Corporate Social Responsibility and Environmental Management

WILEY

Corporate Social Responsibility and Environmental Management

RESEARCH ARTICLE OPEN ACCESS

Investigating Factors for an Inclusive Workforce for Women in the Logistics and Supply Chain Industry

Vernika Agarwal[1] | Shefali Srivastava[2] | Ashish Dwivedi[3] | Sanjoy Kumar Paul[4] | Anchal Patil[5]

[1]Apeejay School of Management, New Delhi, India | [2]Operations and Decision Sciences, Christ University, Bengaluru, India | [3]Jindal Global Business School, O.P. Jindal Global University, Sonipat, India | [4]UTS Business School, University of Technology Sydney, Sydney, Australia | [5]IMI Delhi, New Delhi, India

Correspondence: Sanjoy Kumar Paul (sanjoy.paul@uts.edu.au)

Received: 2 March 2025 | **Revised:** 20 August 2025 | **Accepted:** 27 August 2025

Keywords: gender diversity | human-centric approach | inclusive workforce for women | logistics and supply chain

ABSTRACT

This study seeks to identify and analyze the major factors that contribute to an inclusive workforce for women in the area of logistics and supply chain. It further addresses the need for gender diversity and inclusivity in a traditionally male-dominated field by adopting a human-centric approach. This study employs a combination of Fuzzy Delphi Method (FDM) and Fuzzy Best Worst Method (FBWM) for methodically identifying and prioritizing factors that influence inclusiveness for women in the logistics and supply chain industry. FDM gathers experts' opinions and achieves a consensus on the identified relevant factors. Subsequently, FBWM is used to analyze the factors, providing a clear priority ranking based on their relative significance. The analysis identified potential factors that are crucial for fostering an inclusive workforce in the logistics and supply chain industry for women. The factors were classified into three main categories: employee growth and culture, inclusive business ecosystems, and accessibility and diversity factors. Based on the global weights, the top three ranked factors are: gender-inclusive supply chain practices, skill development workshops, and supporting women-owned businesses. This study is original in terms of gender inclusiveness in the logistics and supply chain industry. The innovative combination of multiple methods stipulates a robust methodology for identifying and analyzing the factors that impact inclusiveness, offering a novel contribution to the literature and practical applications in this field.

1 | Introduction

The logistics and supply chain industry has been well-known as a predominantly male-dominated industry, presenting significant problems for women looking to enter and thrive in this sector. Despite various advancements in gender equality, women still face numerous challenges, including gender bias, lack of mentorship, limited career advancement opportunities, and a work culture that often fails to accommodate their unique needs (Stamarski and Son Hing 2015; Llorens et al. 2021; Smith and Sinkford 2022). Such challenges are detrimental to women's careers on a personal basis and the industry's overall efficiency and potential for innovation; it is essential to note that the industry can benefit immensely from diverse perspectives. Recognizing the importance of inclusiveness, there is an escalating need to understand factors that can prepare the logistics and supply chain industry to be more welcoming and supportive for women (Deloitte Consulting 2020; People Matters 2024). Inclusiveness is not just a moral or ethical statement. It is a business necessity that can lead to enhanced organizational performance, greater innovation, and enhanced employee satisfaction (Maurelli and Mussome 2020; Washington et al. 2023).

Identifying and addressing the reasons for fostering an inclusive workforce can help organizations leverage the full potential of their employees, thus driving better decision-making and competitive advantage.

The need for gender inclusiveness in the logistics and supply chain industry is underscored by the tangible benefits observed in organizations that have successfully integrated diversity initiatives (OECD 2018; Luchetti and Turrini 2022). Gender inclusiveness fosters a more self-motivated and innovative work ecosystem by facilitating varied perspectives and differential problem-solving approaches (Pless and Maak 2004; Nishii 2013; Kuknor and Bhattacharya 2022; Pike and English 2022). For instance, organizations like Maersk have seen significant improvements in operational efficiency and employee engagement through their targeted inclusiveness programs. Maersk's gender diversity strategy, which includes mentorship courses and leadership training for women, has led to a more balanced workforce and a notable increase in female representation in leadership roles (Economic Times 2023). This demonstrates that promoting gender inclusiveness addresses equity and fairness and drives business success by leveraging the full spectrum of talent available in the workforce.

Despite the acknowledged benefits of inclusiveness, there is a notable research gap in systematically identifying and prioritizing the factors contributing to an inclusive environment, specifically for women in the logistics and supply chain industry. Although some studies have touched upon general diversity issues, there is an absence of comprehensive structures that address the issues and requirements of women in this industry (Wolf and Brenning 2023; Baron et al. 2024). Existing studies tend to either broadly address diversity issues without concentrating on the hurdles faced by women or lack a structured approach to prioritize the relevant factors (Janssens and Zanoni 2021; Frisch et al. 2024). Additionally, there is a scarcity of research that applies advanced decision-making methodologies to inclusiveness in this context, leaving a gap in actionable frameworks that can guide industry practices. This research gap underscores the need for targeted research that can provide actionable insights and practical solutions. To address the research gap, this study sets research objectives (ROs) that focus on identifying and prioritizing the factors essential for creating an inclusive workforce for women in the logistics and supply chain industry. The ROs for this study are as follows.

RO1. *To explore the critical factors that contribute to an inclusive workforce for women in the logistics and supply chain industry.*

RO2. *To analyze the identified factors based on their relative importance.*

The study employs a combination of Fuzzy Delphi Method (FDM) and Fuzzy Best Worst Method (FBWM) to achieve the identified ROs. FDM is utilized to gather expert opinions and build a consensus on relevant factors, whereas FBWM is applied to prioritize these factors and offer a clear hierarchy based on their importance. This study's specific contributions lie in its methodological rigor and practical implications. By integrating FDM and FBWM, the study gives a robust and systematic methodology to understand inclusiveness in the logistics and supply chain industry. This dual-method approach identifies key factors and ranks them, enabling organizations to focus their efforts on the most critical areas for improvement. This prioritization is crucial for resource allocation, strategic planning, and ensuring that initiatives that enhance inclusiveness are effective and efficient. Overall, the novelty of this study is reflected in its unique use of a fuzzy multi-criteria framework in the context of women's inclusiveness in the logistics and supply chain industry. This approach provides a novel addition to the literature by bridging gaps and specifying a framework for fostering an inclusive workforce. The findings from this study can help policymakers, managers, and consultants in developing and executing strategies that support women in the industry to enhance organizational performance and innovation.

2 | Literature Review

The literature review section is segmented into three subsections. The foremost sub-section explores the impact of inclusivity on the performance of the organizations. The second sub-section reviews the literature on inclusive practices in the workforce in logistics and supply chains. The last sub-section discusses the research gaps.

2.1 | Impact of Inclusivity on Organizational Performance

Previous literature has positively correlated women's participation with innovation and improved operational performance (Zinn et al. 2018). However, organizations encounter multiple challenges while promoting gender diversity. A key challenge that women employees face is unconscious bias, which may be one of the reasons for the low percentage of women in this sector. Agarwal (2020) discussed the need for training programs that address unconscious bias in hiring, promotion, and performance evaluation processes. Further, a review study of 518 articles on bias in human resource literature was provided (Storm et al. 2023). Continuous education and awareness programs can help employees recognize and minimize their prejudices, resulting in more equitable treatment for all employees. Return to work is another prominent challenge faced by women in the workplace. An agile workplace plays a vital role in supporting women returning to the workforce after career breaks. Tretiakov et al. (2023) reflected that implementing agile approaches in the workplace encourages more women to return to work post-career break. It also highlighted that friendly co-workers and a supportive work environment can simplify the reintegration process for women who take breaks. Frisch et al. (2024) supported the argument, stating that such initiatives support employees in general but also benefit organizations by tapping into a skilled and experienced talent pool.

The research by Groeneveld et al. (2020) reflected that the lack of gender equity in top management affects the excessive workforce reductions in Dutch civil services. The study concluded that diversity in leadership teams is vital for organizations to have perspectives from diverse angles for their growth. This claim is further highlighted in a study by Birindelli et al. (2019), which showed that organizations with women in leadership roles manage to perform better in terms of innovation and financial performance. Evans and Maley (2021) emphasized the need for gender equality in key policy areas in Australia, with the most convincing economic argument being that women in politics and women's leadership in organizations eliminate the gender pay gap and improve labor market participation. Baron et al. (2024) reflected that having clear awareness and norms regarding the benefits of gender diversity can promote a culture of equality within organizations. Mentorship programs customized for women in crucial roles toward career advancement and professional development are needed for equal representation.

Banwell et al. (2019) elaborated on mentorship's role in supporting women in coaching. Also, Read et al. (2020) discovered that women who are active members of mentorship programs have a better probability of advancing to higher positions within their organizations. Wolf and Brenning (2023) supported the need for mentoring female students in Science, Technology, Engineering, and Math (STEM) courses, emphasizing that mentorships support individual growth and foster a supportive organizational culture. Such programs are needed to bridge the gap in supply chains where the retention rate of women is low. In addition to having a good mentor and equity at a higher organizational hierarchy, flexibility is essential for attracting and retaining women in the logistics industry. Dilmaghani (2021) argued that workplace flexibility is essential for a higher retention rate. Shifrin and Michel (2022) investigated the association between flexible work arrangements for workers and health habits. The study concluded that flexibility at work can help employees maintain their health and lead to more satisfaction and productivity in their work. This finding was further supported in a study by Kumar et al. (2023). Employee resource groups (ERGs) are professional associations that aim to make a more inclusive workplace for women. Wang et al. (2025) studied the political participation of women in promoting green innovation, considering the global context. Green (2018) discussed the importance of platforms in sharing experiences and seeking support. Collaboration between diverse groups can also aid in overcoming organizational inequalities (Dennissen et al. 2020).

Implementing gender-inclusive policies, such as equal pay and anti-discrimination measures, is necessary for creating a fair working environment. Accordingly, Casad et al. (2021) showed that the lack of support for women in STEM faculty places. Meanwhile, Baltenweck et al. (2022) argued that policies that assist women in STEM faculty positions are crucial for attracting and retaining female talent. Inclusive policies will guarantee that women have the same opportunities for growth and are treated fairly in the workplace. Overall, there are many challenges for an inclusive workforce for women in the logistics and supply chain industry. By implementing inclusive strategies, companies can attract and retain female talent, increase their diversity, and improve the overall performance of the organization.

2.2 | Women's Inclusion in Logistics and Supply Chain Workforce

The recent discourse on human-machine interactions, sparked by Industry 5.0 (I5.0) literature, has also spurred the investigation into the involvement of women in the logistics and supply chain industry. Recent studies have discussed the importance of reduced physical labor and the human-centric approach of I5.0 as favorable for increasing women's participation in the industry (Stiffler et al. 2020). However, supply chains are grappling with the concern that women are under-represented in the workforce. A recent report by PWC highlighted that logistics and supply chains remain male-dominated (PWC 2020). Zinn et al. (2018) underscored the growing pay disparity in the supply chain industry. Cooper et al. (2016) found that women's involvement in supply chain conferences is only around 15%. Nix and Stiffler (2016) studied the barriers impacting the inclusion of women in supply chain management. Brown (2022) highlighted the wage inequality, workplace hazards, gender-based violence, and harassment faced by women clothing workers in the global supply chain. The author suggested various measures that can alleviate these hazards. Cravero (2018) studied diversity in public procurement and reported multiple benefits to achieving social sustainability goals and economic efficiency. Davis-Sramek et al. (2018) used behavioral decision theory to investigate the carrier selection decision in the transportation industry. Lorber and Farrell (2020) identified cultural norms, structural barriers, and unconscious biases as major impediments that impede gender equality within supply chain operations. Quintana-García et al. (2021) expanded this list to include restricted data accessibility, lack of proper monitoring mechanisms, and competing priorities. Baltenweck et al. (2022) reviewed literature related to gender-inclusive business models in the livestock value chain. They reported a scarcity of literature on gender-inclusive models and suggested studying the mechanisms that promote gender diversity.

In an editorial, Zinn et al. (2018) drew attention to the underserved domain of gender diversity in the supply chain. They proposed expanding the talent pool through initiatives that promote inclusion in the workplace. Ruel et al. (2020) discussed the impact of gender diversity on the sustainable management of the supply chain. They reported that although most of the literature focuses on challenges, it does not focus on women as change agents in sustainable supply chain management. A study by Cook and Glass (2014) revealed that due to the lack of diversity among decision-makers, the representation of women in leadership roles is severely affected. They emphasized that even representation of women in leadership roles in the logistics industry is needed for creating an inclusive work environment. Schneider and Northcutt (2018) also confirmed these findings and reported that gender diversity helps improve adaptive capacity and enhances resilience. In contrast, Chin and Tat (2015) reported that having a diverse workforce does not impact supply chain performance in the electronics industry. Bodrožić and Gold (2024) reported slow and frustrating progress of supply chain diversity, equity, and inclusion practices (DEI). They studied and compared laissez-faire, regulatory, and transformative public policies impacts on DEI and sought further research on policies promoting DEI initiatives.

2.3 | Research Gaps

The above two subsections reported multiple studies reporting the positive benefits of promoting women's involvement in the workforce. Literature has studied the impediments and modeled them to suggest potential solutions. In the supply chain industry, women's involvement remains low and progress has stagnated, even after reporting the multiple advantages of an inclusive workforce. Ruel et al. (2020) highlighted the need to study the factors promoting workplace diversity instead of reporting the issues and challenges. Bodrožić and Gold (2024) recently highlighted the need to explore and promote DEI initiatives by studying public policies. Many authors have reported that the limited supply chain literature has previously focused on inclusive workplaces. Also, various studies have suggested exploring and discovering ways to improve inclusivity and increase the participation of women in the supply chain and logistics industry. Although research on diversity and inclusion for women is rich and continually expanding, especially within the contexts of corporate governance and sustainability, its application in the logistics and supply chain industry remains comparatively underexplored. Existing studies have established strong links between gender diversity, particularly in management positions, and improved corporate social responsibility (CSR) performance, eco-innovation, and environmental disclosure practices (Kuzey et al. 2022; Amorelli and García-Sánchez 2023). Past studies also indicate that gender-diverse boards contribute significantly to ethical labor standards, stakeholder responsiveness, and sustainability reporting (Birindelli et al. 2019; Graafland 2020). Moreover, gender diversity reforms at national and organizational levels have shown a positive association with CSR scores and the implementation of environmentally responsible practices (Yang et al. 2024). Although there have been advancements in literature, few studies have operationalized gender inclusivity within the specific and traditionally male-dominated field of logistics and supply chain management. Thus, studying factors that contribute to an inclusive workforce for women in the logistics and supply chain industry is considered as an essential research gap. This study addresses this gap by contextualizing well-established gender and CSR relationships into a structured, industry-specific prioritization framework using FDM and FBWM. In doing so, it contributes to the evolving understanding of how gender inclusivity can be strategically advanced in industrial domains beyond the more commonly studied corporate and service sectors. The study aims to identify the factors that will aid women in overcoming the glass ceiling effect, thus motivating more women to pursue jobs in conventionally male-dominated fields.

3 | Research Methodology

The research methodology section is divided into four subsections. The first sub-section highlights the information related to identifying inclusive workforce factors. The second sub-section reflects details related to the design of the questionnaire and the selection of the panel. The steps related to the FDM approach are provided in the third sub-section. The information on the steps used in FBWM is provided in the fourth sub-section.

3.1 | Identification of Inclusive Workforce Factors

In this sub-section, a review of the literature was conducted to recognize the factors related to inclusivity in the logistics and supply chain industry. The utilized research papers were selected using the title and summary of each paper in Science Direct, Scopus, Springer, and Emerald Insight. The following keywords were used: “women in logistics,” “inclusivity in supply chain,” “women in supply chain,” “flexibility for women in supply chain,” “gender equity in supply chain,” and “inclusive workforce.” Later, the search was refined using the year of publication, and recent documents were selected for further evaluation. Then, the search was screened exclusively for documents in English. As our area of focus is relatively new in the logistics and supply chain industry, most papers were related to human resources and social psychology. Based on the literature review, the inclusive workforce factors were shortlisted, as given in Table 1.

3.2 | Questionnaire and Panel Selection

To begin with, the selection of the experts involved a purposive-convenience sampling technique, an accepted and prominent method in studies employing the Delphi technique: FDM and multi-criteria decision method: FBWM. The focus was to have a balance between access and domain specialization, particularly because of the technicality of the topic, which involves inclusiveness for women within supply chain and logistics activities. A total of 30 experts were identified through LinkedIn outreach, professional networks, and industry-academia advisory board lists. The final panel consisted of professionals from manufacturing firms, logistics companies, policy advisory bodies, and academic institutions renowned for research in supply chain sustainability and workforce equity. To ensure diversity of perspective, we ensured representation across genders, industries (automotive, consumer goods, third-party logistics), and institutional affiliations (private sector, public sector, academia). The experts who have a minimum of 10–20 years of professional involvement in supply chain management, human resource strategy, gender inclusivity programs, policy-making, or academic research and participated in cross-sectoral or international initiatives concerning workforce diversity or operational excellence were considered. Once the experts agreed, an initial contact was made through email with a formal invitation letter, which contained a project brief, consent form, and an overview of what was expected from them. A pre-screening form was utilized to verify their interest and qualification for participation in the topic. A Zoom orientation session was conducted to describe the research goals, methodological approaches (FDM and FBWM), and fuzzy linguistic scales for making judgments to guarantee clarity and coherence in replies.

Once the factors were analyzed using FDM, they were finalized based on the shortlisted ones with the support of experts. Following the analysis of the responses obtained from FDM, the questionnaire was administered to the same group of experts for their input on FBWM. FBWM was employed to prioritize the identified factors obtained from the FDM, considering their relative significance in fostering an inclusive

TABLE 1 | List of inclusive workforce factors for the logistics and supply chain industry.

Notation	Name of the factor	Description	References
IWF1	Safe and respectful workplace	Ensuring a zero-tolerance rule for harassment and discrimination, with well-defined reporting and resolution processes.	George et al. (2017), Robotham and Cortina (2021)
IWF2	Network of supportive employee resource groups	Establishing employee resource groups, industry events, and professional associations, specifically for women in logistics, to provide a supportive community, networking opportunities, and resources for professional development.	Green (2018), Dennissen et al. (2020)
IWF3	Catering to unconscious bias	Executing training programs to prevent unconscious prejudice in hiring, raise, and performance appraisal processes, to make a more inclusive workplace for women.	Agarwal (2020), Evans and Maley (2021), Storm et al. (2023)
IWF4	Cross-functional training programs	Encouraging women to participate in cross-functional training programs that expose them to different aspects of the business, thus broadening their skill sets and career opportunities.	Experts' opinion
IWF5	Workplace diversity training	Organizing diversity training sessions to raise awareness and consideration for gender-related issues, to make a more inclusive work environment for women in this sector.	Janssens and Zanoni (2021), Mishra and Sahoo (2025).
IWF6	Gender-inclusive policies	Creating and executing gender-inclusive rules, such as equity in pay and bias-free procedures, can support fairness and an understanding work ecosystem for women in the logistics industry.	Casad et al. (2021), Baltenweck et al. (2022), Hall et al. (2023)
IWF7	Inclusive recruitment practices	Employing inclusive recruitment practices and overcoming the bias in recruitment and retention processes to create a more diverse workforce in the logistics and supply chain industry.	Maurelli and Mussome (2020), Yang et al. (2024), Matthews et al. (2024)
IWF8	Initiatives for return-to-work programs	Offering support for women returning to the workforce after career breaks, such as maternity leave, can simplify their reintegration and retention in this industry.	Tretiakov et al. (2023), Frisch et al. (2024)
IWF9	STEM outreach programs	Engaging in outreach programs aimed at promoting STEM education and careers among girls and young women, therefore cultivating the interest and skills necessary for success in logistics-specific domains.	Benson and Chau (2017), Lane and Id-Deen (2023)

(Continues)

TABLE 1 | (Continued)

Notation	Name of the factor	Description	References
IWF10	Transparent promotion criteria	Clearly outlining the criteria for promotions raises to ensure transparency and fairness.	Kafa et al. (2023)
IWF11	Representation of women in leadership positions	Increasing the women's ratio in leadership roles within the logistics industry can act as a role model and inspire more women to pursue careers in supply chain and logistics.	Cook and Glass (2014), Groeneveld et al. (2020), Evans and Maley (2021), Baron et al. (2024)
IWF12	Programs for mentorship of women	Implementing mentorship courses tailored for women in logistics can provide them with guidance, encouragement, and opportunities for career advancement.	Banwell et al. (2019), Read et al. (2020), Wolf and Brenning (2023)
IWF13	Skill development workshops	Providing workshops on skills that are critical for the logistics and supply chain industry, such as negotiation, project management, and technology.	Experts' opinion
IWF 14	Education toward allied areas of supply chain	Providing opportunities for women to gain experience in different areas of supply chain to broaden their expertise.	Experts' opinion
IWF15	Executive coaching	One-on-one coaching sessions with experienced leaders to help women develop their leadership style and navigate challenges in the industry.	Experts' opinion
IWF16	Flexible work arrangements	Offering flexible work options, such as working from home and flexible hours, can assist women in coping with work and family duties.	Dilmaghani (2021), Shifrin and Michel (2022), Kumar et al. (2023), Vohra et al. (2024)
IWF17	On-site facilities	Introducing amenities such as on-site daycare, restrooms, maternity support, hygienic facilities, and safe transportation.	Experts' opinion
IWF18	Health and wellness programs	Tailoring health and wellness programs to address issues specifically affecting women.	Sznajder et al. (2022), Subramanian (2020)
IWF19	Assimilation of work-life integration policies for women	Launching policies that support work–life integration.	Kumar et al. (2023)
IWF20	Inclusive communication	Ensuring all workplace communications are inclusive and respectful fosters a culture of respect and equality.	Silva and Ruel (2022)
IWF21	Supporting women-owned businesses	Prioritizing partnerships with women-owned suppliers and service providers.	Orser et al. (2021), Ngoasong and Kimbu (2019)
IWF22	Gender-inclusive supply chain practices	Ensuring that diversity and inclusion extend to the entire supply chain.	Kini (2022), Ramirez et al. (2020)

(Continues)

TABLE 1 | (Continued)

Notation	Name of the factor	Description	References
IWF23	Ethical and fair sourcing	Ensure that women-owned suppliers adhere to fair labor practices, promoting gender equity within their own operations.	Muldoon et al. (2023), Perry et al. (2015)
IWF24	Awareness and advocacy	Educate internal stakeholders about the importance and benefits of supplier diversity.	Prieto-Carrón (2008), Perry et al. (2015)
IWF25	Capacity building and support	Partner with women entrepreneurs or local businesses.	Ruel et al. (2020)

workforce for women in the logistics and supply chain industry. FDM was applied twice, once for each group of factors. The experts were requested to provide a pairwise comparison for the most crucial and least crucial factors to evaluate the relative importance.

Out of the 30 invited experts, 12 filled out the questionnaire for both the FDM and FBWM approaches. FDM and FBWM are judgment-based, expert-led decision tools instead of statistical generalization methods. The validity and robustness of such methods are achieved in terms of depth and specific relevance of expert opinion, not necessarily large numbers of subjects. Some of the early and recent research in decision science and fuzzy multi-criteria decision-making attests to the sufficiency of small expert panels. Clayton (1997) reported that Delphi studies are capable of yielding significant consensus using panels of 10–15 experts. The studies using FBWM often use 10–20 experts to ensure judgment consistency without overloading the cognitive resources required for pairwise comparisons (Hsu et al. 2010; Chang et al. 2011; Bouzon et al. 2016; Tsai et al. 2020). The data obtained were tested for consistency ratio, and the pairwise comparisons were analyzed for rational consistency as part of the FBWM protocol.

3.3 | Fuzzy Delphi Method

This section discusses the FDM, which is utilized to advance expert consensus on a particular problem. FDM is used to transform expert judgments into crisp values to fulfill requirements and produce further help with decision-making time and cost.

Step 1: Design the questionnaire that presents the identified factors to the expert c.

Step 2: Identify the Fuzzy Scale for evaluation of the factors. Fuzzy scales allow experts to express their opinions in linguistic terms such as "very unlikely," "somewhat unlikely," "neutral," "somewhat likely," and "very likely." In order to operationalize expert opinions within the FDM, a fuzzy linguistic scale was used, as given in Table 2. The scale converts subjective expert views into triangular fuzzy numbers (TFNs), which allow for the imprecision in human decision-making. For instance, a "somewhat likely" rating translates into a TFN of (0.5, 0.75, 1.0), reflecting the range of perceived importance for a factor. These values are essential in calculating the fuzzy weights aggregated over expert answers.

The prominence of factor d is assessed as $= (x_{cd}; y_{cd}; z_{cd})$, $c = 1, 2, 3, \ldots, n$, $d = 1, 2, 3, \ldots, m$, c is experts, and d is element. Then, weight j_d is $j_d = (x_d; y_d; z_d)$, where $x_d = \min(x_{cd})$, $y_d = (\Pi_1^n y_{cd})^{1/n}$, and $z_d = \max(z_{cd})$.

Step 3: Gather the responses from the experts and compile the data for analysis. Ensure the questionnaire is properly filled out and the judgments are as per the defined scale.

Step 4: Use fuzzy aggregation techniques to combine the experts' responses and generate aggregated judgments. In this step, the authors generate the convex combination value, D_a, using a $\propto -$ cut method given in Equation (1), the results are computed:

$$u_d = z_d - \alpha(z_d - y_d), l_d = x_d - \alpha(y_d - yx_d), d = 1, 2, 3 \ldots . m \tag{1}$$

Usually, 0.5 is used for the computation, although this value can vary between 0 and 1, based on experts' opinion. The value of D_a is computed using the following expression:

$$D_a = \int (u_d, l_d) = \delta[u_d + (1 - \delta) l_d] \tag{2}$$

δ denotes the favorable level of experts and establishes balance across basic judgments among the expert group.

Step 5: The final selection of the factors is done using the threshold of the previous step. Compute $\gamma = \Sigma_{a=1}^n (D_a / n)$ as the threshold. If $D_a \geq \gamma$, factor b is accepted. Otherwise, it is rejected.

3.4 | Fuzzy Best Worst Method

In this section, we prioritize the inclusive workforce factors that were shortlisted from FDM.

Step 1. Define the decision factors: The shortlisted factors from the FDM approach are used in this section. The same experts are approached to give feedback on the shortlisted factors to prioritize them.

TABLE 2 | Fuzzy linguistic scale for the FDM.

Linguistic terms	Corresponding TFNs
Very likely (EI)	(0.75, 1.0, 1.0)
Somewhat likely (I)	(0.5, 0.75, 1.0)
Neutral (MI)	(0.25, 0.5, 0.75)
Somewhat unlikely (LI)	(0, 0.25, 0.5)
Very unlikely (NI)	(0, 0, 0.25)

TABLE 3 | Fuzzy linguistic scales for FBWM.

Linguistic terms	Membership function
Equally important (EI)	(1, 1, 1)
Weakly important (WI)	(2/3, 1, 3/2)
Fairly important (FI)	(3/2, 2, 5/2)
Very important (VI)	(5/2, 3, 7/2)
Absolutely important (AI)	(7/2, 4, 9/2)

Step 2. Define fuzzy numbers: In this study, the fuzzy linguistic scale developed by Guo and Zhao (2017) was utilized in FBWM. The scale is presented in Table 3 and consists of five linguistic terms: from "equally important" to "absolutely important" and each of them is paired with a corresponding TFN. These values represent the intensity of preference or priority for each criterion in pairwise comparisons between the most and least favorable factors. These fuzzy comparisons are the foundation for building the FBWM decision matrix and then deriving the fuzzy optimal weights of the factors identified. To give an example, if a specialist judged Factor A to be "very important" than Factor B, then such a valuation would be converted into the TFN (5/2, 3, 7/2). Such TFNs are subsequently utilized to calculate fuzzy consistency ratios, defuzzify (using the centroid method), and ultimately give the crisp priority weights that dictate the ranking of inclusion factors.

Step 3. Identify the best and worst performances: Determine the most important (best) and least important (worst) factors for each expert, given by C_B and C_W, respectively.

Step 4. Calculate the relative degrees of importance: Calculate the relative degrees of importance for each criterion by comparing the performance of each alternative to the best and worst performances for that criterion. The obtained fuzzy best-to-others (BO) vector is: $\widetilde{A}_B = (\widetilde{a}_{B1}, \widetilde{a}_{B2}, \ldots, \widetilde{a}_{Bn})$ and the others-to-worst (OW) vector can be obtained as: $\widetilde{A}_W = (\widetilde{a}_{1W}, \widetilde{a}_{2W}, \ldots, \widetilde{a}_{nW})$, where $\widetilde{A}_B$ and $\widetilde{A}_W$ are the vectors. We used constrained optimization to find the optimal weights $(\widetilde{w}_1^*, \widetilde{w}_2^*, \ldots, \widetilde{w}_n^*)$ for the vectors, using the steps shown in Appendix A.

Step 5. Aggregate and rank the relative importance values: Aggregate and rank the relative importance values for each criterion across all alternatives to obtain the final weights for each criterion using the expression given in Appendix A.

Step 6. Consistency check: Check the consistency by using the expression shown in Appendix A.

4 | Numerical Results

The following steps were used to evaluate the factors impacting the inclusivity of women in the logistics and supply chain industry:

Step 1. Identification of inclusive workforce factors: The factors were initially identified from the literature and expert opinions. A total of 25 factors were identified for the existing study and are presented in Table 1.

Step 2. Refining the factors using FDM: FDM is utilized to shortlist the classified factors by using Equations (1) and (2). The questionnaire includes instructions on how to provide their judgments using fuzzy scales, as provided in Appendix B and Table B1.

Step 3. Prioritization using the FBWM: After the factors are shortlisted, FBWM is employed to prioritize the categories and their factors, determining the weights or importance levels for each factor with the relevant questionnaire as provided in Appendix C and Tables C1–C8.

4.1 | Finalizing the Inclusive Workforce Factors

During the first stage of analysis, the FDM was used to test and validate the list of factors affecting workforce inclusivity for women in logistics and the supply chain. The experts were requested to rate each of the factors on how significant they were using a fuzzy scale, enabling them to provide judgments that account for uncertainty and subjectivity. Each expert's rating was translated into TFNs for the minimum value ($l(y)$), most likely value ($m(y)$), and maximum value ($u(y)$) of their opinion. These fuzzy answers were then collected and processed to calculate the fuzzy consensus threshold (D_b) for each factor. The value at which the agreement between the experts, and thus each factor's inclusion in the final list, was obtained is the threshold value ($\gamma = 0.412$), which is presented in Table 4.

A total of 18 factors were shortlisted through this process, as provided in Table 5. Later, the FBWM was applied to the finalized factors. The finalized factors were again discussed with the experts. The factors were categorized into three main categories: (i) employee growth and culture (EGC) factors, (ii) inclusive business ecosystem (IBE) factors, and (iii) accessibility and diversity factors (ADF).

4.2 | Prioritization of Main Categories

The experts were requested to determine the most and least important factors that influence the inclusiveness of women in the logistics and supply chain industry. A pairwise comparison on a fuzzy linguistic scale was conducted to indicate how much more significant the best category was than the others, and how much less significant each category was than the worst. This two-way comparison format enhances the consistency and reliability of the expert responses. Table 6 shows the BO and OW vectors for the principal categories based on aggregated expert judgments. These fuzzy comparisons were crucial in building the FBWM optimization model, which was then employed to compute the fuzzy and defuzzified weights of each category.

TABLE 4 | Finalizing factors using the FDM.

Notations	Name of the factors	$u(y)$	$l(y)$	D_b	Decision
IWF1	Safe and respectful workplace	0.944	0.306	0.548	Accept
IWF2	Network of supportive employee resource groups	0.500	0.000	0.250	Reject
IWF3	Catering to unconscious bias	0.890	−0.015	0.441	Accept
IWF4	Cross-functional training programs	0.877	−0.002	0.438	Accept
IWF5	Workplace diversity training	0.852	0.023	0.432	Accept
IWF6	Gender-inclusive policies	0.944	0.306	0.548	Accept
IWF7	Inclusive recruitment practices	0.375	0.000	0.188	Reject
IWF8	Initiatives for return-to-work programs	0.944	0.306	0.548	Accept
IWF9	STEM outreach programs	0.869	0.006	0.436	Accept
IWF10	Transparent promotion criteria	0.375	0.000	0.188	Reject
IWF11	Representation of women in leadership positions	0.988	0.262	0.560	Accept
IWF12	Programs for mentorship of women	0.869	0.006	0.436	Accept
IWF13	Skill development workshops	0.891	−0.016	0.442	Accept
IWF14	Education toward allied areas of supply chain	0.500	0.000	0.250	Reject
IWF15	Executive coaching	0.913	0.337	0.541	Accept
IWF16	Flexible work arrangements	0.988	0.262	0.560	Accept
IWF17	On-site facilities	0.869	0.006	0.436	Accept
IWF18	Health and wellness programs	0.880	−0.005	0.439	Accept
IWF19	Assimilation of work-life integration policies for women	0.500	0.000	0.250	Reject
IWF20	Inclusive communication	0.905	−0.030	0.445	Accept
IWF21	Supporting women-owned businesses	0.977	0.273	0.557	Accept
IWF22	Gender-inclusive supply chain practices	0.869	0.006	0.436	Accept
IWF23	Ethical and fair sourcing	0.796	−0.296	0.324	Reject
IWF24	Awareness and advocacy	0.375	0.000	0.188	Reject
IWF25	Capacity building and support	0.886	−0.011	0.440	Accept

Similarly, the BOs and OW responses for EGC factors are provided in Table 7.

The BOs and OW responses for IBE factors are provided in Table 8.

The BOs and OW responses for ADFs are provided in Table 9.

Using the steps of the FBWM, the final weights for the main categories are provided in Table 10.

The final weights for EGC factors are provided in Table 11.

The final weights for IBE factors are provided in Table 12.

The final weights for ADFs are provided in Table 13.

The weights of the EGC factors by each DM are provided in Figure 1.

The weight of the IBE factors by each DM is provided in Figure 2.

The weight of the ADFs by each DM is provided in Figure 3.

5 | Findings and Discussions

This study delves into the critical factors identified as essential for fostering an inclusive workforce for women in this industry, prioritized through a rigorous application of the FDM and FBWM. Table 14 demonstrates the global weights and ranks of all factors. The identified factors were clubbed under three categories: EGC, IBEs, and ADFs. The factors were ranked accordingly and discussed in the subsequent portion.

The global ranking of factors influencing the development of an inclusive workforce for women in the logistics and supply chain industry highlights the highest priority of factors associated with

TABLE 5 | Finalized inclusive workforce factors for further analysis.

Main categories	Name of the factors	New notations
Employee growth and culture factors (EGC)	Safe and respectful workplace	EG1
	Catering to unconscious bias	EG2
	Workplace diversity training	EG3
	Representation of women in leadership positions	EG4
	Programs for mentorship of women	EG5
Inclusive business ecosystem factors (IBE)	Gender-inclusive policies	IB1
	Initiatives for return-to-work programs	IB2
	STEM outreach programs	IB3
	Flexible work arrangements	IB4
	On-site facilities	IB5
	Supporting women-owned businesses	IB6
	Gender-inclusive supply chain practices	IB7
Accessibility and diversity factors (ADF)	Cross-functional training programs	AD1
	Skill development workshops	AD2
	Executive coaching	AD3
	Health and wellness programs	AD4
	Inclusive communication	AD5
	Capacity building and support	AD6

the category IBE, with a weight of 0.505. IBE reports the wider organizational practices and external partnerships that assist gender inclusiveness in this industry. The ranking of factors within this category concentrates on the requirement to develop a holistic and supportive business environment, spreading beyond the workplace. Next, the category ADF obtains a weight of 0.297. ADF encompasses the initiatives and programs intended to improve employees' skills, well-being, and overall inclusion within the workplace. The factors under this category reflect the critical components essential for constructing a condition that supports diverse talent and encourages equal access to opportunities. The factors under the category EGC obtain a weight of 0.198.

TABLE 6 | Best-to-others and others-to-worst for main categories.

	Best-to-others (BO)			Others-to-worst (OW)		
	EGC	IBE	ADF	EGC	IBE	ADF
DM1	AI	EI	VI	EI	AI	VI
DM2	VI	EI	FI	EI	VI	FI
DM3	AI	EI	VI	WI	AI	EI
DM4	VI	EI	FI	EI	VI	EI
DM5	AI	WI	EI	EI	AI	VI
DM6	VI	EI	EI	EI	VI	FI
DM7	AI	EI	AI	WI	AI	EI
DM8	EI	WI	AI	VI	WI	EI
DM9	AI	EI	AI	EI	AI	EI
DM10	VI	WI	EI	EI	FI	VI
DM11	AI	WI	EI	EI	AI	VI
DM12	FI	EI	WI	EI	FI	WI

The factors within the EGC reveal a clear pathway for organizations to enhance inclusiveness. Such initiatives support women in the logistics and supply chain industry and contribute to developing a more innovative and productive organization. The priority structure of these factors indicates that organization-level strategies such as gender-inclusive supply chain practices, women-owned business support, and the provision of on-site facilities deliver the greatest impact in advancing inclusivity (Holmes and Marra 2022). By integrating gender inclusiveness into supply chain operations and external partnerships, organizations are able to enable far-reaching changes that benefit not just their internal workforce but the wider professional and economic environment. Significantly, factors like gender-inclusive supply chain practices and supporting women-owned businesses are ranked among the top three priorities, indicating the strategic need to adopt an outward perspective and craft policies, partnerships, and procurement practices that extend the organizational commitment to gender equality far beyond the boundaries of the corporate sphere (Kumar et al. 2023).

In the analysis of global weights, gender-inclusive supply chain practices (IB7) obtain the highest rank, highlighting the requirement to assimilate gender inclusiveness into supply chain operations. This involves confirming that suppliers and partners adhere to gender-inclusive policies and practices, thereby encouraging diversity throughout the supply chain (Pike and English 2022). For example, organizations like Unilever have dedicated themselves to working with suppliers that support gender equality, thereby promoting an inclusive ecosystem. This approach improves the organization's reputation and supports broader social change by inspiring inclusive practices across the industry (Unilever 2023).

The results show that skill development workshops (AD2) are ranked second in the analysis, underlining the significance of continuous learning and professional development. These workshops allow employees to attain new and enhance existing skills, thereby

TABLE 7 | Best-to-others and others-to-worst responses for employee growth and culture factors.

	Best-to-others (BO)					Others-to-worst (OW)				
	EG1	EG2	EG3	EG4	EG5	EG1	EG2	EG3	EG4	EG5
DM1	EI	AI	VI	AI	VI	AI	VI	FI	EI	FI
DM2	WI	FI	EI	AI	VI	AI	VI	AI	EI	FI
DM3	WI	VI	EI	AI	VI	AI	FI	VI	EI	WI
DM4	WI	EI	EI	AI	VI	VI	AI	AI	EI	FI
DM5	EI	AI	FI	AI	AI	AI	EI	FI	WI	WI
DM6	WI	VI	EI	AI	VI	AI	FI	VI	EI	EI
DM7	WI	EI	WI	AI	VI	AI	VI	AI	WI	EI
DM8	EI	WI	EI	VI	VI	VI	WI	VI	WI	EI
DM9	WI	VI	EI	AI	FI	AI	FI	VI	EI	WI
DM10	WI	VI	EI	AI	VI	AI	EI	VI	WI	FI
DM11	EI	FI	EI	VI	AI	AI	FI	VI	EI	WI
DM12	EI	FI	EI	VI	EI	AI	FI	VI	EI	AI

TABLE 8 | Best-to-others and others-to-worst responses for inclusive business ecosystem factors.

	Best-to-others (BO)							Others-to-worst (OW)						
	IB1	IB2	IB3	IB4	IB5	IB6	IB7	IB1	IB2	IB3	IB4	IB5	IB6	IB7
DM1	AI	VI	FI	VI	VI	VI	EI	EI	WI	FI	WI	WI	FI	AI
DM2	AI	AI	AI	VI	VI	VI	EI	EI	EI	WI	FI	FI	FI	AI
DM3	AI	AI	AI	VI	VI	VI	EI	EI	EI	EI	WI	FI	FI	AI
DM4	AI	AI	AI	AI	VI	VI	EI	EI	EI	EI	EI	WI	FI	VI
DM5	AI	AI	VI	VI	VI	EI	WI	EI	WI	FI	WI	WI	AI	AI
DM6	AI	AI	VI	VI	WI	EI	WI	EI	EI	WI	FI	VI	AI	AI
DM7	AI	VI	VI	VI	EI	WI	WI	EI	WI	FI	VI	AI	AI	AI
DM8	VI	FI	WI	EI	WI	EI	FI	EI	WI	FI	WI	VI	VI	FI
DM9	AI	VI	VI	EI	WI	WI	WI	EI	WI	FI	VI	AI	AI	AI
DM10	EI	EI	WI	FI	VI	AI	AI	AI	AI	VI	VI	EI	WI	WI
DM11	AI	VI	VI	VI	VI	EI	WI	EI	EI	EI	EI	WI	AI	VI
DM12	AI	AI	AI	VI	AI	VI	EI	EI	EI	WI	FI	EI	WI	AI

increasing their competitiveness and prospects for career development. This helps ensure that all employees, including women, have the tools needed to succeed and grow within the organization.

Supporting women-owned businesses (IB6) ranks as the third most important factor, identifying the value of empowering women entrepreneurs and incorporating them into the supply chain. Organizations can encourage economic empowerment and diversity by actively supporting women-owned businesses. Initiatives such as procurement policies that rank women-owned suppliers can considerably impact the inclusiveness of the business ecosystem. For instance, Walmart has initiatives to enhance the brands/products held by women in its supply chain, reflecting a commitment to accompany female entrepreneurs (IFC 2018).

On-site facilities (IB5) rank as the fourth inclusive workforce factor, underlining the need for providing facilities that meet the requirements of women at the workplace. This can include childcare facilities, nursing rooms, and other amenities that assist women in balancing work and personal responsibilities. Companies like Google offer extensive on-site facilities to encourage their diverse workforce, signifying how such amenities can enhance job satisfaction and retention (Kumar et al. 2023).

TABLE 9 | Best-to-others and others-to-worst responses for accessibility and diversity factors.

	Best-to-others (BO)						Others-to-worst (OW)					
	AD1	**AD2**	**AD3**	**AD4**	**AD5**	**AD6**	**AD1**	**AD2**	**AD3**	**AD4**	**AD5**	**AD6**
DM1	VI	EI	AI	AI	AI	VI	WI	AI	FI	WI	EI	WI
DM2	VI	EI	AI	AI	AI	VI	VI	AI	WI	EI	EI	FI
DM3	VI	EI	AI	AI	AI	VI	WI	AI	EI	EI	EI	FI
DM4	WI	WI	WI	WI	VI	EI	VI	AI	FI	WI	EI	VI
DM5	EI	WI	VI	VI	AI	WI	VI	AI	FI	WI	EI	VI
DM6	AI	EI	AI	AI	AI	AI	VI	AI	FI	WI	EI	EI
DM7	WI	WI	WI	VI	W	EI	VI	AI	WI	EI	EI	FI
DM8	WI	WI	WI	WI	FI	VI	EI	VI	WI	EI	FI	EI
DM9	VI	EI	VI	AI	AI	VI	VI	AI	WI	EI	EI	FI
DM10	FI	WI	WI	WI	VI	EI	EI	AI	WI	WI	EI	FI
DM11	AI	EI	AI	AI	AI	VI	EI	AI	WI	WI	EI	FI
DM12	WI	WI	VI	WI	WI	EI	WI	AI	EI	EI	EI	FI

TABLE 10 | Final weights for main categories.

	EGC	**IBE**	**ADF**
DM1	0.125	0.601	0.274
DM2	0.167	0.535	0.299
DM3	0.171	0.645	0.184
DM4	0.212	0.563	0.225
DM5	0.125	0.438	0.437
DM6	0.167	0.417	0.416
DM7	0.167	0.667	0.167
DM8	0.542	0.296	0.162
DM9	0.167	0.667	0.167
DM10	0.167	0.359	0.474
DM11	0.125	0.438	0.437
DM12	0.240	0.436	0.324
AVERAGE	0.198	0.505	0.297
Rank	3	1	2

TABLE 11 | Final weights for employee growth and culture factors.

	EG1	**EG2**	**EG3**	**EG4**	**EG5**
DM1	0.380	0.134	0.206	0.073	0.206
DM2	0.298	0.192	0.317	0.073	0.120
DM3	0.324	0.136	0.333	0.094	0.114
DM4	0.234	0.303	0.278	0.070	0.115
DM5	0.444	0.111	0.222	0.111	0.111
DM6	0.346	0.140	0.342	0.076	0.096
DM7	0.302	0.251	0.302	0.065	0.079
DM8	0.244	0.184	0.337	0.134	0.101
DM9	0.318	0.134	0.327	0.092	0.129
DM10	0.338	0.097	0.345	0.078	0.141
DM11	0.464	0.175	0.111	0.107	0.143
DM12	0.263	0.172	0.226	0.075	0.263
AVERAGE	0.330	0.169	0.279	0.087	0.135
RANK	1	3	2	5	4

The fifth-ranked factor, safe and respectful workplace (EG1), underscores the fundamental need for a work setting where all employees feel secure and respected. This factor is paramount because a safe and respectful workplace forms the foundation for all other inclusiveness initiatives. Other efforts to promote diversity and inclusion may be undermined if physical and psychological safety is not ensured. Companies like Maersk have implemented strong policies and procedures to prevent harassment and discrimination, demonstrating a promise of creating an understanding environment that encourages all employees, particularly women, to thrive (Economic Times 2023).

Flexible work arrangements (IB4) are also critical for developing an IBE and ranked as sixth in the analysis. Policies, such as telecommuting, flexible working timings, and job sharing, can encourage employees to handle their work-life balance in an efficient manner. These arrangements are mostly beneficial for women, who frequently bear a major part of caregiving duties. IBM's flexible work policies have been commended for

TABLE 12 | Final weights for inclusive business ecosystem factors.

	IB1	IB2	IB3	IB4	IB5	IB6	IB7
DM1	0.076	0.098	0.177	0.098	0.098	0.124	0.329
DM2	0.101	0.073	0.101	0.101	0.143	0.143	0.339
DM3	0.087	0.087	0.083	0.110	0.136	0.136	0.361
DM4	0.085	0.085	0.085	0.112	0.153	0.153	0.374
DM5	0.070	0.072	0.115	0.091	0.093	0.303	0.256
DM6	0.064	0.060	0.078	0.099	0.202	0.263	0.233
DM7	0.051	0.100	0.103	0.112	0.246	0.194	0.194
DM8	0.098	0.186	0.152	0.107	0.163	0.237	0.057
DM9	0.057	0.061	0.083	0.204	0.198	0.198	0.198
DM10	0.234	0.240	0.167	0.166	0.068	0.062	0.062
DM11	0.082	0.108	0.108	0.084	0.115	0.294	0.210
DM12	0.094	0.094	0.091	0.142	0.086	0.115	0.376
AVERAGE	0.092	0.105	0.112	0.119	0.142	0.185	0.249
RANK	7	6	5	4	3	2	1

TABLE 13 | Final weights for accessibility and diversity factors.

	AD1	AD2	AD3	AD4	AD5	AD6
DM1	0.140	0.405	0.120	0.105	0.088	0.142
DM2	0.167	0.366	0.112	0.076	0.115	0.164
DM3	0.128	0.417	0.096	0.100	0.100	0.158
DM4	0.194	0.263	0.171	0.115	0.072	0.185
DM5	0.274	0.266	0.112	0.083	0.077	0.189
DM6	0.136	0.383	0.136	0.136	0.136	0.074
DM7	0.196	0.270	0.125	0.075	0.146	0.188
DM8	0.159	0.201	0.270	0.159	0.132	0.078
DM9	0.169	0.370	0.120	0.077	0.106	0.158
DM10	0.093	0.338	0.142	0.142	0.070	0.216
DM11	0.100	0.434	0.101	0.101	0.101	0.164
DM12	0.131	0.284	0.079	0.154	0.154	0.198
Average	0.157	0.333	0.132	0.110	0.108	0.160
Rank	3	1	4	5	6	2

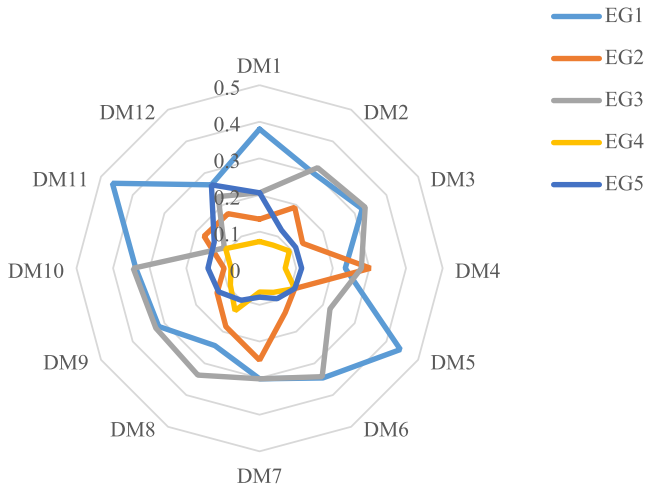

FIGURE 1 | Weights of the employee growth and culture factors by each DM.

facilitating employees to accomplish better work-life balance, leading to improved productivity and job satisfaction (Vohra et al. 2024).

STEM outreach programs (IB3) ranked at seventh place are necessary for addressing gender discrepancies in conventionally male-dominated domains. Outreach programs concentrate on accompanying young women and girls with an emphasis on careers in STEM. This can help develop a pipeline of diverse talent for the logistics and supply chain industry (Beck et al. 2022). For instance, organizations like Intel have STEM outreach initiatives intended to motivate the next generation of female engineers and scientists (Lane and Id-Deen 2023).

Workplace diversity training (EG3) is the eighth most important factor. It highlights the necessity to educate employees on diversity, equity, and inclusion principles. Diversity training programs are critical in tackling and mitigating unconscious biases, developing a culture of respect and inclusion, and equipping employees with the skills and training needed to work effectively in diverse teams. For example, DHL has integrated extensive diversity training into its organizational development programs, and this has been instrumental in promoting an inclusive culture (DHL 2023).

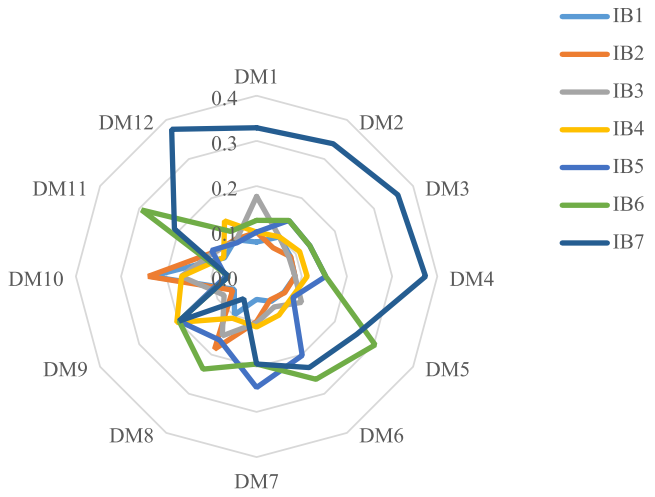

FIGURE 2 | Weights of the inclusive business ecosystem factors by each DM.

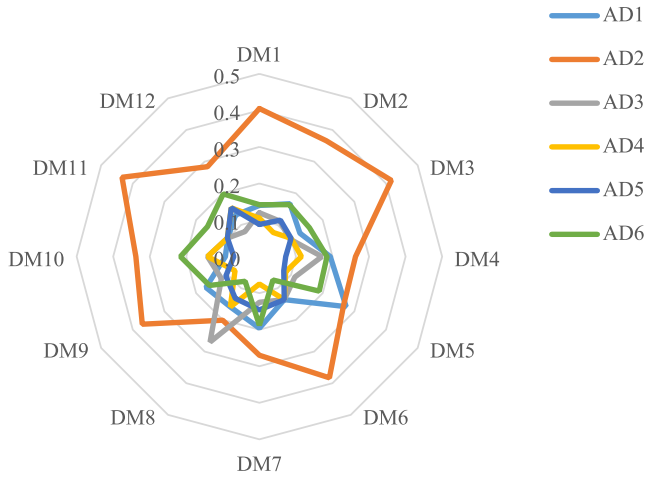

FIGURE 3 | Weights of the accessibility and diversity factors by each DM.

Initiatives for return-to-work programs (IB2) are another critical factor and are fundamental for supporting women who take career breaks, often for caregiving purposes, to re-enter the workforce. Such programs can include refresher courses, mentorship, and flexible working alternatives to assist returnees in updating their skills and reintegrating into their careers. For example, in the company Intuit, there is a returnship program which offers necessary support and training for back into the technology workforce after a career break (Intuit 2015). Such initiatives help maintain experienced talent and diminish the career progression gap that often results from stretched breaks (Read et al. 2020; Wolf and Brenning 2023).

Capacity building and support (AD6) is the tenth most important factor; it concentrates on strengthening employees' competencies through targeted support and resources. This can include providing admittance to educational resources, assisting networking prospects, and offering career counseling. Organizations like Deloitte have robust capacity-building programs that empower employees by providing the support needed to navigate their career paths effectively (Deloitte Consulting 2020).

Cross-functional training programs (AD1) are ranked eleventh, emphasizing the value of exposing employees to various functions within the organization. These programs enable employees to advance a wider understanding of the business, improve their versatility, and prepare for leadership responsibilities (Kossek et al. 2017). By participating in cross-functional training, employees can break down silos and foster collaboration across departments. General Electric has successfully executed cross-functional training programs, which have been influential in developing well-rounded leaders who understand various facets of the business (Kroes et al. 2024).

Gender-inclusive policies (IB1) form the groundwork for an IBE. These policies ensure that organizational practices are fair and equitable; these practices cover aspects such as hiring, promotions, pay equity, and anti-discrimination measures. Organizations like Amazon have accepted stringent gender-inclusive policies to ensure that their workplaces are fair and supportive for all employees, thus encouraging inclusiveness. By prioritizing gender-inclusive supply chain practices, supporting women-owned businesses, providing on-site facilities, offering flexible work arrangements, and creating robust return-to-work initiatives can construct a comprehensive and supportive environment in the organizations (Primecz and Pelyhe 2023). Such efforts not only improve gender diversity but also enhance resilience and competitiveness in the business ecosystem.

Executive coaching (AD3) is another critical factor ranked at thirteenth place, concentrating on personalized development for high-potential employees. Executive coaching provides tailored guidance and feedback, facilitating individuals to improve their leadership skills and direct complicated organizational dynamics.

Catering to unconscious bias (EG2) is ranked fourteenth, reflecting the importance of acknowledging and addressing the subtle, often unintentional biases that can affect decision-making and conduct in the workplace (Holmes and Marra 2022). Unconscious bias training aids employees in recognizing their own biases and developing strategies to mitigate their impact. This is crucial for ensuring fair treatment and equal chances for all employees.

Health and wellness programs (AD4) are important for encouraging the overall well-being of employees. These programs can include leads for physical health training, mental well-being support, and wellness activities that assist employees in sustaining a healthy work-life balance (Hall et al. 2023). Organizations like Johnson & Johnson have complete health and wellness programs accommodating to workforce diversity requirements, identifying that well-being is critical to employee engagement and productivity (Shanafelt and Noseworthy 2017).

Inclusive communication (AD5) ensures that every employee feels valued and heard and is placed at the sixteenth position. This comprises implementing communication practices that are clear and considerate of diverse perceptions. Effective inclusive communication supports a sense of belonging and makes sure that every employee is informed and engaged. Microsoft has executed inclusive communication strategies

TABLE 14 | Global weights of the inclusive workforce factors.

Categories	Weights	Factors	Local weights	Global weights	Rank
EGC	0.198	EG1	0.330	0.065	5
		EG2	0.169	0.033	14
		EG3	0.279	0.055	8
		EG4	0.087	0.017	18
		EG5	0.135	0.027	17
IBE	0.505	IB1	0.092	0.046	12
		IB2	0.105	0.053	9
		IB3	0.112	0.057	7
		IB4	0.119	0.060	6
		IB5	0.142	0.072	4
		IB6	0.185	0.094	3
		IB7	0.249	0.126	1
ADF	0.297	AD1	0.157	0.047	11
		AD2	0.333	0.099	2
		AD3	0.132	0.039	13
		AD4	0.110	0.033	15
		AD5	0.108	0.032	16
		AD6	0.160	0.047	10

that encourage transparency and inclusivity, facilitating the development of a cohesive and supportive workplace culture (Mukherjee 2020).

Programs for mentorship of women (EG5) are another factor at the seventeenth place, emphasizing the function of mentorship in supporting women's career paths. Effective mentorship programs connect women with experienced mentors who can give direction, support, and opportunities for enhancing their careers. FedEx's mentorship initiatives have proven effective in helping women navigate their careers to attain leadership positions, thereby contributing to a more inclusive leadership pipeline (FedEx 2023).

Representation of women in leadership positions (EG4) is ranked last in the analysis. This is needed for setting an example and demonstrating an organization's commitment to gender inclusiveness. Women in leadership positions can provide role models for other women and ensure that diverse viewpoints are represented in decision-making. Maersk's efforts to increase female representation in senior roles highlight the importance of this factor (Economic Times 2023). By promoting women to leadership positions, organizations can drive cultural change and make sure that inclusiveness is embedded at every level of the organization.

This study features the importance of having an inclusive workforce by focusing on potential elements across three main categories: EGC, IBEs, and ADFs. It emphasizes that promoting a safe and respectful workplace, providing comprehensive diversity training, and addressing unconscious bias are important for constructing an inclusive organizational culture. Additionally, supporting women-owned businesses and executing gender-inclusive practices throughout the supply chain is fundamental for developing a broader and more IBE. Furthermore, proposing skill development workshops, capacity-building support, and health and wellness programs is vital for improving accessibility and diversity, and for ensuring all employees have the opportunities and resources they require to succeed. These synchronized initiatives not only promote gender inclusion but also assist in advancing organizational performance, creativity, and resilience.

Hence, this study not only confirms existing knowledge in the literature but also offers a refined, data-driven structure for understanding the complex nature of workforce inclusiveness for women in logistics and supply chains. By categorizing the identified factors into three key dimensions, EGC, IBE, and ADF, the study synthesizes distinct elements discovered in previous research (Cook and Glass 2014; Bodrožić and Gold 2024) and evaluates them through a rigorous prioritization framework. This methodologically novel amalgamation of FDM and FBWM allowed for ranking not just based on conceptual importance but on expert consensus about practical applicability. Moreover, the study enhances the discourse on gender inclusivity by underlining specific under-represented factors, such as support for women-owned businesses, inclusive communication practices, and STEM outreach, demonstrating their relative importance over more traditional factors like promotion criteria or policy awareness. These insights

bridge the often theoretical nature of diversity studies and the practice-oriented needs of logistics and supply chain professionals. This arrangement with improved literature makes the findings not only reflective of past academic work but also directly applicable to advancing gender inclusivity in real-world industrial contexts.

6 | Managerial Implications

The results of this study carry considerable executive and strategic implications for organizations functioning in the logistics and supply chain industry. Beyond the identified potential factors, broader implications underline the requirement to adopt inclusiveness and leverage diversity to attain sustainable success.

The findings highlight that fostering gender inclusivity in logistics and supply chains requires a multi-dimensional strategy that integrates organizational culture, business ecosystem practices, and accessibility measures. Managers should embed gender inclusivity into core supply chain operations by adopting procurement and partnership policies that actively engage women-owned businesses and ensure fair representation across suppliers and contractors. Organizations can promote a culture that values diversity and raises belonging among all employees by fostering inclusiveness at the highest levels. Developing comprehensive diversity and inclusion strategies is crucial for inserting inclusiveness into the organizational fabric. Such strategies should be affiliated with broader business objectives and be sustained by measurable objectives and metrics. Integrating diversity and inclusion initiatives into core business practices permits organizations to create inclusiveness, a fundamental characteristic of their operations, rather than a peripheral concern.

Inclusive recruitment and retention practices are necessary for attracting and maintaining a diverse workforce. Organizations should proactively seek candidates from underrepresented groups, engaging targeted outreach, inclusive job descriptions, and diverse interview panels to attain the same. Moreover, creating an inclusive workplace culture is essential for holding diverse talent. By offering supportive networks, professional development opportunities, and flexible work arrangements, organizations may promote an environment where all workers feel appreciated and encouraged. Investment in training and development programs that support inclusiveness is crucial to constructing a culture of diversity and respect in the organization. Establishing a culture of equity is done through end-to-end diversity and inclusion policies supported by leadership commitment.

Implementing flexible work policies is essential for accommodating the diverse needs of employees. Flexible work provisions can assist employees in balancing their professional and personal obligations. By offering flexibility, organizations reflect their support for employees' well-being and work-life balance, eventually improving job satisfaction and productivity. Ensuring equal pay and anti-discrimination policies is also important for generating a fair and equitable workplace. Organizations must perform frequent pay audits to identify and correct gender pay disparities. Additionally, strict anti-discrimination policies should be imposed, with clear procedures for reporting and solving instances of discrimination. By promoting equality and fairness, organizations can promote employee trust and confidence and improve their reputation as inclusive employers.

Establishing supportive networks and mentorship programs can considerably impact the career growth of women and other underrepresented groups. Formal mentoring programs offer noteworthy guidance, support, and networking prospects to employees at all levels. Furthermore, ERGs may encourage a feeling of community and belonging by connecting employees with peers who share similar experiences and difficulties. Forming strategic alliances and industry partnerships can improve an organization's diversity efforts by providing access to diverse talent pools. It can also help in sharing best practices and in offering joint training and development programs. Collaborating with external stakeholders establishes a commitment to inclusiveness and can improve the organization's reputation and employer brand. Thus, incorporating inclusivity and diversity is both a moral duty and a strategic requirement for logistics and supply chains. Organizations that use the above-mentioned methods and practices are more likely to develop a workplace where all workers feel appreciated and empowered to provide their views and abilities to attain common goals.

Finally, collaboration with universities to encourage young women to participate in the field of STEM can add to the pipeline of future capacity for supply chains and logistics. Early exposure, internships, and sponsorship programs can reduce long-term underrepresentation of women in technical and operational roles. Together, such management steps can foster a sustainable, diverse workforce that reinforces organizational strength, stimulates supply chain innovation, and accommodates greater corporate responsibility needs.

Developing and aligning comprehensive diversity and inclusion strategies with overall business objectives ensures that inclusiveness is not just a peripheral concern but a core element of operations. By fostering such a culture, organizations can create a sense of belonging, improve innovation, and enhance collective performance. From a managerial perspective, the global rankings highlight the importance of focusing on the broader business ecosystem to drive gender inclusiveness. Beyond internal HR practices, the creation of gender-inclusive supply chain standards and supplier diversity requirements fosters equity throughout the value chain. Partnerships with women-owned businesses, investments in supportive on-site facilities, and targeted capacity-building and development programs for women all prove crucial. These actions not only prepare women for leadership and broaden the talent pool but also send a clear message to current and potential employees that the organization is dedicated to diversity and inclusion.

Thus, embedding diversity into recruitment, retention, and daily culture is vital for lasting impact. Proactive outreach, transparent promotion criteria, zero-tolerance harassment policies, flexible work arrangements, and regular pay audits help build a respectful, equitable environment. Additional support through mentoring programs, ERGs, and industry partnerships

further empowers underrepresented groups. Ultimately, making inclusivity a strategic priority is both a moral responsibility and a business imperative, enabling logistics and supply chain organizations to attract, retain, and empower a diverse workforce that drives collective success.

7 | Conclusions, Limitations and Future Research Directions

The existing study has recognized and ranked key factors adding to an inclusive workforce for women in the logistics and supply chain industry. Such findings reflect the significance of leadership commitment, supportive and inclusive practices for building a work setting where women can grow and add to organizational success. The ranking of these factors provides valuable insights for managers and policymakers to improve gender inclusiveness in the logistics and supply chain industry. Organizations can develop targeted strategies to address systemic barriers and create a more inclusive workplace culture by concentrating on areas such as leadership representation, mentorship opportunities, and diversity training. Moreover, the adoption of fuzzy multi-criteria decision-making methods offers a systematic approach to prioritizing inclusiveness factors, thus enhancing the reliability of the study's results.

The study establishes that factors related to the IBE, such as gender-inclusive supply chain practices and supporting women-owned businesses, underscore the need to extend diversity efforts beyond internal HR practices and embed them within organizational partnerships and procurement strategies. This study uncovers three distinct findings that are crucial to furthering gender inclusivity in the logistics and supply chain sector. First, the study discovers that IBE-related factors, that is, gender-inclusive supply chain management and women-owned business empowerment, have overarching global significance with regard to the necessity to extend diversity initiatives beyond internal HR practices and integrate them into organizational partnerships and procurement systems. Second, the application of a hybrid approach that combines FDM and FBWM is revealed to be significantly effective in rigorously determining, validating, and ranking critical inclusiveness factors, hence making a major methodological contribution that surpasses conventional qualitative evaluations. This dual-method application offers a more rigorous, transparent, and replicable means of evaluating the relative importance of various drivers of inclusivity, advancing methodological sophistication in diversity research.

It is critical to identify the limitations of this study. First, the study's conclusions are based on expert views, which may be influenced by subjective judgments and biases. Although efforts are made to confirm that varied opinions are included, there may be inherent limitations in the sample selection process. Furthermore, the study's importance on gender inclusivity may overlook other aspects of diversity, such as color and socioeconomic position, all of which play important functions in determining workplace dynamics. Furthermore, the findings' generalizability may be constrained due to the logistics and supply chain industry's distinctive environment and features. Different sectors and organizational circumstances may require specific measures to solve inclusivity concerns; thus, attention should be exercised when extrapolating the study's conclusions to other industries or areas.

Despite these limitations, this study provides a foundation for future research that can improve gender inclusiveness in the logistics and supply chain industry. Future studies could discover additional factors influencing inclusiveness, such as organizational climate, career advancement opportunities, and work-life balance policies. Furthermore, longitudinal studies might follow the usefulness of diversity programs over time, providing information about their long-term effects on organizational performance and employee outcomes. Thus, this study improves the research on workplace diversity and inclusion by offering actionable insights and methodological advances. Prioritizing the characteristics highlighted in this study and implementing focused interventions can assist organizations in developing a more inclusive and equitable work setting that benefits both workers and the industry as a whole. Finally, encouraging gender inclusivity is a strategic condition for organizations planning to succeed in an increasingly varied and competitive environment.

Data Availability Statement

Data will be available on request.

Acknowledgments

Open access publishing facilitated by University of Technology Sydney, as part of the Wiley - University of Technology Sydney agreement via the Council of Australian University Librarians.

References

Agarwal, P. 2020. *Sway: Unravelling Unconscious Bias*. Bloomsbury Publishing.

Amorelli, M. F., and I. M. García-Sánchez. 2023. "Leadership in Heels: Women on Boards and Sustainability in Times of COVID-19." *Corporate Social Responsibility and Environmental Management* 30, no. 4: 1987–2010.

Baltenweck, I., E. A. Ouma, and J. Nagujja. 2022. "Gender-Inclusive Business Models in Livestock Value Chains in Low- and Middle-Income Countries: What Can We Learn From the Literature?" *Frontiers in Sustainability* 3: 958251.

Banwell, J., A. Stirling, and G. Kerr. 2019. "Towards a Process for Advancing Women in Coaching Through Mentorship." *International Journal of Sports Science and Coaching* 14, no. 6: 703–713.

Baron, J., B. Ganglmair, N. Persico, T. Simcoe, and E. Tarantino. 2024. "Representation Is Not Sufficient for Selecting Gender Diversity." *Research Policy* 53, no. 6: 104994.

Beck, M., J. Cadwell, A. Kern, K. Wu, M. Dickerson, and M. Howard. 2022. "Critical Feminist Analysis of STEM Mentoring Programs: A Meta-Synthesis of the Existing Literature." *Gender, Work and Organization* 29, no. 1: 167–187.

Benson, G. E., and N. N. Chau. 2017. "The Selection of a Supply Chain Management Major by Female Students." *Journal of Higher Education Theory and Practice* 17, no. 4: 24–39.

Birindelli, G., A. P. Iannuzzi, and M. Savioli. 2019. "The Impact of Women Leaders on Environmental Performance: Evidence on Gender Diversity in Banks." *Corporate Social Responsibility and Environmental Management* 26, no. 6: 1485–1499.

Bodrožić, Z., and S. Gold. 2024. "Building Diverse, Equitable, and Inclusive Operations and Supply Chains: Bringing Public Policy Back." *Production and Operations Management* 34, no. 4: 837–845.

Bouzon, M., K. Govindan, C. M. T. Rodriguez, and L. M. Campos. 2016. "Identification and Analysis of Reverse Logistics Barriers Using Fuzzy Delphi Method and AHP." *Resources, Conservation and Recycling* 108: 182–197.

Brown, G. D. 2022. "Women Garment Workers Face Huge Inequities in Global Supply Chain Factories Made Worse by Covid-19." *New Solutions: A Journal of Environmental and Occupational Health Policy* 31, no. 2: 113–124.

Casad, B. J., J. E. Franks, C. E. Garasky, et al. 2021. "Gender Inequality in Academia: Problems and Solutions for Women Faculty in STEM." *Journal of Neuroscience Research* 99, no. 1: 13–23.

Chang, P. L., C. W. Hsu, and P. C. Chang. 2011. "Fuzzy Delphi Method for Evaluating Hydrogen Production Technologies." *International Journal of Hydrogen Energy* 36, no. 21: 14172–14179.

Chin, T. A., and H. H. Tat. 2015. "Does Gender Diversity Moderate the Relationship Between Supply Chain Management Practice and Performance in the Electronic Manufacturing Services Industry?" *International Journal of Logistics Research and Applications* 18, no. 1: 35–45.

Clayton, M. J. 1997. "Delphi: A Technique to Harness Expert Opinion for Critical Decision-Making Tasks in Education." *Educational Psychology* 17, no. 4: 373–386.

Cook, A., and C. Glass. 2014. "Women and Top Leadership Positions: Towards an Institutional Analysis." *Gender, Work and Organization* 21, no. 1: 91–103.

Cooper, M. C., T. Esper, H. Stolze, J. Kent, and S. Ma. 2016. "Career Patterns of Women in Logistics: How Are Companies Managing Omni-Channel and Consumer-Driven Supply Chains?" Paper Presented at the Council of Supply Chain Management Professionals Annual Conference, September 25–28, Orlando, FL.

Cravero, C. 2018. "Promoting Supplier Diversity in Public Procurement: A Further Step in Responsible Supply Chain." *European Journal of Sustainable Development Research* 2, no. 1: 08.

Davis-Sramek, B., R. W. Thomas, and B. S. Fugate. 2018. "Integrating Behavioral Decision Theory and Sustainable Supply Chain Management: Prioritizing Economic, Environmental, and Social Dimensions in Carrier Selection." *Journal of Business Logistics* 39, no. 2: 87–100.

Deloitte Consulting. 2020. "Inclusion as the Competitive Advantage the Case for Women in Supply Chain." https://www.deloitte.com/us/en/insights/topics/talent/diversity-in-supply-chain-management.html.

Dennissen, M., Y. Benschop, and M. van Den Brink. 2020. "Rethinking Diversity Management: An Intersectional Analysis of Diversity Networks." *Organization Studies* 41, no. 2: 219–240.

DHL. 2023. "Why Workplace Diversity Is Key to Success." https://www.dhl.com/discover/en-nz/small-business-advice/growing-your-business/workplace-diversity-and-inclusivity.

Dilmaghani, M. 2021. "There Is a Time and a Place for Work: Comparative Evaluation of Flexible Work Arrangements in Canada." *International Journal of Manpower* 42, no. 1: 167–192.

Economic Times. 2023. "Turning the Tide: How Maersk Is Steering Diversity and Shattering Gender Stereotypes in the Marine, Logistics Industry." https://economictimes.indiatimes.com/industry/transportation/shipping-/-transport/turning-the-tide-how-maersk-is-steering-diversity-and-shattering-gender-stereotypes-in-the-marine-logistics-industry/articleshow/99111933.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst.

Evans, K. J., and J. F. Maley. 2021. "Barriers to Women in Senior Leadership: How Unconscious Bias Is Holding Back Australia's Economy." *Asia Pacific Journal of Human Resources* 59, no. 2: 204–226.

FedEx. 2023. "Investing in Inclusion: Women." https://fedexcares.com/sites/default/files/2019-07/FINAL%20-%20Women%20Fact%20Sheet.pdf.

Frisch, K. F., S. Costa, and F. Matos. 2024. "External Return-To-Work Programs Impact on Women Relauching Their Careers." *International Conference on Gender Research* 7, no. 1: 144–151.

George, E. R., C. D. Gibson, R. Sewall, and D. Wofford. 2017. "Recognizing Women's Rights at Work: Health and Women Workers in Global Supply Chains." *Berkeley Journal of International Law* 35: 1.

Graafland, J. 2020. "Women in Management and Sustainable Development of SMEs: Do Relational Environmental Management Instruments Matter?" *Corporate Social Responsibility and Environmental Management* 27, no. 5: 2320–2328.

Green, W. M. 2018. "Employee Resource Groups as Learning Communities." *Equality, Diversity and Inclusion: An International Journal* 37, no. 7: 634–648.

Groeneveld, S., V. Bakker, and E. Schmidt. 2020. "Breaking the Glass Ceiling, but Facing a Glass Cliff? The Role of Organizational Decline in Women's Representation in Leadership Positions in Dutch Civil Service Organizations." *Public Administration* 98, no. 2: 441–464.

Guo, S., and H. Zhao. 2017. "Fuzzy Best-Worst Multi-Criteria Decision-Making Method and Its Applications." *Knowledge-Based Systems* 121: 23–31.

Hall, W., T. Schmader, E. N. Cyr, and H. B. Bergsieker. 2023. "Collectively Constructing Gender-Inclusive Work Cultures in STEM." *European Review of Social Psychology* 34, no. 2: 298–345.

Holmes, J., and M. Marra. 2022. "The Battle Heads Underground: Unrecognised Bias in Everyday Workplace Talk." In *Globalisation, Geopolitics, and Gender in Professional Communication*, 127–148. Routledge.

Hsu, Y. L., C. H. Lee, and V. B. Kreng. 2010. "The Application of Fuzzy Delphi Method and Fuzzy AHP in Lubricant Regenerative Technology Selection." *Expert Systems With Applications* 37, no. 1: 419–425.

IFC. 2018. "Women-Owned Businesses and the Supply Chain." https://commdev.org/wp-content/uploads/pdf/publications/ToolSuite2_Interior_FIN-05-16_LoRes-1.pdf.

Intuit. 2015. "Intuit Again Returnship Program at Intuit." https://www.intuit.com/in/careers/intuit-again/.

Janssens, M., and P. Zanoni. 2021. "Making Diversity Research Matter for Social Change: New Conversations Beyond the Firm." *Organization Theory* 2, no. 2: 26317877211004603.

Kafa, N., S. Ruel, and A. Jaegler. 2023. "Factors Influencing Career Advancement in Supply Chain Management With Gender Perspectives: French Case Study." *International Journal of Logistics Management* 35, no. 5: 1549–1576.

Kini, J. 2022. "Gender-Aware Inclusive Value Chain: A Theoretical Perspective." *Frontiers in Sustainable Food Systems* 6: 1047190.

Kossek, E. E., R. Su, and L. Wu. 2017. "'Opting Out' or 'Pushed Out'? Integrating Perspectives on Women's Career Equality for Gender Inclusion and Interventions." *Journal of Management* 43, no. 1: 228–254.

Kroes, J., A. Land, A. S. Manikas, and F. Klein. 2024. "Gender Diversity and Injustice Among Supply Chain Executives: Exploring Outcomes That Advance Social Justice." *International Journal of Operations & Production Management* 45, no. 3: 677–699.

Kuknor, S. C., and S. Bhattacharya. 2022. "Inclusive Leadership: New Age Leadership to Foster Organizational Inclusion." *European Journal of Training and Development* 46, no. 9: 771–797.

Kumar, S., S. Sarkar, and B. Chahar. 2023. "A Systematic Review of Work-Life Integration and Role of Flexible Work Arrangements." *International Journal of Organizational Analysis* 31, no. 3: 710–736.

Kuzey, C., M. M. C. Fritz, A. Uyar, and A. S. Karaman. 2022. "Board Gender Diversity, CSR Strategy, and Eco-Friendly Initiatives in the Transportation and Logistics Sector." *International Journal of Production Economics* 247: 108436.

Lane, T. B., and L. Id-Deen. 2023. "Nurturing the Capital Within: A Qualitative Investigation of Black Women and Girls in STEM Summer Programs." *Urban Education* 58, no. 6: 1298–1326.

Llorens, A., A. Tzovara, L. Bellier, et al. 2021. "Gender Bias in Academia: A Lifetime Problem That Needs Solutions." *Neuron* 109, no. 13: 2047–2074.

Lorber, J., and S. Farrell. 2020. *The Social Construction of Gender*. Sage Publications.

Luchetti, M., and A. Turrini. 2022. "A New Organizational Challenge for Inclusive Theaters: Who Will Manage the Change?" *TRAlinea: Online Translation Journal* 24: 1.

Matthews, L., S. Gold, and M. C. Schleper. 2024. "Broadening the Scope of Operations and Supply Chain Management Scholarship on Diversity, Equity, and Inclusion: Justice, Paradox, and Dialectical Lenses." *Production and Operations Management* 34, no. 4: 820–828.

Maurelli, M., and A. Mussome. 2020. *Inclusion as the Competitive Advantage. The Case for Women in Supply Chain*. Deloitte Development LLC.

Mishra, S., and C. K. Sahoo. 2025. "Impact of Sustainable Financial Literacy and Digital Financial Inclusion on Women's Sustainable Entrepreneurial Intention." *Corporate Social Responsibility and Environmental Management* 32, no. 3: 4166–4178.

Mukherjee, A. S. 2020. *Leading in the Digital World: How to Foster Creativity, Collaboration, and Inclusivity*. MIT Press.

Muldoon, J., C. Cant, M. Graham, and F. Ustek Spilda. 2023. "The Poverty of Ethical AI: Impact Sourcing and AI Supply Chains." *AI & Society* 40: 1–543.

Ngoasong, M. Z., and A. N. Kimbu. 2019. "Why Hurry? The Slow Process of High Growth in Women-Owned Businesses in a Resource-Scarce Context." *Journal of Small Business Management* 57, no. 1: 40–58.

Nishii, L. H. 2013. "The Benefits of Climate for Inclusion for Gender-Diverse Groups." *Academy of Management Journal* 56, no. 6: 1754–1774.

Nix, N., and D. Stiffler. 2016. "Women in Supply Chain." *Supply Chain Management Review*. https://www.scmr.com/article/women_in_supply_chain.

OECD. 2018. "Bridging the Digital Gender Divide Include, Upskill, Innovate." https://www.enterprise-development.org/bridging-the-digital-gender-divide-include-upskill-innovate-oecd-2018/.

Orser, B., X. Liao, A. L. Riding, Q. Duong, and J. Catimel. 2021. "Gender-Responsive Public Procurement: Strategies to Support Women-Owned Enterprises." *Journal of Public Procurement* 21, no. 3: 260–284.

People Matters. 2024. "Empowering Women in the Supply Chain for Inclusive Growth." https://www.peoplematters.in/article/business/empowering-women-in-the-supply-chain-for-inclusive-growth-40511.

Perry, P., S. Wood, and J. Fernie. 2015. "Corporate Social Responsibility in Garment Sourcing Networks: Factory Management Perspectives on Ethical Trade in Sri Lanka." *Journal of Business Ethics* 130: 737–752.

Pike, K., and B. English. 2022. "And Roses Too: How 'Better Work' Facilitates Gender Empowerment in Global Supply Chains." *Gender, Work and Organization* 29, no. 1: 188–204.

Pless, N., and T. Maak. 2004. "Building an Inclusive Diversity Culture: Principles, Processes and Practice." *Journal of Business Ethics* 54: 129–147.

Prieto-Carrón, M. 2008. "Women Workers, Industrialization, Global Supply Chains and Corporate Codes of Conduct." *Journal of Business Ethics* 83: 5–17.

Primecz, H., and V. Pelyhe. 2023. "Hungary as a Precarious Context for the Lesbian, Gay, Bisexual, and Transgender Community. Interviews With Transgender People." *Gender, Work and Organization* 31, no. 5: 1812–1827.

PWC. 2020. "Transportation & Logistics 2030 Volume 5: Winning the Talent Race." https://www.pwc.com/gx/en/transportation-logistics/pdf/pwc-tl-2030-volume-5.pdf.

Quintana-García, C., C. G. Benavides-Chicón, and M. Marchante-Lara. 2021. "Does a Green Supply Chain Improve Corporate Reputation? Empirical Evidence from European Manufacturing Sectors." *Industrial Marketing Management* 92: 344–353.

Ramirez, P. J., T. A. Narvaez, and E. J. Santos-Ramirez. 2020. "Gender-Inclusive Value Chains: The Case of Seaweed Farming in Zamboanga Peninsula, Philippines." *Gender, Technology and Development* 24, no. 1: 110–130.

Read, D. C., P. J. Fisher, and L. Juran. 2020. "How Do Women Maximize the Value of Mentorship? Insights From Mentees, Mentors, and Industry Professionals." *Leadership and Organization Development Journal* 41, no. 2: 165–175.

Rezaei, J. 2015. "Best-Worst Multi-Criteria Decision-Making Method." *Omega* 53: 49–57.

Robotham, K., and L. Cortina. 2021. "Promoting Respect as a Solution to Workplace Harassment." *Equality, Diversity and Inclusion: An International Journal* 40, no. 4: 410–429.

Ruel, S., M. Fritz, and N. Subramanian. 2020. "Gender Diversity for Sustainability Management: Developing a Research Agenda From a Supply Chain Perspective." *Logistique & Management* 28, no. 3–4: 224–239.

Schneider, J., and N. Northcutt. 2018. "Gender Diversity and Supply Chain Resilience: An Empirical Examination." *Supply Chain Management, an International Journal* 23, no. 6: 447–465.

Shanafelt, T. D., and J. H. Noseworthy. 2017. "Executive Leadership and Physician Well-Being: Nine Organizational Strategies to Promote Engagement and Reduce Burnout." *Mayo Clinic Proceedings* 92, no. 1: 129–146.

Shifrin, N. V., and J. S. Michel. 2022. "Flexible Work Arrangements and Employee Health: A Meta-Analytic Review." *Work & Stress* 36, no. 1: 60–85.

Silva, M. E., and S. Ruel. 2022. "Inclusive Purchasing and Supply Chain Resilience Capabilities: Lessons for Social Sustainability." *Journal of Purchasing and Supply Management* 28, no. 5: 100767.

Smith, S. G., and J. C. Sinkford. 2022. "Gender Equality in the 21st Century: Overcoming Barriers to Women's Leadership in Global Health." *Journal of Dental Education* 86, no. 9: 1144–1173.

Stamarski, C. S., and L. S. Son Hing. 2015. "Gender Inequalities in the Workplace: The Effects of Organizational Structures, Processes, Practices, and Decision Makers' Sexism." *Frontiers in Psychology* 6: 135488.

Stiffler, D., S. Watt, and C. Chumakov. 2020. *Women in Supply Chain Survey Highlights Consumer Value Chain Progress*. Gartner.

Storm, K. I. L., L. K. Reiss, E. A. Guenther, M. Clar-Novak, and S. L. Muhr. 2023. "Unconscious Bias in the HRM Literature: Towards a Critical-Reflexive Approach." *Human Resource Management Review* 33, no. 3: 100969.

Subramanian, L. 2020. "Enabling Health Supply Chains for Improved Well-Being." *Supply Chain Forum: An International Journal* 21, no. 4: 229–236.

Sznajder, K. K., S. D. Harlow, J. Wang, L. Tso, Y. Ashagre, and C. Han. 2022. "Factors Associated With Symptoms of Poor Mental Health Among Women Factory Workers in China's Supply Chain." *International Archives of Occupational and Environmental Health* 95: 1–1219.

Tretiakov, A., J. Bensemann, and T. Jurado. 2023. "Social Outcome Expectations and Women's Intentions to Return to IT Employment." *Australasian Journal of Information Systems* 27: 4111.

Tsai, H. C., A. S. Lee, H. N. Lee, C. N. Chen, and Y. C. Liu. 2020. "An Application of the Fuzzy Delphi Method and Fuzzy AHP on the Discussion of Training Indicators for the Regional Competition, Taiwan National Skills Competition, in the Trade of Joinery." *Sustainability* 12, no. 10: 4290.

Unilever. 2023. "Integrating Gender Equity Across Unilever's Value Chain." https://www.unilever.com/files/fdb74b69-5824-4709-a8cf-84748dfe1c45/unilever-gender-equality-report.pdf.

Vohra, V., S. Singh, and T. Dutta. 2024. "Embracing Flexibility Post-COVID-19: A Systematic Review of Flexible Working Arrangements Using the SCM-TBFO Framework." *Global Journal of Flexible Systems Management* 25, no. 1: 1–26.

Wang, J. Z., G. F. Feng, Z. J. Yin, and C. P. Chang. 2025. "Does Women's Political Participation Promote Green Innovation? Global Evidence." *Corporate Social Responsibility and Environmental Management* 32, no. 2: 1847–1862.

Washington, E. F., D. D. S. Dobson-Smith, S. Rezvani, and S. A. Gordon. 2023. *Inclusion (HBR Emotional Intelligence Series)*. Harvard Business Press.

Wolf, E., and S. Brenning. 2023. "Unlocking the Power of Mentoring: A Comprehensive Guide to Evaluating the Impact of STEM Mentorship Programs for Women." *Social Sciences* 12: 508.

Yang, B., N. Subramanian, and S. Al Harthy. 2024. "Are Gender Diversity Issues a Hidden Problem in Logistics and Supply Chain Management? Building Research Themes Through a Systematic Literature Review." *Journal of Purchasing and Supply Management* 30, no. 5: 100937.

Zinn, W., T. J. Goldsby, and M. C. Cooper. 2018. "Researching the Opportunities and Challenges for Women in Supply Chain." *Journal of Business Logistics* 39: 84–86.

Appendix A

Fuzzy Best Worst Method

The crisp weights, namely the Graded Mean Integration Representation (GMIR) of fuzzy weights of all the factors. The GMIR of a TFN $a_i = (l_j, m_j, u_j)$ represents the ranking of TFNs by the following mathematical formula (Guo and Zhao 2017).

$$R(a_j) = \frac{l_j + 4m_j + u_j}{6} \tag{A1}$$

The consistency of the solution is calculated as follows:

$$\text{Consistency ratio} = \frac{\phi^*}{\text{consistency index}} \tag{A2}$$

The value of a consistency ratio closer to "0" shows more consistency, whereas values closer to 1 show less consistency (Rezaei 2015).

The optimal fuzzy weight for each criterion is the one where, for each fuzzy pair $\widetilde{W}_B / \widetilde{W}_j$ and $\widetilde{W}_j / \widetilde{W}_w$, it should have $\frac{\widetilde{W}_B}{\widetilde{W}_j} = \widetilde{a}_{Bj}$ and $\frac{\widetilde{W}_j}{\widetilde{W}_w} = \widetilde{a}_{jw}$. To satisfy these conditions for all j, it should determine a solution where the maximum absolute gaps $\left| \frac{\widetilde{W}_B}{\widetilde{W}_j} = \widetilde{a}_{Bj} \right|$ and $\left| \frac{\widetilde{W}_j}{\widetilde{W}_w} = \widetilde{a}_{jw} \right|$ for all j are minimized. We use the following constrained optimization problem to determine the optimal fuzzy weights $(\widetilde{w}_1^*, \widetilde{w}_2^*, \ldots, \widetilde{w}_n^*)$.

$$\min \ \max_j \left\{ \left| \frac{\widetilde{W}_B}{\widetilde{W}_j} - \widetilde{a}_{Bj} \right|, \left| \frac{\widetilde{W}_j}{\widetilde{W}_w} - \widetilde{a}_{jw} \right| \right\}$$

Subject to

$$\sum_{j=1}^{n} R\left(\widetilde{W}_j\right) = 1$$

$$l_j^w \le m_j^w \le u_j^w$$

$$l_j^w \ge 0, j = 1, 2 \ldots, n$$

where $\widetilde{w}_B = (l_B^w, m_B^w, u_B^w)$, $\widetilde{w}_j = \left(l_j^w, m_j^w, u_j^w\right)$, $\widetilde{w}_W = (l_w^w, m_w^w, u_w^w)$, $\widetilde{a}_{Bj} = (l_{Bj}, m_{Bj}, u_{Bj})$, and $\widetilde{a}_{jw} = (l_{jw}, m_{jw}, u_{jw})$.

The above constrained optimization problem can be converted to the following nonlinearly constrained optimization problem.

$$\min \widetilde{\xi}$$

Subject to

$$\left| \frac{\widetilde{W}_B}{\widetilde{W}_j} - \widetilde{a}_{Bj} \right| \le \widetilde{\xi}$$

$$\left| \frac{\widetilde{W}_j}{\widetilde{W}_W} - \widetilde{a}_{jW} \right| \le \widetilde{\xi}$$

$$\sum_{j=1}^{n} R\left(\widetilde{W}_j\right) = 1$$

$$l_j^w \le m_j^w \le u_j^w$$

$$l_j^w \ge 0, j = 1, 2 \ldots, n$$

where $\widetilde{\xi} = \left(l_j^w, m_j^w, u_j^w\right)$.

Considering $l_j^w \le m_j^w \le u_j^w$, we assume $\widetilde{\xi} = (k^*, k^*, k^*)$, $k^* \le l^{\xi}$, then the above optimization problem can be transformed to:

$$\min \widetilde{\xi}^*$$

Subject to

$$\left| \frac{(l_B^w, m_B^w, u_B^w)}{\left(l_j^w, m_j^w, u_j^w\right)} - (l_{Bj}, m_{Bj}, u_{Bj}) \right| \le (k^*, k^*, k^*)$$

$$\left| \frac{\left(l_j^w, m_j^w, u_j^w\right)}{(l_W^w, m_W^w, u_W^w)} - (l_{jw}, m_{jw}, u_{jw}) \right| \le (k^*, k^*, k^*)$$

$$\sum_{j=1}^{n} R\left(\widetilde{W}_j\right) = 1$$

$$l_j^w \le m_j^w \le u_j^w$$

$$l_j^w \ge 0, j = 1, 2 \ldots, n$$

By solving this problem, we obtain the optimal fuzzy weights.

Appendix B

Questionnaire for Refining the Factors Using FDM

Dear Expert,

Thank you for participating in this Fuzzy Delphi study aimed at assessing the importance of various factors for creating an inclusive workforce for women in the logistics and supply chain industry. Your expertise and insights are invaluable to this research. Please rate the importance of each factor listed below using the provided linguistic terms and corresponding triangular fuzzy numbers in Table B1.

Instructions

- Please rate each factor based on its importance for creating an inclusive workforce for women in the logistics and supply chain industry.
- Use the provided linguistic terms and corresponding triangular fuzzy numbers to express your judgment.
- Consider the potential impact of each factor on fostering diversity, gender equality, and inclusion in the industry.
- Your responses will be kept confidential and anonymized for analysis.

TABLE B1 | Rating for inclusive workforce factors.

Notation	Name of factors	Very likely (EI)	Somewhat likely (I)	Neutral (MI)	Somewhat unlikely (LI)	Very unlikely (NI)
IWF1	Safe and respectful workplace					
IWF2	Network of supportive employee resource groups					
IWF3	Catering to unconscious bias					
IWF4	Cross-functional training programs					
IWF5	Workplace diversity training					
IWF6	Gender-inclusive policies					
IWF7	Inclusive recruitment practices					
IWF8	Initiatives for return-to-work programs					
IWF9	STEM outreach programs					
IWF10	Transparent promotion criteria					
IWF11	Representation of women in leadership positions					
IWF12	Programs for mentorship of women					
IWF13	Skill development workshops					
IWF 14	Education toward allied areas of supply chain					
IWF15	Executive coaching					
IWF16	Flexible work arrangements					
IWF17	On-site facilities					
IWF18	Health and wellness programs					
IWF19	Assimilation of work-life integration policies for women					
IWF20	Inclusive communication					
IWF21	Supporting women-owned businesses					
IWF22	Gender-inclusive supply chain practices					
IWF23	Ethical and fair sourcing					
IWF24	Awareness and advocacy					
IWF25	Capacity building and support					

Appendix C

Questionnaire for the Prioritization Using the FBWM

This questionnaire aims to collect data to understand the importance of factors in creating an inclusive workforce for women in the logistics and supply chain industry. We will employ the Fuzzy Best Worst Method (FBWM). Please select the most and least important factors among the given factors. Then, provide ratings for the importance of the best factor compared to each of the other factors and the importance of each factor compared to the worst factor.

Notations and Factors

Employee growth and culture factors (*EGC*).

Safe and respectful workplace (EG1).

Catering to unconscious bias (EG2).

Workplace diversity training (EG3).

Representation of women in leadership positions (EG4).

Programs for mentorship of women (EG5).

Inclusive business ecosystem factors (*IBE*).

Gender-inclusive policies (IB1).

Initiatives for return-to-work programs (IB2).

STEM outreach programs (IB3).

Flexible work arrangements (IB4).

On-site facilities (IB5).

Supporting women-owned businesses (IB6).

Gender-inclusive supply chain practices (IB7).

Accessibility and diversity factors (*ADF*).

Cross-functional training programs (AD1).

Skill development workshops (AD2).

Executive coaching (AD3).

Health and wellness programs (AD4).

Inclusive communication (AD5).

Capacity building and support (AD6).

Pairwise Comparisons for Main Categories

Step 1: Identifying the best and worst categories of factors.

i. Which category do you think is the most crucial (best) for creating an inclusive workforce for women in the logistics and supply chain industry?

   [ ] EGC

   [ ] IBE

   [ ] ADF

ii. Which category do you think is the least crucial (worst) for creating an inclusive workforce for women in the logistics and supply chain industry?

   [ ] EGC

   [ ] IBE

   [ ] ADF

Step 2: Pairwise comparisons.

Assume you selected "*X*" as the most crucial category. Kindly rate the importance of "*X*" compared to each of the other categories in Table C1.

Assume you selected "*Y*" as the least crucial category. Kindly rate the importance of each category compared to "*Y*" in Table C2.

Pairwise Comparisons for EGC Factors

Step 1: Identifying the best and worst factors.

i. Which factor do you think is the most crucial (best) for creating employee growth and culture for women in the logistics and supply chain industry?

   [ ] EG1

   [ ] EG2

   [ ] EG3

   [ ] EG4

   [ ] EG5

ii. Which factor do you think is the least crucial (worst) for creating employee growth and culture for women in the logistics and supply chain industry?

   [ ] EG1

   [ ] EG2

   [ ] EG3

   [ ] EG4

   [ ] EG5

Step 2: Pairwise comparisons.

Assume you selected "*X*" as the most crucial factor. Kindly rate the importance of "*X*" compared to each of the other factors in Table C3.

Assume you selected "*Y*" as the least crucial factor. Kindly rate the importance of each factor compared to "*Y*" in Table C4.

Pairwise Comparisons for IBE Factors

Step 1: Identifying the best and worst factors.

i. Which factor do you think is the most crucial (best) for inclusive business ecosystem factors for women in the logistics and supply chain industry?

   [ ] IB1

   [ ] IB2

TABLE C1 | Pairwise comparisons for best-to-others for main categories.

	Equally important (EI)	Weakly important (WI)	Fairly important (FI)	Very important (VI)	Absolutely important (AI)
X vs. EGC					
X vs. IBE					
X vs. ADF					

TABLE C2 | Pairwise comparisons for others-to-worst for main categories.

	EI	WI	FI	VI	AI
EGC vs. *Y*					
IBE vs. *Y*					
ADF vs. *Y*					

TABLE C3 | Pairwise comparisons for best-to-others for EGC factors.

	EI	WI	FI	VI	AI
X vs. EG1					
X vs. EG2					
X vs. EG3					
X vs. EG4					
X vs. EG5					

TABLE C4 | Pairwise comparisons for others-to-worst for EGC factors.

	EI	WI	FI	VI	AI
EG1 vs. *Y*					
EG2 vs. *Y*					
EG3 vs. *Y*					
EG4 vs. *Y*					
EG5 vs. *Y*					

[ ] IB3

[ ] IB4

[ ] IB5

[ ] IB6

[ ] IB7

ii. Which factor do you think is the least crucial (worst) for inclusive business ecosystem factors for women in the logistics and supply chain industry?

[ ] IB1

[ ] IB2

[ ] IB3

[ ] IB4

[ ] IB5

[ ] IB6

[ ] IB7

Step 2: Pairwise comparisons.

Assume you selected "*X*" as the most crucial factor. Kindly rate the importance of "*X*" compared to each of the other factors in Table C5.

Assume you selected "*Y*" as the least crucial factor. Kindly rate the importance of each factor compared to "*Y*" in Table C6.

TABLE C5 | Pairwise comparisons for best-to-others for IBE factors.

	EI	WI	FI	VI	AI
X vs. IB1					
X vs. IB2					
X vs. IB3					
X vs. IB4					
X vs. IB5					
X vs. IB6					
X vs. IB7					

TABLE C6 | Pairwise comparisons for others-to-worst for IBE factors.

	EI	WI	FI	VI	AI
IB1 vs. *Y*					
IB2 vs. *Y*					
IB3 vs. *Y*					
IB4 vs. *Y*					
IB5 vs. *Y*					
IB6 vs. *Y*					
IB7 vs. *Y*					

Pairwise Comparisons for ADF Factors

Step 1: Identifying the best and worst factors.

i. Which factor do you think is the most crucial (best) for accessibility and diversity

for women in the logistics and supply chain industry?

[ ] AD1

[ ] AD2

[ ] AD3

[ ] AD4

[ ] AD5

[ ] AD6

ii. Which factor do you think is the least crucial (worst) for accessibility and diversity for women in the logistics and supply chain industry?

[ ] AD1

[ ] AD2

[ ] AD3

[ ] AD4

[ ] AD5

[ ] AD6

Step 2: Pairwise comparisons.

Assume you selected "*X*" as the most crucial factor. Kindly rate the importance of "*X*" compared to each of the other factors in Table C7.

Assume you selected "*Y*" as the least crucial factor. Kindly rate the importance of each factor compared to "*Y*" in Table C8.

TABLE C7 | Pairwise comparisons for best-to-others for ADF factors.

	EI	WI	FI	VI	AI
X vs. AD1					
X vs. AD2					
X vs. AD3					
X vs. AD4					
X vs. AD5					
X vs. AD6					

TABLE C8 | Pairwise comparisons for others-to-worst for ADF factors.

	EI	WI	FI	VI	AI
AD1 vs. *Y*					
AD2 vs. *Y*					
AD3 vs. *Y*					
AD4 vs. *Y*					
AD5 vs. *Y*					
AD6 vs. *Y*					

Thank you for your participation.