain management approach is the concept of reverse logistics. Improving the product and developing a closed-loop supply chain system through renewal activities such as recycling, remanufacturing, reuse, and disposal is possible.

Suitably qualified human resources, as one of the most essential components of intellectual capital, is required to reach the goals outlined by the organization in the pursuit of sustainability (Jabbour & Santos, 2008). Therefore, it is critically important for a business to manage its human resources in line with the sustainability paradigm to achieve sustainability-oriented change (Preuss, Haunschild & Matten, 2009).

Next section includes the methodology part. But, before this, it is crucial to explain the necessity of bibliometric analysis in multidisciplinary scientific areas. Bibliometric analyses offer significant perspectives into the body of knowledge pertaining to a certain subject or area. Finding important gaps in these studies can help future researchers push the bounds of theory and advance our body of knowledge. Future researchers could fill in the following possible gaps that could be found in bibliometric analyses:

Harmonization of the fields of study: Interdisciplinary research is beneficial to many subjects; nonetheless, bibliometric studies may show a lack of cross-disciplinary integration. In order to give a more thorough grasp of a subject, future researchers can investigate methods to close gaps between other academic disciplines (Falagas, Karavasiou & Bliziotis, 2006; Tarkowski 2007; Xie, Zhang & Ho, 2008).

Geographical discrepancies: The distribution of research may exhibit geographic biases that can be identified by bibliometric analysis. Future researchers could help by addressing these disparities, doing out studies with a range of geographical viewpoints, and advocating for a more comprehensive understanding of the topic (Lin, 2012; Zhuang, Liu, Nguyen, He & Hong, 2013)

Technological developments: Since technology is advancing quickly, bibliometric research might not be able to include the most recent developments. In the future, scholars can distinguish and investigate new approaches, technologies, and patterns that may have emerged following the most recent bibliometric analysis.

Niche or emerging subfields: While bibliometric analyses can reveal prevailing themes, they may also reveal undiscovered or developing subfields within a discipline. Subsequent investigators may explore these domains to offer hitherto implicit insights and viewpoints.

Studies on cross-cultural variances: Gaining insight into how cultural context shapes theories and research can be a productive topic of investigation. Researchers in the future can do cross-cultural investigations to find differences in theoretical perspectives and deepen our knowledge of how culture affects a given topic.

Shifting dynamics in longitudinal analyses: Studies using bibliometrics frequently offer a moment in time view of the literature. It will be possible for researchers in the future to perform longitudinal analyses to follow the development of theories and research trends across time, identifying changes, patterns, and the emergence of new paradigms (Li, Zhang, Wang & Ho).

Converging theory and practice: Theoretical developments and their real-world applications might not always align. Subsequent academics may concentrate on converting theoretical understandings into workable plans, structures, or answers to practical problems.

Representation gaps: Studies using bibliography may point to deficiencies in the representation of various viewpoints, such as those based on gender, race, or other demographic characteristics.

Methodological critique: The methodological strategies employed in the body of current work can be evaluated critically by future researchers. Assessing the rigor of research methodologies,

making recommendations for enhancements, and advocating for increased standards of study design and analysis are all part of this (Van Raan 2005; Liu, Zhang & Hong).

Each research may make addition to theoretical frameworks, produce a more nuanced understanding of the issues they investigate, and progress knowledge by filling in these possible gaps.

2. Methodology

This research collected bibliometric data from studies, including the effects of green human resources practices on sustainable supply chains. For this purpose, Paul et al. (Paul, Lim, O'Cass, Hao & Bresciani, 2021) suggested SPAR-4-SLR steps were followed. These steps can be briefly summarized as assembling, arranging, and assessing.

In the Assembling part, there are decisions such as determining the search terms to be used in the research and which databases to use. This research aimed to explore the effects of green human resources on the sustainability of supply chains, so the search terms were formed as follows:

Table 1 Search Terms

Database	Web of Science (WoS)	Scopus
Search terms	TS=("green human resource*" AND "supply chain*" AND susta*)	TITLE-ABS-KEY ("green human resource*" AND "supply chain*" AND susta*)
N	89	40

Source: the authors

Previous studies were examined to compile studies directly related to the researched content, and the concepts of supply chain and sustainability were searched in all parts of the relevant texts, together with green human resources or GHRM in their simplest form. Asterisks were used in terms, and different conjugations of words were also included in the set. Using Scopus and Web of Science, two databases with the highest scientific competence, were deemed appropriate for database selection. As a result of the first search, 89 studies were found in the WoS database and 40 in the Scopus database. In the field of academic research, two of the best known and most extensively utilized bibliographic databases are Scopus and Web of Science (WoS). Both have advantages and disadvantages, but for a variety of reasons, many researchers see them as the "best": comprehensive coverage, peer-reviewed content, citation analysis, global reach, indexing quality journals, integration with other tools, usage in bibliometrics and rankings, user-friendly interfaces, etc. Surely there are many more databases with similar eligibilities, but it is requisite to put a limit. So, these two databases are considered most suitable ones for this research in today's conditions (Urío, Redondo & Gavilan, 2022; Grosu, Chelba, Melega, Botez & Socoliuc, 2023).

The studies identified in the first stage section were subjected to some sorting according to various criteria (type of publication, language, and content). In bibliometric studies, it is a general perception that the papers to be considered should consist of articles as a type of filter (Emrouznejad, Parker & Tavares, 2001; Kumar, Sharma, Rao, Lim & Mangla, 2022). It was decided to examine the published articles and the studies in early access status. In addition, considering the difficulty of reviewing studies written in different languages, limiting the language criterion to English was deemed appropriate. When these criteria were used, 32 studies were observed in the Scopus database and 59 in the WoS database. Articles not directly related to human resource management and bibliometric studies were excluded after manually controlling the data set. Due to this process, the number of studies to evaluate was determined to be 46 for the WoS database and 30 for the Scopus database. After classifying 23 studies in both databases were combined to keep them from being included in the data set repeatedly, 53 studies were finally reached.

Table 2 Arranged Data

Database	Web of Science (WoS)	Scopus
Type	Article (Published and Early Access) n:59	Article (Published and Early Access) n:32
Language	English n:59	English:32
Manual Check	n:46	n:30
Combined	N:53	

Source: the authors

The 53 studies in the data set were obtained from sorting in the arranging section, and bibliometric analysis was conducted using the R-based Biblioshiny package on this set. Its simplicity and benefits for visualizing content analysis were the main factors for using Biblioshiny (Moral-Muñoz, Herrera-Viedma, Santisteban-Espejo & Cobo, 2020). In the next section, quantitative and content analysis findings are reported.

3. Findings

3.1. Quantitative analysis

This section of the study provides an overview of the studies that include the context of sustainability in green human resources and supply chains. Along with the scores that establish the relative effects of these actors, this part provides for the distribution of the studies by years, nations, sources, and authors.

Studies that include the context of green human resources' effect on supply chain sustainability have been put forward since 2016. "Green human resource management and green supply chain management: linking two emerging agendas" by Jabbour and Sousa Jabbour (2016) is one of the most influential articles in forming this domain. This article gives a detailed roadmap on which dimensions the two contexts can interact. It is seen that the number of studies published in the years following this publication has gradually increased, and a necessary accumulation has been formed to conduct a systematic literature review (Paul, Lim, O'Cass, Hao & Bresciani, 2021).

Table 3 Main Information

Timespan	2016:2022
Documents	53
article	47
article; early access	6
AUTHORS	
Authors	182
Authors of single-authored documents	6
Collaboration Index	3.17

Source: the authors

It has been noted that most studies have multiple authors. It is anticipated that researchers from different areas of expertise should have worked together in a multidisciplinary domain.

When the distribution by years is examined, it is seen that the number of studies published in the pertinent domain has reached double digits since 2020. The numbers might rise, given that 2023 is still in progress.

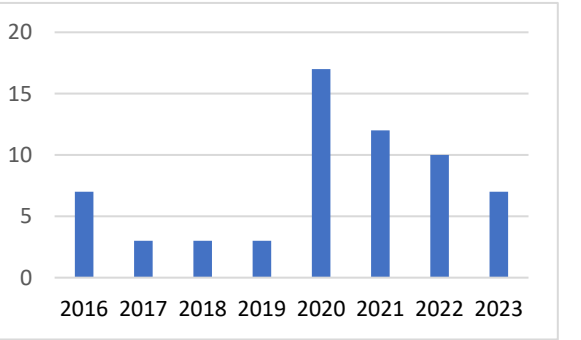

Figure 1 Annual production
Source: the authors

The significant increase in the importance of human resources due to the current COVID-19 epidemic's severe pressure on supply chains and changing consumer preferences with anxiety may cause a giant leap in the 2020s (Awijen, Zaied & Nguyen, 2022; Gordon-Wilson, 2021).

The origin of the published studies was determined based on the addresses specified by the authors. Accordingly, India and China have the most publications in this context.

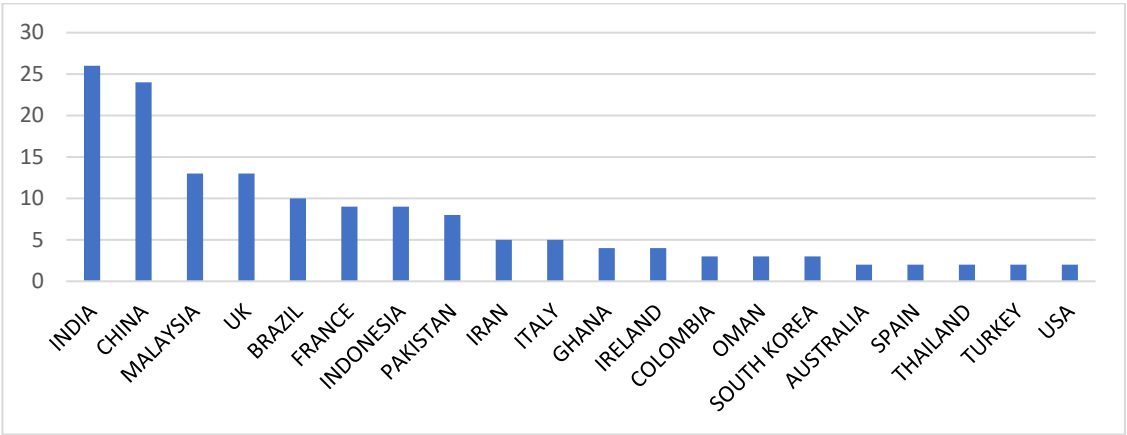

Figure 2 Production by country
Source: the authors

Table 4 Collaboration network

Node	PageRank	Betweenness	Cluster
France	0.150595161	8.571428571	3
China	0.133358497	2	2
United Kingdom	0.132577334	1.428571429	1
Brazil	0.097401974	5	1
India	0.096860896	0	1
Malaysia	0.089428298	0	2
Pakistan	0.089428298	0	2
Italy	0.060818571	0	3
Spain	0.060818571	0	3
Ghana	0.051421271	0	2

Source: the authors

Apart from the number of publications, the scores of the network structure created by researchers from different countries as another indicator that determines the effects of countries in the context of green human resources, supply chain, and sustainability are discussed. Table 4 gives the countries in the top 10 PageRank and betweenness rankings

Studies originating in France take the lead in the PageRank table, which indicates the weight and relative importance of the established connection in the network, and in the betweenness ranking, which ranks the nodes that act as a bridge between directly connected nodes. When the cooperation network is examined, three different clusters are observed. The first of these clusters, which includes the United Kingdom, Brazil, and India, is remarkable in that it indicates cooperation between quite different geographies.

The citations of the published studies are also an indicator that should be examined in terms of the level of influence the countries have on the domain in line with the research.

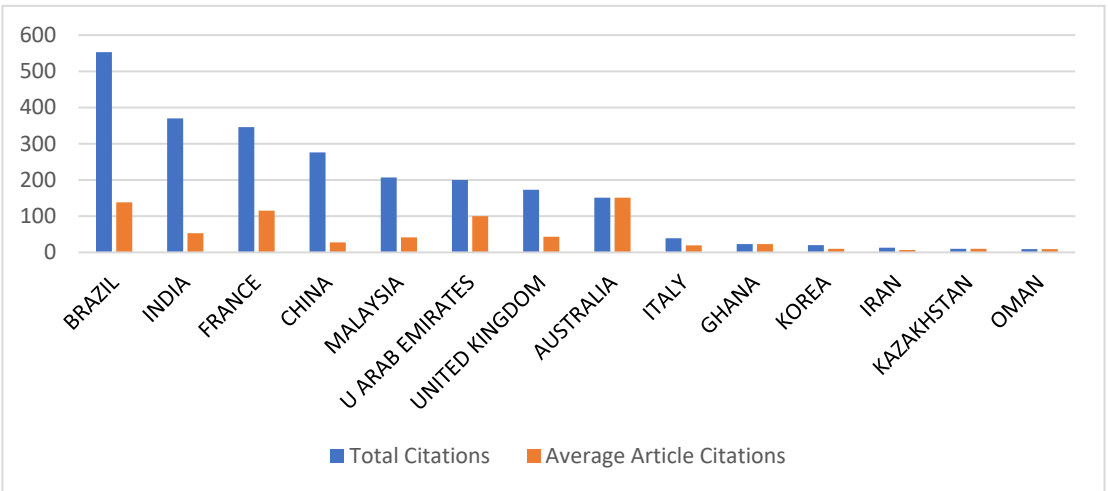

Figure 3 Most cited countries
Source: the authors

Considering the total citations, it is seen that Brazil takes the first place. In the continuation of the ranking, the countries that stand out in terms of criteria, such as the number of publications and PageRank, are India, France, and China.

Table 5 shows the h-index of the top 10 academic journals, including studies published in green human resources, supply chains, and sustainability, according to the total number of citations and publications.

Table 5 Source impact

Element	h_index	TC	NP
Journal of Cleaner Production	11	1526	11
Benchmarking-An International Journal	3	116	3
Business Strategy and the Environment	3	78	6
International Journal of Manpower	2	53	2
International Journal of Production Economics	2	102	2
Journal of Asian Finance Economics and Business	2	41	2
Supply Chain Management-an International Journal	2	81	2
Sustainability	2	53	2
Uncertain Supply Chain Management	2	8	3
Journal of Cleaner Production	11	1526	11

Source: the authors

In Table 5, *The Journal of Cleaner Production*'s h-index is ranked first according to the total number of citations and publications.

The ranking of the researchers working in green human resources, supply chains, and sustainability according to the h-index, total citations, and number of publications is given in Table 6.

Table 6 Author impact

Element	h_index	TC	NP
Jabbour, C.	6	779	6
Jabbour, A.	4	582	5
Mangla, S.	4	204	4
Raut, R.	4	116	5
Luthra, S.	3	145	3
Narkhede, B.	3	106	3
Afum, E.	2	108	2
Agyabeng-Mensah, Y.	2	108	2
De O J	2	179	2
Gardas B	2	91	2
Gedam V	2	25	3
Guerci M	2	329	2
Latan H	2	179	3
Longoni A	2	329	2
Luzzini D	2	329	2
Priyadarshinee P	2	71	2
Rajiani I	2	32	2
Sarache W	2	26	2
Trujillo-Gallego M	2	26	2
Tseng M	2	4	2

Source: the authors

C. Jabbour and A. Jabbour ranked first in the h-index, total citations, and total number of publications presented as contribution indicators. Subsequently, Mangla, S. and Raut, R. became the names that contributed the most to the domain, with four publications each.

3.2. Content analysis

After the documentation phase, which includes a review of the data set's fundamentals, analyses of the dendrogram, co-occurrence network, and thematic evolution were conducted, allowing for a content analysis of the studies. These analyses aim, among other things, to develop a schema of the domain by highlighting the connections between the studies searched. It is also possible to predict the potential shapes that the concepts under consideration will take in the future by examining the variations in their relationships over time.

When conducting content analysis, it must be decided whether to consider the terms used in the first place. Since search terms form the basis of research, they should be analyzed together to observe their interaction with other concepts and, therefore, should be included in the analysis.

Keywords in an article are an imprint created about the subject, content, and scope of the pertinent study. In this respect, it is possible to have information about the article's subject by exploring the keywords of a survey. There are many more keywords, but in terms of visual presentation, the top ten keywords with the highest score were included in Fig. 4.

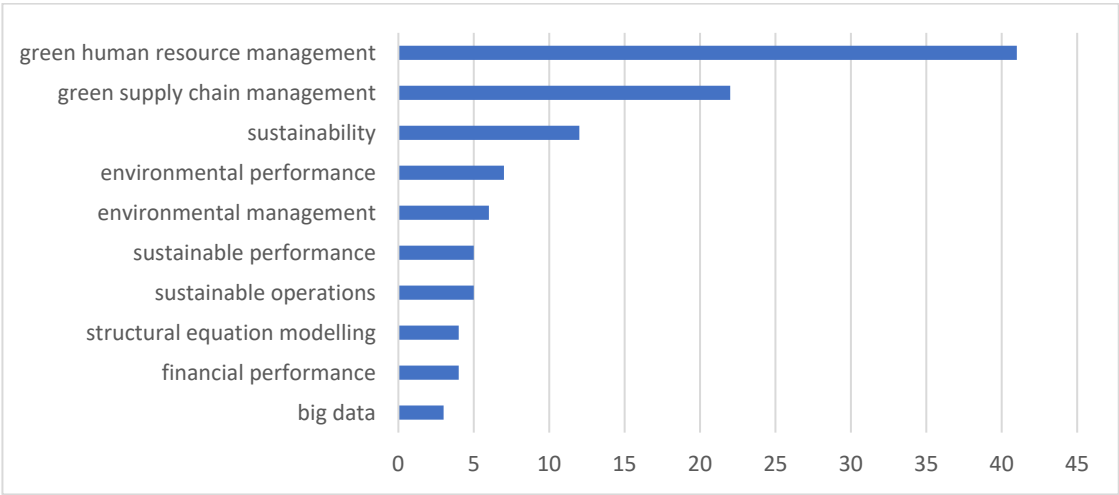

Figure 4 Top ten keywords
Source: the authors

While the usage levels of the keywords are provided in Fig. 4, how these words are grouped and which concepts the sub-dimensions of these groupings consist of are shown with the conceptual structure map that includes multidimensional scaling analysis. Multidimensional scaling analysis is an exploratory data analysis method that preserves the relationship between the phenomena under investigation and reduces the dimensions for localization, analysis, and classification of the variables of the universe where the connection occurs. In the results obtained from the multidimensional scaling analysis, the analyzed keywords are distributed across the plane, and the relative position of each keyword reflects the convergence between the keywords. More convergent words form a cluster. To the extent that a keyword is close to the middle of the cluster, it forms the basis for the relevant context (Hoffman & Leeuw, 1992). Multidimensional Scaling analysis (MDS) was performed to examine the content structure. MDS is a data analysis method of exploring the underlying forms of categorical data (Abdi & Valentin, 2007). MDS functions as a principal component analysis for categorical data.

It was deemed appropriate for the software to automatically calculate the number of dimensions due to the absence of antecedent information about the number of dimensions. Thus, a five-dimensional structure was obtained in the context of green human resources, supply chains, and sustainability.

Cluster analysis is created by statistically processing the network structure according to the frequency of combining keywords to get a smaller and simpler view. The basis of cluster analysis is to treat high-frequency keywords as a class, and after calculating the statistics of these classes, the related categories are combined. The program does this until each keyword is included in the corresponding category. The tree dendrogram is formed according to the MDS findings. The dendrogram created for the compiled data set is shown in Fig. 5.

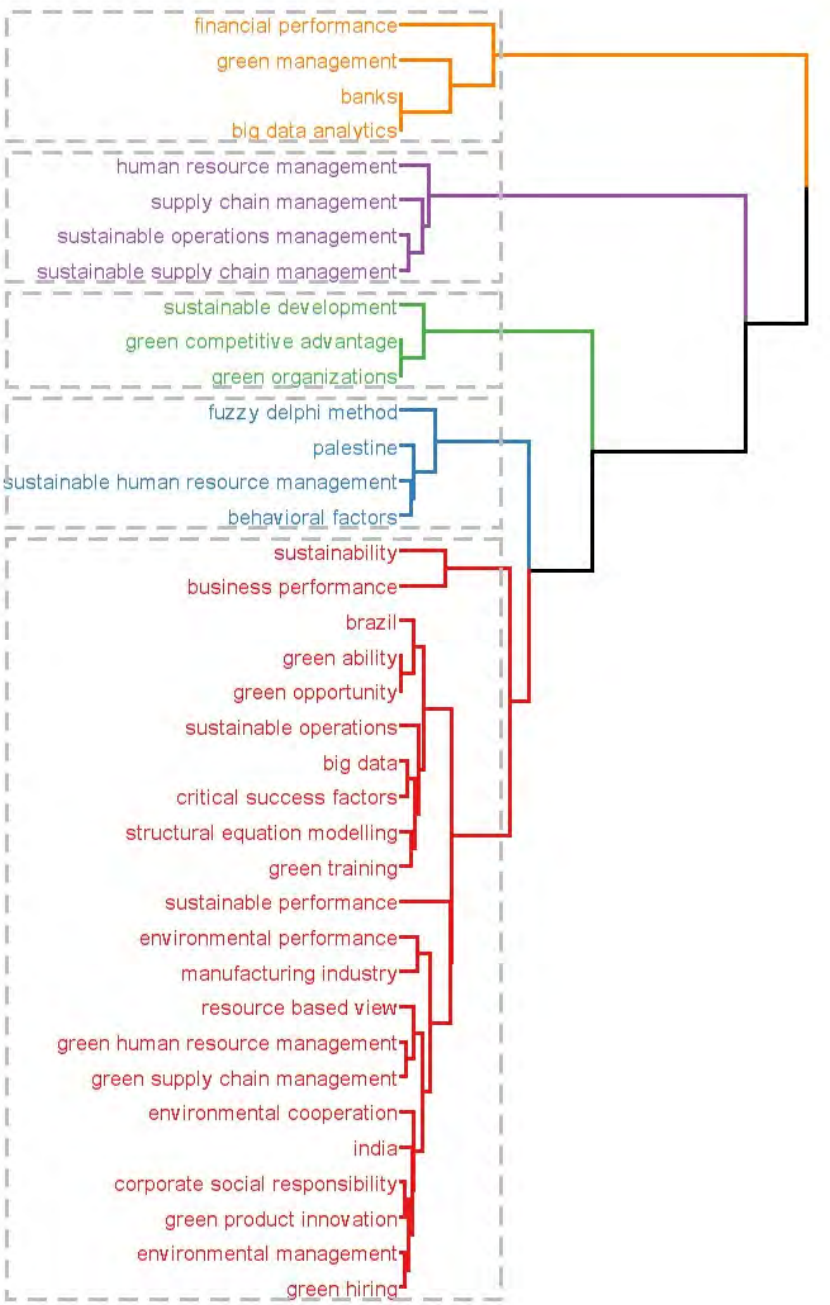

Figure 5 The data set dendrogram
Source: the authors

It is observed that the green human resource management and green supply chain management expressions cluster with the resource-based view expression in the dimension highlighted in red, one of the dimensions where the keywords are divided into groups based on their usage. One of the research's fundamental concepts, sustainability, was also observed in this dimension.

The visual of the co-occurrence network analysis performed to calculate the relative importance and weight of the keywords in the data set and the combination of keywords is presented in Fig. 6.

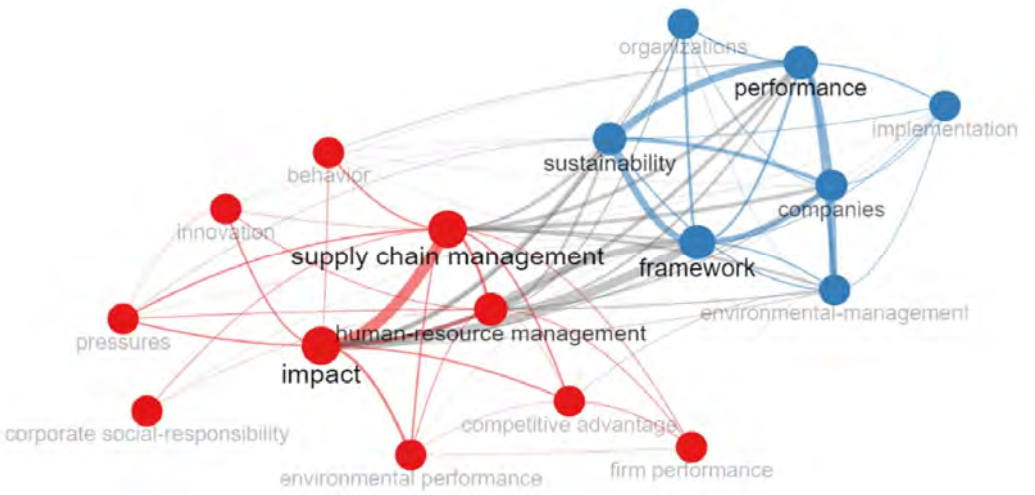

Figure 6 Co-occurrence network analysis
Source: the authors

The sizes of nodes and labels increase proportionally to their PageRank values. The density of the relations between the nodes is effective on the thickness of the bridges established.

Statistical information about the network is given in Table 7, created by ranking the keywords according to Pagerank. The first ten keywords with the highest score are included.

Table 7 Collaboration network

Node	PageRank	Betweenness	Cluster
green human resource management	0.268371815	339.8312514	1
green supply chain management	0.128263465	27.87787501	1
sustainability	0.065537312	59.22314818	2
sustainable operations	0.036785947	0.625	3
financial performance	0.035618166	17.35576887	2
green ability	0.03125	0	4
green opportunity	0.03125	0	4
sustainable performance	0.028904805	0.086956522	1
environmental performance	0.027351124	0	1
green management	0.02535212	0	2

Source: the authors

As stated before, as a result of the search terms remaining in the analysis, the concepts with the highest impact on the network were green human resource management, supply chain, and sustainability. In addition, another aspect that demands attention is the concept of financial performance being at the top. It is possible to argue that the relative intelligibility of measuring economic outputs (Drake & Fabozzi, 2010) and the fact that it is one of any organization's primary goals are essential for this concept.

The changing rules of thematic content, power and structure, evolutionary relationships, and tendencies that have formed in the literature over time can be revealed with the thematic evolution analysis, which is another step in the research. Using thematic evolution analysis can obtain outputs such as visualizing the development in the field, the direction of this development, and making future inferences about the trends in the area (Cobo, López-Herrera, Herrera-Viedma & Herrera, 2011).

Each node in the thematic diagram represents a topic, and the node size varies in proportion to the keywords included in the theme. Connections between nodes express the evolutionary aspect of the concepts under consideration. These connections have existed throughout the observed timeline, which suggests that the ideas have remained crucial to the domain. The thickness of

these lines indicates the number of shared keywords. In other words, the line widens as the connection between the subjects strengthens (Cobo et al., 2011).

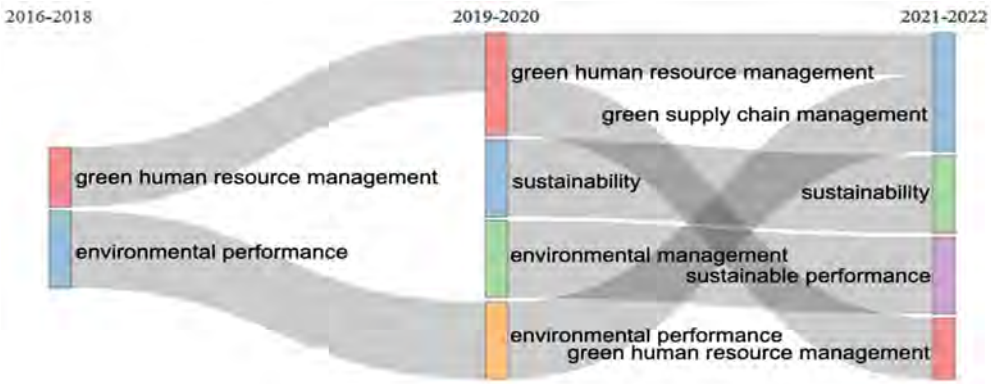

Figure 7 Thematic evolution analysis
Source: the authors

Three time periods were established by proportionally dividing the number of publications by the years. While the concepts of green human resource management and environmental performance gained prominence in 2016–18, sustainability and ecological management became important in the second period, which spans 2019–2020. Environmental performance was replaced by green supply chain management in the most recent period, 2021–2022, which was bolstered by green human resource management. "Sustainable performance" has evolved from "environmental management."

3.3. Integration of articles on green human resources and sustainable supply chains

We integrate the findings from relevant articles that delve into various aspects of green human resources (GHR) and sustainable supply chains (SSC). The table below summarizes critical details about these articles, including their titles, authors, publication dates, and the aspects they address within the context of GHR and SSC.

Table 8 Content list of the dataset

		Green human resources aspects			Aspects of sustainable supply chains		
#	Author	Hiring	Training and involvement	Performance	Environmental	Social	Economic
1	Gedam et al. (2023)		x			x	x
2	Graham et al. (2023)		x		x		
3	Rizzi, Gigliotti and Annunziata (2023)		x		x	x	x
4	Maskuroh, Widyanty, Nurhidajat, Wardhana and Fahlevi, (2023)	x	x		x		
5	Setyaningrum and Muafi (2023)	x	x	x	x		
6	Feng and Sheng (2023)		x	x	x	x	
7	Naseer, Song, Adu-Gyamfi, Abbass and Naseer, (2023)	x	x	x	x	x	x
8	Rajabpour, Fathi and Torabi, (2022)	x	x	x		x	
9	Chen, Tsai and Oen (2022)	x	x	x		x	
10	Trujillo-Gallego, Sarache, and Sousa Jabbour (2022)		x		x		x
11	Jawaad, Hasan, Amir and Imam, (2022)	x	x		x	x	x
12	Fiorini, Jabbour, Latan, Sousa Jabbour and Mariano (2022)			x	x		x
13	Saeed, Rasheed, Waseem and Tabash (2021)	x	x		x		
14	Aldaas, Mohamed, Hareeza Ali and Ismail (2022)	x	x	x	x		

15	Dian, Pambudi, Leonardus, Sukrisno and Kundori (2022)	x	x	x	x		
16	Kara and Edinsel (2022)	x	x	x	x	x	x
17	Gedam, Raut, Priyadarshinee, Chirra and Pathak (2021)	x	x	x	x		
18	Zhu and Yang (2021)		x	x	x	x	x
19	Acquah et al. (2020)	x	x	x	x	x	x
20	Trujillo-Gallego et al., (2021)	x	x	x	x	x	
21	Gedam, Raut, Sousa Jabbour, Narkhede and Grebinevych (2021)	x	x	x		x	
22	Imran, Alraja and Khashab (2021)	x	x	x			x
23	Marrucci, Daddi and Iraldo (2021)	x	x	x	x	x	x
24	Khaleeli, Faisal and Anwar (2021)	x	x	x			x
25	Stefanelli et al. (2021)	x	x	x	x		
26	Tulsi and Ji (2020)	x	x	x		x	
27	Raut, Gardas, Luthra, Narkhede and Kumar Mangla (2020)	x	x	x	x		
28	Ali et al. (2020)		x		x		x
29	Ghouri et al. (2020)	x	x	x	x		x
30	Muduli et al. (2020)		x		x	x	
31	Agyabeng-Mensah et al. (2020)	x	x	x	x	x	x
32	Sittisom and Mekhum (2020)	x	x	x	x	x	
33	Yu et al. (2020)		x	x	x	x	
34	Khan, Tao, Ahmad, Shafique and Nawaz (2020)		x		x		x
35	Tseng et al. (2020)	x	x	x	x	x	x
36	Ogbeibu et al. (2020)	x	x	x	x		
37	Wongleedee (2020)			x			x
38	Lee (2020)	x	x	x	x		
39	Thakur and Mangla (2019)		x		x	x	x
40	Raut et al. (2019)		x		x	x	x
41	Singh and El-Kassar (2019)		x	x	x	x	x
42	Longoni, Luzzini and Guerci (2018)	x	x	x	x		x
43	Zaid et al. (2018)	x	x	x	x	x	x
44	Chiappetta Jabbour, Mauricio and Jabbour (2017)	x	x	x	x		
45	Nejati, Rabiei and Jabbour (2017)		x	x	x	x	
46	Mishra (2017)	x	x	x	x	x	
47	Rajiani, Musa and Hardjono (2016)	x	x		x	x	x
48	Mohtar and Rajiani (2016)		x		x		
49	Jabbour and Sousa Jabbour (2016)	x	x	x	x	x	x
50	Teixeira et al. (2016)		x		x	x	
51	Bhardwaj (2016)		x		x	x	
52	Gholami et al. (2016)	x	x	x		x	
53	Guerci et al. (2016)	x	x	x	x		

Source: the authors

This table presents a comprehensive overview of recent scholarly research at the intersection of green human resources (GHR) and aspects of sustainable supply chains (SSC) (Gedam, Raut, Agrawal & Zhu, 2023; Gholami, Rezaei, Saman, Sharif & Zakuan, 2016; Jabbour & Sousa Jabbour, 2016; Teixeira et al., 2016). We will focus on the essential findings and trends specific to these two dimensions:

Green human resources aspects:

Hiring and training: Several articles (e.g., #2, #8, #9) emphasize the importance of hiring and training practices in GHR. They explore how organizations can recruit and nurture talent, focusing on sustainability and ensuring employees possess the necessary skills and knowledge to contribute to sustainable supply chains.

Employee engagement: Article #2 stands out as it delves into the influence of employee engagement in supporting the implementation of green supply chain management (GSCM) practices. This highlights the critical role of engaged employees in driving sustainability initiatives within supply chains.

Performance: GHR practices aim to enhance employee performance, and some articles (e.g., #1, #3, #4) discuss how GHR impacts individual and organizational performance, especially in sustainable supply chains.

Aspects of sustainable supply chains:

Environmental aspect: Many articles (1, 3, 5) address the environmental dimension of SSC. They explore how organizations can reduce their environmental footprint through sustainable supply chain practices, such as eco-friendly sourcing, reduced emissions, and waste management.

Social aspect: Some articles (3, 7……) discuss the social dimension of SSC, focusing on issues like labor practices, ethical sourcing, and community engagement. These aspects highlight the importance of considering social responsibility within supply chains.

Economic aspect: Sustainability is not just about environmental and social concerns but also economic viability. articles like 1 and 7 emphasize the economic aspect, exploring how sustainable supply chain practices can lead to cost savings and improved financial performance.

Emerging trends and convergence:

several articles (11, 16) explore the interplay between GHR and SSC. They investigate how GHR practices impact various aspects of sustainable supply chains, demonstrating the interconnectedness of these dimensions.

Collaboration between GHR and SSC is a recurring theme, with studies (1, 7) highlighting

the need to align human resource practices and supply chain sustainability objectives.

4. Discussion

4.1. Practical Implications

In line with the above findings, we can emphasize some practical implications in our study. Organizations should recognize that sustainability is a multidimensional effort involving environmental responsibility, social ethics, and economic viability (Payán-Sánchez, Labella-Fernández & Serrano-Arcos, 2021; Tulsi & Ji, 2020; Zaid, Jaaron & Bon, 2018). The existing literature emphasizes the importance of adopting an integrated approach to sustainability that encompasses both Green Human Resources Management (GHRM) and aspects of Sustainable Supply Chains (SSC) (Chen, Jayaraman & Chen, 2021). This integrated approach involves managing products, processes, value chains, and resources to meet present needs without compromising the ability of future generations to meet their own needs (Acquah, Agyabeng-Mensah & Afum, 2020; Gholami et al., 2016; Mani & Delgado, 2019; Trujillo-Gallego, Sarache & Sellitto, 2021). However, the supply chain literature has focused less on social sustainability (Kaufman & Ülkü, 2018). There is a need for more research and exploration regarding assessment and evaluation mechanisms for sustainable supply chain management (Shan & Wang, 2018). Integrating environmental considerations into research and practice is crucial for a systematic and comprehensive green supply chain management approach. Organizations should recognize that sustainability is not a standalone concept but a multidimensional effort involving environmental responsibility, social ethics, and economic viability (Mishra, 2017; Muduli et al., 2020; Raut et al., 2019; Tulsi & Ji, 2020).

Organizations must invest in strategic talent management practices to enhance sustainability. Hiring individuals committed to sustainability, providing targeted training and development programs, and fostering a culture of continuous learning is vital. Such efforts ensure employees possess the skills and knowledge to drive sustainability initiatives (Akhtar, Winsborough, Lovric & Chamorro-Premuzic, 2019; Gedam, et al., 2023; Gedam, Raut, Sousa Jabbour, Narkhede & Grebinevych, 2021; Ghouri, Mani, Khan, Khan, & Srivastava, 2020; Leone, Davis, Velasquez & Nagle-Roides, 2021; Pellegrini, Rizzi & Frey, 2018; Thakur & Mangla, 2019).

Employee engagement is crucial for successful sustainability efforts, and organizations should prioritize strategies that engage employees in sustainability practices. This can be achieved by creating opportunities for employees to contribute ideas and involving them in decision-making processes (Gedam et al., 2023; Graham, Cadden & Treacy, 2023; Payán-Sánchez et al., 2021; Teixeira et al., 2016). Additionally, recognizing and acknowledging employees' contributions towards sustainability goals is essential. Studies have shown that employee engagement positively impacts organizational sustainability, including its economic, social, and environmental dimensions (Chakraborty & Ganguly, 2019; Nandan & Jyoti, 2020; Ruiz-Pérez, Lleo & Ormazabal, 2021). Organizational culture, leadership behavior, rewards, support to employees, and internal communication are critical dimensions of organizational culture that drive employee engagement and impact business sustainability (Pellegrini et al., 2018; Yu, Chavez, Feng, Wong, & Fynes, 2020). Furthermore, frontline employees' perceptions of human resource practices, such as internal sustainability orientation and supervisory support, influence their propensity to adopt sustainable behaviors (Bradley, 2018). By designing HR practices and strategies that promote employee engagement and commitment, organizations can enhance and support organizational change for sustainability (Gholami et al., 2016; Tulsi & Ji, 2020).

Green human resources practices are crucial in improving individual and organizational performance related to sustainability. Companies should align their performance management systems with sustainability objectives to leverage the potential of green HR practices (Dian, Pambudi, Leonardus, Sukrisno & Kundori, 2022; Teixeira et al., 2016; Trujillo-Gallego et al., 2021; Zaid et al., 2018). This can be achieved by setting clear performance metrics aligned with sustainability goals and rewarding employees for their sustainability achievements. Research has shown that green HRM policies, employee engagement in green activities, and sustainability communication positively impact business and sustainability performance. Additionally, green practices, such as green human resource management and green supply chain management, have positively and significantly affected sustainability performance (Zhu, 2023). Therefore,

integrating green HR practices into performance management systems can contribute to achieving sustainable organizational performance (Ali, Salman, Yaacob, Zaini & Abdullah, 2020; Ghouri et al., 2020; Ogbeibu et al., 2020; Setyaningrum & Muafi, 2023; Singh & El-Kassar, 2019).

The convergence of GHRM, SC, and sustainability is critical for firms that want to implement ecologically and socially responsible practices into their operations. There are several canals that connect these three domains.

Collaboration and integration:

Cross-functional teams: Cross-functional teams comprised of professionals from human resources, supply chain management, and sustainability can help to improve collaboration and practice integration.

Integrated reporting: One way to assist align goals across GHRM, SC, and Sustainability is to develop integrated reporting systems that take environmental, social, and governance concerns into account in addition to standard financial indicators.

Elements of a sustainable supply chain:

In order to encourage suppliers to embrace sustainable practices, like ethical sourcing, cutting back on carbon emissions, and supporting fair labor standards, GHRM can work with supply chain teams.

Green Procurement: Including environmentally friendly and sustainable suppliers in the supply chain guarantees the sourcing of goods and services.

Training and employee engagement:

Programs for training: It is ensured that staff members, especially those in supply chain positions, are aware of and supportive of sustainability goals by including sustainability training into employee development programs.

Incentive programs: Linking employee performance metrics related to sustainability goals can motivate individuals to actively contribute to green initiatives.

Corporate social responsibility (CSR):

CSR strategy: GHRM and SC can collaborate on defining and implementing CSR strategies that align with sustainability objectives, covering areas such as community engagement, social impact, and environmental stewardship.

Stakeholder engagement: Engaging with stakeholders, including employees, customers, and communities, can enhance the effectiveness of sustainability initiatives.

Technology and innovation:

Digitalization: Leveraging technology and data analytics in both HRM and supply chain processes can contribute to identifying opportunities for sustainability improvements and measuring performance.

Innovation programs: Encouraging innovation within the organization can lead to the development of sustainable practices and solutions in both HRM and supply chain operations.

Metrics and assessment of performance: KPIs (Key Performance Indicators): Establishing common KPIs to assess the social and environmental effects of supply chain and HR operations guarantees that sustainability objectives are regularly tracked.

Benchmarking: Organizations can evaluate their sustainability progress and pinpoint areas for development by benchmarking against industry standards and best practices.

Regulatory compliance: Teams dedicated to compliance Creating groups to keep an eye on and guarantee adherence to labor and environmental laws can facilitate the integration of sustainability into supply chain and human resource management procedures.

Organizations can develop a more comprehensive approach to sustainability by promoting cooperation and alignment across various channels, which will include supply chain management, human resources, and general operations.

As a result, organizations committed to sustainability in their supply chains should integrate green human resources into their fundamental strategies. This holistic approach is aligned with environmental, social and economic objectives and improves overall business performance and competitiveness. By applying the practical results outlined here, organizations can pave the way for a sustainable future while continuing to adapt to emerging challenges (Nikolić, Lazarević & Jaganjac., 2022) and opportunities.

Conclusion, limitations, and future research opportunities

In this research, a systematic literature review of studies, including the effects of green human resources practices on the sustainability of supply chains, was carried out. Articles written in English in the Web of Science and Scopus databases that include green human resources, supply chain, and sustainability were compiled for this purpose. It

was determined that 53 studies meet the pertinent criteria and are directly related to the topic, of which 47 were published articles, and 6 were early access. Various content analyses were performed on this data set.

The date of the first study in the context of green human resources, supply chain, and sustainability corresponds to 2016. The number of studies in the field reached double digits for the first time in 2020.

Information on the contributions of countries, journals, and authors to the domain regarding the number of publications, h-index, and total citations were obtained. Regarding the number of publications, India and China rank first, while France and China take the first place in cooperation. When ranked according to the citations received, Brazil and India took the first two places. It can be seen that India and China, which have question marks (Huang & Wang, 2010; Sachin & Rajesh, 2022) about sustainability, take the lead in the field. It can be considered a favorable situation that these two countries, which have more than 34% of the world's population, are at the forefront of studies on sustainability.

The academic journal that gave the most coverage to the studies published in the pertinent context was the *Journal of Cleaner Production*. Although 11 studies in the data set were published in this journal, they also rank first in total citations and, consequently, the h-index. The domain's most influential researchers were Jabbour and Sousa Jabbour (2016).

In the content analysis, concepts such as environmental performance, environmental management, financial performance, and big data came to the fore, besides the search terms. The images of green human resources management, supply chain, and sustainability are in the same dimension, according to the tree dendrogram, based on the conducted factor analysis. Additional concepts that support this dimension include resource-based views, green hiring, green training, sustainable performance, and green ability. The supply of human resources, their development, and the use of their skills by the strategies determined are necessary for organizations to achieve their sustainability goals, so examining these functions alongside the sustainability of supply chains is essential.

The concept of financial performance comes to the forefront as both the PageRank value and the betweenness value in the created network, the necessity for organizations to use their financial resources effectively to maintain their existence. The following distinction should be made: should organizational or environmental sustainability be prioritized? Organizations, of course, seek to maximize their interests. They are, however, not independent of the environment in which they operate due to the system's approach. Discussions continue on how organizations should set their priorities to continue working without harming the environment while meeting their goals (Adams, 2003; Gugushvili, 2021).

The concept of *environment*, which stood out in the first two time periods of the thematic evolution analysis, has recently given way to the images of "green supply chain" and "sustainable performance." As in any new domain, general topics are typically the first to be covered while the knowledge develops and touches on more specific subjects over time. However, the effects of green human resources on the sustainability of supply chains are far from being processed in all its dimensions. It can be predicted that both green human resources and the sub-dimensions of the supply chain will gain more weight in the future.

One of its limitations is that the study is rooted in the framework of sustainable supply chains and green human resources. However, the requirement for setting a limit to enable analysis can be used to justify this limitation. The databases used in the research, Web of Science and Scopus, are the most reliable sources at this time, but using different databases can generate more nuanced and comprehensive results.

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The impact of sales growth on manufacturing companies' profitability in the Republic of Serbia – panel data analysis

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Abstract

Background: Sales growth is one of the key factors for achieving a target high profitability rate. Sales growth provides more comprehensive use of companies' capacities, thereby allocating fixed costs to higher value of revenue resulting in higher profitability rate.

Purpose: The aim of this paper is to examine the impact of sales growth on manufacturing companies' profitability in the Republic of Serbia during 2018-2021.

Study design/methodology/approach: The profitability as a dependent variable was measured as return on assets, while the size of the company, current ratio, leverage, sales growth, and inventory ratio were set as independent variables. The research was based on a sample of 200 observations of large and medium size manufacturing companies and panel regression models were used.

Findings: The results indicate that there is a positive and significant impact of inventory ratio and sales growth on the return on assets. The profitability of manufacturing enterprises increases with the increase in sales. The results of this paper are expected to be used by the management of manufacturing companies to be more careful to achieve stable business and development.

Limitations/future research: Recommendations, limitations, and future research are given in the conclusions.

Keywords

sales growth, profitability, panel data analysis, ROA, fixed-effects panel model.

Introduction

The Republic of Serbia as a middle-income country had GDP per capita of 9,393.6 US dollars in 2022 (The World Bank, 2023). Although the level of GDP per capita has recorded constant growth in recent years, the country should accelerate it to achieve the levels in the European Union. As well as in the majority of developed and developing countries, a decreasing share of manufacturing in the GDP is characteristic of this national economy. In 2020 this share was 13.3%, a

decline by 1.9 p.p. in comparison to 15.2% in 2011 (Kovačević et al., 2021).

Despite this, manufacturing is of immense importance for the country`s economy. There were 32,384 business entities in 2021, achieving a turnover of 4,274,255 million RSD and an output value of 3,836,922 million RSD. In the same year, 498,372 people were employed in manufacturing industries, with total personnel costs of 544,520 million RSD, of which gross salaries and wages amounted to 474,040 million RSD (Statistical Office of the Republic of Serbia, 2023a).

Valorization of the output value is on the market, so the main goals of manufacturing companies are to satisfy consumers' needs while achieving the highest possible levels of profitability. In order to reach them, one of the basic available instruments is sales, as an intangible activity that adds value to products after tangible production (de Borja Reis et al., 2020). Efficient coordination of sales with other internal activities, contributes to companies` "enhanced ability to learn via knowledge transfers, desirable customer responses, and improved business performance" (Peterson et al., 2021, p. 542).

Although sales on local markets are important, for small markets such as Serbian, it is not sufficient because manufacturing capacities cannot be fully utilized. Therefore, most of the manufacturing companies should be oriented towards foreign markets. In addition to better manufacturing capacity utilization, export orientation would also increase the country's national income and inflow of foreign currency. Higher efficiency or productivity gains known as "learning by exporting" could be expected as well (Erbahar, 2020, p. 314).

Manufacturing companies' primary focus should be countries with which Serbia has signed free trade agreements. Due to these agreements, domestic manufacturing companies can export most of their key industrial products in a customs-free regime, with exceptions and annual quotas for a limited number of goods (Development Agency of Serbia, 2020). Lowering levels of protectionism through free trade agreements generally leads to a reduction in costs of entering and doing business in foreign markets, and to an improvement in companies' and countries' export performance and sustainability (Turkcan et al., 2022).

The European Union is the most important trade partner and investor, with a share of over 60% of the total Serbian foreign trade. In 2022 the Republic of Serbia recorded exports of 17,690 million EUR to the European Union, which represented 64.1% of its total world exports. In the same year, the country's imports from the European Union amounted to 21,450 million EUR or 54.9% of its total world imports (European Commission, 2023). Although the volume of trade is continuously growing, there is a long-term deficit for Serbia. Manufacturers participate in the country's exports with a value of 16,398 million EUR or 67.0% of the total products, while their share in the country's imports is 12,451 or 68.5% (European Commission, 2023).

The CEFTA countries, as a regional market of Southeast European countries with around 20 million inhabitants, features as the second most important trade partner for Serbia. As the value of exports reached 4,387.5 million EUR in 2022, and the value of imports 2,026.5 million EUR, Serbia recorded a surplus of 2,361 million EUR in 2022 (Statistical Office of the Republic of Serbia, 2023b). In addition to the above, the markets of China, Russia, and Turkey are also of special importance for Serbia's foreign trade exchange.

1. Literature review

Sales growth can be defined as a change in companies' sales over a period. Sales growth is one of the key factors for achieving a high profitability rate. Companies can achieve sales growth of existing products or services, or based on diversification and sales of new products and services (Vuković et al., 2022). Increasing direct sales of products and services will lead to more revenue (Bhandari et al, 2024). According to Iskandar (2021), high level of sales growth will increase income, which would provide increase in dividend payments. Companies with a higher amount of income could increase profit and retain earnings. Sam and Hoshino (2013) in their research conclude that sales growth provides more comprehensive use of capacity, which allocates fixed costs over higher revenue resulting in higher profitability rate.

Many authors analyzed the impact of sales growth on the companies' profitability. Among the research methods and results, there are differences between the method used and the conclusions. Some authors have based research only on the variable from the financial statements, while other authors used other non-financial information. Hollas et al. (2021) argue that among numerous specific factors and non-financial factors of agritourism, sales have significant impact on profitability of tourism sector. Regardless of the

methods and different indicators, the performance of the company's business should be continuously measured and analyzed. In this way, management can react in time to solve problems or take advantage of opportunities for business improvement (Hornungova, 2022).

Determinants of profitability of food industry in India were examined during the period 1998-2009 by Azhagaiah and Deepa (2012). The research was based on multiple regression models. The results show that growth is one of the major factors in determining profitability in small-size and medium-size companies.

The impact of sales growth on the firm performance of 194 companies from manufacturing sector listed on the Indonesia Stock Exchange in 2010-2016 was examined by regression model. The research results show that the sales growth has a positive and significant influence on firm performance (Ghozali et al., 2018). Furthermore, the authors conclude that firms with a higher rate of sales growth will achieve future profits. Also, sales growth is one of the important factors in achieving a better position against competitors.

The relationship between sales growth and profitability of Spanish manufacturing companies during the period 2000 – 2014 was analyzed by using regression models OLS, GLS, and GMM (Fuertes-Callen, Cuellar-Fernandez, 2019). Profitability as a dependent variable was measured by ROA, while the following variables were defined as independent: sales growth, employment growth, size, liquidity, debt, innovation, export. The results showed that sales growth has a positive impact on profits in the short-term. Furthermore, the results indicate that the impact of exports on profitability in the period of economic crisis is indirectly achieved through growth in sales.

Dakić and Mijić (2020) analyzed the impact of internal factors of meat processing companies on return on assets. The authors used the panel analysis for 24 companies in Serbia during the period 2007 – 2016. The following variables were set as the internal factors: company size, age, leverage, quick ratio, inventory, sales growth, and capital turnover ratio. The research results indicate that age, leverage, quick ratio, sales growth, and capital turnover ratio have a significant influence on profitability measured by return on assets. The impact of sales growth on the return of assets is positively related.

Nadia et al. (2021) analyzed the effect of sales growth on the financial performance of manufacturing enterprises listed on the Indonesia Stock Exchange. The research sample consisted of 59 companies during the period 2018-2020. Return on assets was set as a measure of financial performance. Besides sales growth, the following independent variables were set: independent commissioners, corporate social responsibility, firm size, and shareholder's equity. Besides variables from financial statements this study includes variables from non-financial reports. The results of regression analysis indicate that higher sales lead to higher financial performance.

Indiansyah et al. (2022) analyzed the influence of sales and other independent determinants on changes in profits. The research was based on enterprises listed on the Indonesia Stock Exchange during the period 2014-2021. The authors used a multiple linear regression model. The research results show that sales growth has a positive effect on profit changes. According to this, it can be concluded that if the following year sales growth increases, the net profit will increase from the previous year.

The effect of macro and micro variables, as independent variables, on financial performance of companies in Turkey and South Korea was analyzed by Kilic et al. (2022). Among the results, they emphasize that sales growth has a significant and positive effect on return on assets as financial performance. Regardless of the level of development between the two countries, sales growth is a key factor of financial performance.

Asadifard et al. (2023) investigated the effect of sales growth rate, inventory turnover ratio, and growth opportunities on company profitability. Profitability was measured by return on assets, net profit margin, and return on equity. The research sample consisted of 171 companies listed on the Tehran Stock Exchange over the period 2014-2022. Among the results of multiple regression analysis, the author indicates that sales growth rate has a positive and significant relationship with the profitability of companies.

Marella et al. (2023) analyzed the impact of sales growth and leverage on the profitability measured as return on assets. The sample consisted of 11 infrastructure companies listed on the IDX in 2020-2022. The data was analyzed by panel data regression. The results indicated that sales growth doesn`t have a significant impact on return on assets. On the other side, leverage has a significant negative influence on return on assets.

2. Methodology

The aim of this research was to investigate the impact of sales growth on the profitability of enterprises from the manufacturing sector in Serbia. In order to realize the research, besides sales growth, the following independent variables were selected: inventory ratio, size, current ratio as liquidity ratio, and debt to assets as leverage ratio. The study covers a period of 4 years (2018-2021) and encompasses 50 large and medium-sized companies in sector C (manufacturing). The sample consists of 200 observation units. The data were collected from the financial statement publicly available by the Serbian Business Registers Agency (2023).

Taking into account the set goal and the subject of the research, we defined the following hypothesis:

H_1: Sales growth of manufacturing companies in Serbia significantly impacts the ROA of selected companies in Serbia.

Statistical models based on combining data with real cross-sectional values and time series are gaining more and more importance in economic research recently. The reason for this popularity is the fact that the panel data set offers certain advantages over the traditional pure time series or pure cross-sectional data sets. According to (Szwacka-Mokrzycka, 2020) "panel studies provide the opportunity to increase the data set and thus expand the analysis. They make it possible to identify the causes of the phenomena examined in the study, observe the dynamics of these phenomena, as well as control unobservable individual effects in regression models". "The virtues of panel data are well known and include enabling controls for unobserved heterogeneity and intertemporal development" (Kenneth et al., 2024). Panel data models are suitable for solving problems that cannot be solved by using cross-sectional data or time series data. (Biorn, 2016). "In contrast to individual time series, the regression panel better observes and measures the effects and enriches the empirical analysis"(Bosna, 2022).This is exactly why we opted for panel regression analysis in this study. More about the benefits of panel data can be found in the book by Chang Hsiao (see more: Ai-bing Ji et al., 2022).

In the observed period from 2018 to 2021, there were no missing observations. Since that there is the same number of time series observations for each comparative unit, and the balanced panel data was the most suitable for use in the research.

A panel data set is a two-dimensional data set that consists of cross-sectional elements and time-series elements. This means that panel data models at each of T time periods (t =1... T.) have n cross-sectional units (i=1,..., N.) (Hsiao, 2014).

Return on assets (ROA) was set as a measure of profitability. On the other side, based on available data from financial statements, the explanatory variables are defined as growth, inventory ratio, company size, current ratio, and leverage. A list of dependent and explanatory variables used in panel models is presented in Table 1.

Table 1 List of variables used in panel analysis.

Variable name	Code	Type of variable: dependent or explanatory	Definition	Explanation
ROA (Return on asset)	Y	Depend.	Ability of company to generate earnings from its assets.	Net income / Total Assets
Size	X_1	Explan.	Size of Company	Natural logarithm of the total assets
Current ratio	X_2	Explan.	Ability to pay short term debt on time	Current assets / Short term debt
Leverage	X_3	Explan.	The structure of funding sources	Total debts / Total assets
Growth	X_4	Explan.	Firm growth during 2018-2021	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$
Inventory ratio	X_5	Explan.	The size of inventory	Inventory / Current assets

Source: the authors' based on Helfert, 2001; Asadifard, 2023

3. Results and discussions

Table 2 presents the results of descriptive statistics analysis of the variables used in the panel models. According to the results given in Table 2, it can be concluded that manufacturing enterprises have an average positive ROA rate of 2.84%. This means that an average manufacturing company achieves 28.4 of RSD on 1,000 RSD engaged total assets. Even though the average rate of ROA is positive, the rate of ROA is not at referent value of 10% (see more: Rodić et al., 2017). The descriptive statistical analysis of leverage indicates that manufacturing companies used twice as much debt for financing business activities. Even though there

is more debt in the structure of capital, liquidity is above the referent value (more than 2). The growth rate indicates that sales increased by 5.2%. Inventory ratios indicate that there is almost half inventory in the structure of current assets.

Table 2 Descriptive statistics

Variable name	Mean	Median	Min.	Max.
ROA (Return on asset)	0.0284	0.0292	-0.4990	0.2767
Size	14.3511	14.8632	9.060	17.8821
Current ratio	2.7322	1.5420	0.3302	17.9813
Leverage	2.0010	0.5869	0.0349	42.7411
Growth	1.0520	1.0021	0.4465	4.4170
Inventory ratio	0.4726	0.4519	0.06284	0.9770

Source: the authors

The presence of multicollinearity is considered problematic if the correlation between variables is higher than 0.8 (Field, 2005). In order to identify the problem of multicollinearity, the correlation of independent variables was done (see table 3).

Table 3 Pearson correlation coefficient

Y	X_1	X_2	X_3	X_4	X_5	
1	0.2957	0.1228	-0.1082	0.2523	-0.0404	Y
	1	-0.0595	0.0230	0.0089	-0.1830	X_1
		1	-0.2055	-0.1042	0.3231	X_2
			1	0.1412	-0.1191	X_3
				1	-0.1129	X_4
					1	X_5

Source: the authors

According to the results given in Table 3, we can make a conclusion that there is no multicollinearity problem because all correlations are less than 0.8.

"Before starting a regression analysis, it is important to investigate whether there are outliers and/or collinearity problems in the data" (Ekiz, 2023). The variance inflation factor (VIF) is one of the most powerful tests of multicollinearity. VIF gives us an answer to the question of how much the variance of a coefficient is inflated due to linear dependence on other independent variables. The VIF reference value is 10 (Marquardt, 1970). All VIF values not greater than 10 are good. If the multicollinearity between the independent variables is smaller, the VIF will also be smaller. As we can see in Table 4, all scores are less than 10, so we can conclude that there is no multicollinearity problem.

Table 4 Result of multicollinearity test

Variable	VIF (Variance Inflation Factor)	1/VIF
Size	1.035	0.97
Current ratio	1.156	0.87
Leverage	1.063	0.94
Growth	1.033	0.97
Inventory ratio	1.162	0.86

Source: the authors

There are several different models in panel data analysis. The pooled regression model, the fixed effect model, and the random effect model are most often used in practice and mentioned in the literature.

According to Greene (2018, p.780), "the basic linear panel models can be described through the restrictions of the following general model:

$$Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}; \quad i = 1, \ldots, N; t = 1, \ldots, T; \tag{1}$$

where Y_{it} is the dependent variable, X_{it} is a K dimensional vector of explanatory variables without a constant term, α is the intercept (i.e. the heterogeneity and or individual effects), β is a (K×1) vector of unknown coefficients (i.e. the slopes), and ε_{it} is iid error terms, where $\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$".

The fixed effects model and random effects model are the most used regression models in panel analysis. The reason for that is the fact that the pool model has more limitations compared to them. All three models are represented in Table 5.

Table 5 Panel models

Explan. variables	Coefficient		
	Model 1	Model 2	Model 3
Const	−0.246279	−0.338125	−0.260602
	(0.001)***	(0.5245)	(0.0003)***
X_1	0.0136267	0.00891044	0.0143710
	(0.001)***	(0.8107)	(0.0010)***
X_2	0.00427177	0.00213010	0.00318894
	(0.0324)**	(0.5982)	(0.2032)
X_3	−0.0026813	−0.001673	−0.002563
	(0.0595)*	(0.3683)	(0.0929)*
X_4	0.0725010	0.0485842	0.0615967
	(0.001)***	(0.0015)***	(0.001)***
X_5	−0.0071564 (0.8103)	0.391739 (0.0006)***	0.0305743 (0.4610)

Source: the authors

Note:

- Model 1: Pooled OLS; Model 2: Fix-effects model; Model 3: Random-effects; (GLS).
- *, **, *** indicate statistical significance at the 90% and 95%, and 99% levels of confidence.

Formal recommendations on the suitability of individual panel models are given by panel diagnostics tests. "The output of the tests is a comprehensive report that provides recommendations on the suitability of individual panel models"(Linhartová et al., 2022).

Table 6 presents the results of the panel model diagnostic to choose an adequate model. Based on the panel model diagnostic results, the fixed-effects model is adequate.

Table 6 Panel model diagnostic

Diagnostics	Null hypothesis	Alternative hypothesis	p-value	Decision
Joint significance of differing group means:	The pooled OLS model is adequate	The fixed effects is adequate	F(49, 145) = 3,49327 with p-value 0,0001	A p-value is less than 5% (0.05). That means the null hypothesis is rejected and the fixed effects model is adequate.
Breusch-Pagan test statistic	The pooled OLS model is adequate	The random effects model is adequate	LM = 32,3559 with p-value = prob(chi-square(1) > 32,3559) = 0,0001	A p-value is less than 5% (0.05). That means the null hypothesis is rejected and the random effects model is adequate.
Hausman test statistic	The random effects model is adequate	The fixed effects model is adequate	H = 14,9987 with p-value = prob(chi-square(5) > 14,9987) = 0,010368	A p-value is less than 5% (0.05). That means the null hypothesis is rejected and the fixed effects model is adequate.

Source: the authors

The following table presents the results of the fixed-effects model.

Table 7 Fixed-effect model

	Coefficient	Std. Error	t-ratio	p-value
const	−0.338125	0.530059	−0.6379	0.5245
X_1	0.00891044	0.0371248	0.2400	0.8107
X_2	0.00213010	0.00403275	0.5282	0.5982
X_3	−0.00167352	0.00185447	−0.9024	0.3683
X_4	0.0485842	0.0150478	3.229	**0.0015**
X_5	0.391739	0.111930	3.500	**0.0006**

Source: the authors

The research results indicate that two independent variables have a significant influence on the return on assets of manufacturing enterprises in Serbia during the period 2018-2021 (p-value is less than 0.05). Inventory ratio and sales growth have a significant positive impact on return on assets. Manufacturing companies with a higher rate of inventory in the structure of current assets achieve a higher rate of return on assets.

Furthermore, according to the research findings, it can be concluded that an increase in sales growth rate has a positive impact on the return on assets as a profitability determinant. This finding is in accordance the previous research results which confirm the positive relationship between sales growth and profitability (Azhagaiah, Deepa, 2012; Dakić & Mijić, 2020; Asadifard et al. 2023; Marella, 2023). For a stable business, it is not enough just to assess profitability rate, but also to analyze the factors that affect profitability (Tekić et al., 2023).

The research results indicate that the research hypothesis is confirmed. These findings are also consistent with the previous research, which indicates that a company can obtain the maximum profit through sales growth (Nadia et al., 2021).). The achieved performance of growth and sustainability in the previous period affects the future profitability of the company (Lu et al., 2022).

Conclusion

Sales growth represents one of the key factors influencing the profitability of manufacturing enterprises in Serbia. To increase the rate of sales growth, manufacturing companies should focus on satisfying customers' needs. They should try to differentiate themselves more successfully from the competition by providing unique products that have value for customers beyond low prices. In addition to sales growth, differentiation on the market enables premium prices and higher levels of customer loyalty, especially during periods of crisis (Porter, 2007).

Some of the competitive advantages for the manufacturing companies in Serbia include the possibility of duty-free exports to a market of more than 1.3 billion inhabitants, the country`s geographical location, the fact that it is the largest country in the Western Balkan region, etc. Certainly, it is very encouraging that the country attracted more than half of the total foreign direct investments to the Western Balkan region in 2018-2022 (National Bank of Serbia, 2023).

Manufactured goods have the largest share in the total exports of Serbia. However, the negative fact is that they dominantly consist of medium-

level skills and technology. Considering this, improving the market position of manufacturing companies on a global scale could be one of the major export and economic growth drivers, but only if companies improve their levels of skills and implement highly sophisticated technology. Superior and highly competitive products generating high levels of real income are of crucial importance for economy`s global competitiveness (Matkovski et al., 2022).

Some other issues that should be addressed are lack of financial resources, undeveloped transport and logistics infrastructure, deficient intellectual property rights, insufficiently qualified labor, high manufacturing costs, etc. To improve these issues and to manufacture high-value-added goods, continuous organized support from the national government and its institutions is necessary. Export assistance programs especially designed for small and medium enterprises to help them face trade barriers on the international markets are of a particular importance because of their limited financial, management, marketing or information resources (Njegić et al., 2020).

The limitation of this study can be explained by the fact that the sales were analyzed by the overall sales of companies. Future studies should divide domestic sales and exports to identify the impact of a specific type of sales on the profitability ratio.

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> Ljubojević, T.K. (1998). Ljubojević, T.K. (2000a). Ljubojević, T.K. (2000b). Ljubojević, T.K., & Dimitrijević, N.N. (1994).

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Authors must be listed by their last names, followed by initials. Publication year must be written in parentheses, followed by a full stop. Title of the article must be in sentences case: only the first word and proper nouns in the title are capitalized. The periodical title must be in title case, followed by the volume number, which is also italicized:

> Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. *Title of Periodical, volume number* (issue number), pages.

➲ **Journal article, one author, paginated by issue.**

Journals paginated by issue begin with page 1 in every issue, so that the issue number is indicated in parentheses after the
volume. The parentheses and issue numbers are not italicized, e.g.

> Seliverstova, Y. (2021). Workforce diversity management: A systematic literature review. *Strategic Management*, *26*(2), 3–11. https://doi.org/10.5937/StraMan2102003S

➲ **Journal article, one author, paginated by volume.**

Journals paginated by volume begin with page 1 in issue 1, and continue page numbering in issue 2 where issue 1 ended, e.g.

> Perić, O. (2006). Bridging the gap: Complex adaptive knowledge management. *Strategic Management, 14*, 654–668.

➲ **Journal article, two authors, paginated by issue.**

Dakić, S., & Mijić, K. (2020). Regression analysis of the impact of internal factors on return on assets: A case of meat processing enterprises in Serbia. *Strategic Management*, *25*(1), 29–34. https://doi.org/10.5937/StraMan2001029D

➲ **Journal article, two authors, paginated by volume.**

Ljubojević, K., & Dimitrijević, M. (2007). Choosing your CRM strategy. *Strategic Management, 15*, 333-349.

➲ **Journal article, three to six authors, paginated by issue.**

Marić, S., Uzelac, O., & Strugar-Jelača, M. (2019). Ownership structure as a measure of corporate performance. *Strategic Management*, *24*(4), 28–37. https://doi.org/10.5937/StraMan1904028M

➲ **Journal article, three to six authors, paginated by volume.**

Boškov, T., Ljubojević, K., & Tanasijević, V. (2005). A new approach to CRM. *Strategic Management, 13*, 300-310.

➲ **Journal article, more than six authors, paginated by issue.**

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., et al. (2005). Putting the user at the center of software testing activity. *Management Information Systems, 3*(1), 99-106.

➲ **Journal article, more than six authors, paginated by volume.**

Strakić, F., Mirković, D., Boškov, T., Ljubojević, K., Tanasijević, V., Dimitrijević, M., et al. (2003). Metadata in data warehouse. *Strategic Management, 11*, 122-132.

➲ **Magazine article.**

Strakić, F. (2005, October 15). Remembering users with cookies. *IT Review*, *130*, 20-21.

➲ **Newsletter article with author.**

Dimitrijević, M. (2009, September). MySql server, writing library files. *Computing News, 57,* 10-12.

➲ **Newsletter article without author.**

VBScript with active server pages. (2009, September). *Computing News,57,* 21-22.

B. BOOKS, BROCHURES, BOOK CHAPTERS, ENCYCLOPEDIA ENTRIES, AND BOOK REVIEWS

Basic format for books

Author, A. A. (Year of publication). *Title of work: Capital letter also for subtitle*. Publisher.

- **Book, one author.**

  Ljubojević, K. (2005). *Prototyping the interface design*. Faculty of Economics in Subotica.

- **Book, one author, new edition**

  Dimitrijević, M. (2007). *Customer relationship management* (6th ed.). Faculty of Economics in Subotica.

- **Book, two authors.**

  Ljubojević, K., Dimitrijević, M. (2007). *The enterprise knowledge portal and its architecture*. Faculty of Economics in Subotica.

- **Book, three to six authors.**

  Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., & Perić, O. (2006). *Importance of software testing*. Faculty of Economics in Subotica.

- **Book, more than six authors.**

  Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., Boškov, T., Strakić, F., et al. (2007). *Supply chain management*. Faculty of Economics in Subotica.

- **Book, no author or editor.**

  Web user interface (10th ed.). (2003). Faculty of Economics.

- **Group, corporate, or government author.**

  Statistical office of the Republic of Serbia. (1978). *Statistical abstract of the Republic of Serbia.* Ministry of community and social services.

- **Edited book.**

  Dimitrijević, M., & Tanasijević, V. (Eds.). (2004). *Data warehouse architecture*. Faculty of Economics.

- **Chapter in an edited book.**

  Repa, V. (2019). Deriving Key Performance Indicators from Business Process Model. In M. Pańkowska & K. Sandkuhl (Eds.), *Perspectives in Business Informatics Research. BIR 2019. Lecture Notes in Business Information Processing, vol 365.* (pp. 148–162). Springer. https://doi.org/10.1007/978-3-030-31143-8_11

➲ **Encyclopedia entry.**

Mirković, D. (2006). History and the world of mathematicians. In *The new mathematics encyclopedia* (Vol. 56, pp. 23-45). Faculty of Economics.

C. UNPUBLISHED WORKS

➲ **Paper presented at a meeting or a conference.**

Ljubojević, K., Tanasijević, V., Dimitrijević, M. (2003). *Designing a web form without tables*. Paper presented at the annual meeting of the Serbian computer alliance, Beograd.

➲ **Paper or manuscript.**

Boškov, T., Strakić, F., Ljubojević, K., Dimitrijević, M., & Perić, O. (2007. May). *First steps in visual basic for applications*. Unpublished paper, Faculty of Economics Subotica, Subotica.

➲ **Doctoral dissertation.**

Strakić, F. (2000). *Managing network services: Managing DNS servers*. Unpublished doctoral dissertation, Faculty of Economics Subotica.

➲ **Master's thesis.**

Dimitrijević, M. (2003). *Structural modeling: Class and object diagrams*. Unpublished master's thesis, Faculty of Economics Subotica.

D. ELECTRONIC MEDIA

The same guidelines apply for online articles as for printed articles. All the information that the online host makes available must be listed, including an issue number in parentheses:

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Online Periodical, volume number* (issue number if available). https://www.anyaddress.com/full/url/

➲ **Article in an internet-only journal**

Tanasijević, V. (2003, March). Putting the user at the center of software testing activity. *Strategic Management*, *8* (4). https://www.ef.uns.ac.rs/sm2024

➲ **Document from an organization**

Faculty of Economics. (2008, March 5). *A new approach to CRM*. https://www.ef.uns.ac.rs/papers/acrm.html

➲ **Article from an online periodical with DOI assigned.**

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54. https://doi.org/10.5937/StraMan213302003S

➲ **Article from an online periodical without DOI assigned.**

Online journal articles without a DOI require a URL.

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Journal, volume number*. https://www.anyaddress.com/full/url/

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If a work is directly quoted from, then the author, year of publication and the page reference (preceded by “p.”) must be included. The quotation is introduced with an introductory phrase including the author’s last name followed by publication date in parentheses.

According to Mirković (2001, p. 201), “The use of data warehouses may be limited, especially if they contain confidential data”.

Mirković (2001, p. 201), found that “the use of data warehouses may be limited”. What unexpected impact does this have on the range of availability?

If the author is not named in the introductory phrase, the author's last name, publication year, and the page number in parentheses must be placed at the end of the quotation, e.g.

He stated, “The use of data warehouses may be limited,” but he did not fully explain the possible impact (Mirković, 2001, p. 201).

➲ **Summary or paraphrase**

According to Mirković (1991, p. 201), limitations on the use of databases can be external and software-based, or temporary and even discretion-based.

Limitations on the use of databases can be external and software-based, or temporary and even discretion-based (Mirković, 1991, p. 201).

➲ **One author**

Boškov (2005) compared the access range…

In an early study of access range (Boškov, 2005), it was found...

➲ When there are **two authors**, both names are always cited:

Another study (Mirković & Boškov, 2006) concluded that…

➲ If there are **three or more authors** the abbreviation "et al." (Latin for "and others") is employed in APA in-text citations when referencing works with three or more authors. The format is to include only the first author's last name, followed by "et al.," a comma, and the year of publication. For instance, (Dakic et al., 2024) would be used as an example.

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If the work does not have an author, the source is cited by its title in the introductory phrase, or the first 1-2 words are placed in the parentheses. Book and report titles must be italicized or underlined, while titles of articles and chapters are placed in quotation marks:

A similar survey was conducted on a number of organizations employing database managers (Limiting database access, 2005).

If work (such as a newspaper editorial) has no author, the first few words of the title are cited, followed by the year: (The Objectives of Access Delegation, 2007)

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If the author is an organization or a government agency, the organization must be mentioned in the introductory phrase or in the parenthetical citation the first time the source is cited:

According to the Statistical Office of the Republic of Serbia (1978), …

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The overview is limited to towns with 10,000 inhabitants and up (Statistical Office of the Republic of Serbia [SORS], 1978).

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➲ When citing **more than one reference from the same author**: (Bezjak, 1999, 2002)

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(Bezjak, 1999; Griffith, 2004)

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Survey results published in Theissen (2004a) show that…

➲ To **credit an author for discovering a work** when you have not read the original:

Bergson's research (as cited in Mirković & Boškov, 2006)…

Here, Mirković & Boškov (2006) will appear in the reference list, while Bergson will not.

➲ When **citing more than one author**, the authors must be listed alphabetically:

(Britten, 2001; Sturlasson, 2002; Wasserwandt, 1997)

➲ When there is **no publication date**: (Hessenberg, n.d.)

➲ **Page numbers must always be given for quotations**:

(Mirković & Boškov, 2006, p.12)

Mirković & Boškov (2006, p. 12) propose the approach by which "the initial viewpoint…

➲ **Referring to a specific part of a work**:

(Theissen, 2004a, chap. 3) (Keaton, 1997, pp. 85-94)

➲ **Personal communications, including interviews, letters, memos, e-mails, and telephone conversations**, are cited as below. (These are *not* included in the reference list.)

(K. Ljubojević, personal communication, May 5, 2008).

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A few footnotes may be necessary when elaborating on an issue raised in the text, adding something that is in indirect connection, or providing supplementary technical information. Footnotes and endnotes are numbered with superscript Arabic numerals at the end of the sentence, like this.1 Endnotes begin on a separate page, after the end of the text. However, *Strategic Management* **does not recommend the use of footnotes or endnotes.**

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