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RESEARCH ARTICLE

Barriers to women's participation and contribution in the process manufacturing industry: Managerial insights from multiple case studies in an emerging economy

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Abstract
This study examines multilevel barriers to women's participation and contribution to the process manufacturing industry in an emerging economy. We employed an exploratory multiple-case study approach, and 24 semi-structured interviews were conducted with senior corporate managers. Drawing on the behavioral reasoning theory, intellectual capital-based view, and institutional theory-based view, the findings highlighted several individual, organizational, sociocultural, infrastructure, and institutional barriers at micro, meso, and macro levels that inhibited female participation in the manufacturing sector. This study is one of the early empirical investigations to examine the obstacles hindering women's contributions to the process manufacturing industry in an emerging country, applying three theoretical lenses – behavioral reasoning theory, intellectual capital-based view, and institutional theory-based view. Furthermore, the insights gained from the study contribute to the literature on diversity, equity, and inclusion in the operations management domain by developing a multilevel integrative model of barriers to women's participation in the manufacturing sector.

Keywords: women's participation; barriers; operations management; diversity; social sustainability

Introduction

Debates on gender diversity in operations and supply chains date back to the early seventies (1970s) (Lynagh & Poist, 1975) when antidiscrimination laws, such as the Civil Rights Act of 1964, were passed in the United States of America (Yang, Subramanian & Al Harthy, 2024). This act prohibited employment discrimination based on race, color, sex, or ethnicity and paved the way for subsequent protections and policies promoting gender diversity and inclusion. Similarly, the International Conference on Population and Development in Cairo (1994) recognized gender inclusivity as essential for global sustainable development and social progress (Villano et al., 2024). In recent years, frameworks such as the United Nations sustainable development goals have further emphasized the need to explicitly address gender related issues in organizations and their supply chain operations. Alongside these efforts, stakeholders, including consumers, governments, brands, and nongovernment organizations, are increasingly pressuring firms to adopt ethical and inclusive practices (Denu et al., 2023). Responding to these pressures, several multinational corporations, including L'Oreal, Henkel, Microsoft, Schneider Electric, and Unilever, joined international initiatives such as Business

for Inclusive Growth to foster inclusive working environments and promote social sustainability (Silva et al., 2023).

Despite widespread recognition of human capital as a key source of intellectual capital and competitive advantage (MacDuffie, 1995), operations management (OM) scholars and practitioners continue to treat it as a means of achieving efficiency, productivity, and performance. Consequently, gender-related issues are often approached casually and only treated second to the economic performance (Cao, Pil & Lawson, 2023; Yang et al., 2024; Zinn et al., 2018). This reductionist approach is problematic as it operationalizes gender diversity within business-case logic. Further, gender remains marginally integrated as a unit of analysis in OM research. This often leads to overlooking the contribution of women in production processes and conveniently leaves them out of the decision-making processes and upward mobility within the organization (Andrade et al., 2021; Stephens et al., 2024). Therefore, there is a need to recognize the criticality of addressing gender issues in OM because it is identified in the literature that the women employees can be a source of intellectual capital in the operations process and could serve as a starting point in building resilient and sustainable supply chains (Kumar & Paraskevas, 2018; Meinzen-Dick et al., 2014).

From a supply chain perspective, it is imperative to move beyond the logic of the business case for the organizations to address the underlying systemic exploitation and precarity that women face, especially in emerging economies (Barrientos, 2019; LeBaron, 2021). The global labor report estimates that 25 million people are forced labor, of which women constitute nearly 59% particularly in supplier networks of large multinational corporations operating in emerging economies (Paiva et al., 2020). This persistent exploitation of the women workforce, especially in production sectors such as agriculture, garments, and textiles, is not merely because of the regulatory loopholes but also due to the neglect of practitioners and researchers of OM and supply chain management (SCM). The OM field has seldom explored how gender inequalities are reproduced through operational logics and various organizational practices. For instance, in the processing and manufacturing industries, where female participation is high but mostly informal and unrecognized, the response of organizations to gender disparity and workplace discrimination has been slow and inadequate (Fröhlich, 2022; Rustagi, Nathan, Datta & George, 2013).

The above issues underscore the importance of examining the role of women's participation in OM within complex supply chains. Several scholars have called for investigations into contemporary challenges that hinder women's participation in production operations in the manufacturing sector, to address gender detachment and inequity (Gold, Trautrims & Trodd, 2015; LeBaron, 2021; LeBaron & Gore, 2020). Within manufacturing, the process industries are unique due to their critical characteristics, including continuous and complex operations, multiple tiers, and long durations (Farrukh, Mathrani & Sajjad, 2022, 2023a). Despite the significant contribution of the women's workforce in the global supply chain of the process industry (e.g., textile) and organizations' efforts to promote gender diversity (Andrade et al., 2021; Panda, 2017; Pham & Jinjarak, 2022), only a few studies examined the factors (micro, meso, and macro) impeding women's growth and career development in the manufacturing environment (e.g., El Wali, Golroudbary & Kraslawski, 2021), providing fragmented and partial insights. Existing studies mainly examine macro-level inhibitors, such as sociocultural barriers, while ignoring micro- and meso-level factors that critically shape women's participation in manufacturing operations and supply chains (Naguib, 2022).

Therefore, a holistic view and multilevel perspective on barriers to women's contributions to manufacturing operations is essential for advancing understanding of gender diversity and social sustainability issues in operations and supply chains (Naguib, 2022). Building on these arguments, this study explores the factors that inhibit women's participation and their holistic contribution from a manager's perspective within firms operating in the process manufacturing industry in an emerging economy context. We primarily considered managerial perspectives due to their significant role in strategy formulation and implementation and their decision-making role in issues related to OM and stakeholder engagement. Therefore, this study addresses the following research question.

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RQ: What micro-, meso-, and macro-level factors inhibit women's participation and contribution in the process manufacturing industry, and how do managers perceive these challenges in an emerging economy context?

To this end, we employed a multiple-case study approach, focusing on Pakistan's packaging, fertilizer, leather, and textile sectors. We conducted 24 semi-structured interviews with the senior corporate managers to gain fresh insights into the barriers to women's participation. Based on our analysis of the findings, we develop a multilevel, integrative model that encompasses various micro-, macro-, and meso-level barriers. In addition, the study uses organizational theories such as behavioral reasoning theory (BRT), intellectual capital-based view (ICBV), and institutional theory-based view (ITBV) since there is a lack of theory-based approach and application of organizational theories to understand and examine the diverse challenges hindering women's participation and contribution to OM (Yang et al., 2024). From a practical viewpoint, the findings can aid manufacturing organizations in developing economies, realizing the challenges faced by the women's workforce, and adopting suitable strategies to improve their social sustainability performance by advocating for gender equity and diversity. Furthermore, decision-makers and policymakers can utilize the findings in developing, implementing, and monitoring adequate policies and frameworks to address the obstacles hindering women's participation in manufacturing operations in the global supply chain and production networks.

Theoretical background and literature review

As a starting point to provide a critical argumentation and overview of the topic, we conducted a systematic literature review (SLR) to identify and analyze the factors hindering women's participation in the process manufacturing sector. SLR employs well-defined, credible, and rigorous criteria to assess and synthesize the literature (Thomé, Scavarda & Scavarda, 2016), and is considered a transparent, valid, reliable, and comprehensive methodology to extend existing knowledge in a specific subject domain (Petticrew & Roberts, 2008; Tranfield et al., 2003). A set of keywords was identified (Table A1) and used to search the articles in the SCOPUS database using the Boolean operators AND and OR. The SCOPUS database is considered the most extensive database, including peer-reviewed journal articles, conference proceedings, and books, providing us with the most comprehensive literature relevant to the topic of the study (Aksnes et al., 2019). However, we selected only peer-reviewed journal articles published in the English language and excluded proceedings and textbook chapters to ensure the rigor and validity of the research process (Farrukh et al., 2020). Figure 1 presents the PRISMA flow chart highlighting the filtration procedure of the selected studies. Only those articles where the discussion was centered around gender issues in OM were considered. Initially, the abstract and keywords were scanned to select articles relevant to the topic, and this was followed by a thorough reading of the entire article to ensure that only those articles were selected that had rigorous discussion at the intersection of gender and OM/SCM. Finally, a detailed content analysis of the selected articles was carried out to extract key findings, debates, and argumentation related to the topic. Below, we provide a critical discussion of the findings of the review.

Barriers hindering women's participation and contribution

The SLR revealed various barriers that hinder women's participation and contribution to the manufacturing OM and SCM. These barriers are classified into individual, organizational, sociocultural, and infrastructural and institutional issues at the micro, meso, and macro levels. At the micro level, these barriers are related to women's individual-level constraints, including psychological and behavioral characteristics. One obstacle that is frequently identified in the literature is the 'self-efficiency' that refers to a 'lack of belief in one's own capacity to achieve goals' (Sachdeva, Bharti & Badhotiya, 2022, p. 2). Women with such beliefs are more likely to give up specific tasks and fail, hindering their professional development, enrolment, and growth in organizations (Germain, Herzog &

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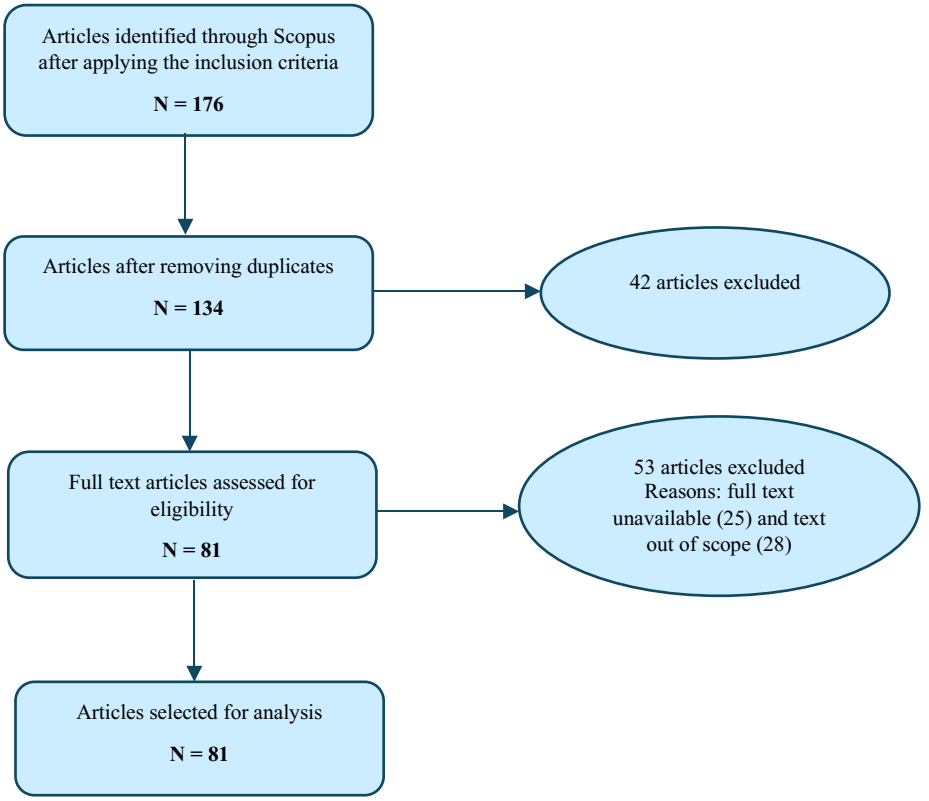

Figure 1. Filtering procedure of article selection.

Hamilton, 2012). Gupta and Kiran (2023) emphasized that women with low self-confidence may tend to miss out on potential opportunities in the workplace even when they are available. Schiffer et al. (2022), examining women in the energy sector, found that female energy brokers in male-dominated environments often comprise minority positions and compromise their comfort level. These individual-level barriers are not merely personal traits and are not stand-alone, but are often a result of the social construction of the organizational practices and expectations from women as a gender (Ma, Hao & Aloysius, 2021). Next, we address meso-level organizational barriers where the interaction between organizational and societal factors becomes more pronounced.

At the meso (organizational) level, women's participation in OM is hindered by challenges such as the 'glass ceiling', which limits women's access to senior management and decision-making roles (Yang et al., 2024). While studying the Malaysian agriculture sector, Souissi et al. (2024) revealed that limited opportunities and exclusion from community group participation are deeply embedded, impacting women's mobility toward higher leadership echelons in the organization. Ruel and Fritz (2021) also emphasized that uneven promotion practices hinder women's progression in the OM domain. Previous research has also highlighted that gender diversity and increasing female representation in manufacturing can enhance organizational innovation and research, sustainability outcomes, and operational performance (Meinzen-Dick et al., 2014; Kumar & Paraskevas, 2018). However, Körber and Cotta (2021) question whether gender diversity in roles such as supply chain managers genuinely manages complex issues like product recalls, or whether it merely reproduces

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dominant operational logics under the guise of inclusivity. Therefore, it must be seen if the participation of women employees in the OM domain remains at the representation level or if it changes the existing gender discrimination in the organizations.

The literature also highlighted occupational health and safety hazards linked with the organizational barriers hindering women's participation in complex operations and supply chains in different industries such as mining, construction, phosphorus, chemical, transportation, and textile sectors (El Wali et al., 2021; Yadav & Gahlot, 2022). For example, a study conducted in the phosphorus industry identified significant health and safety concerns for female workers due to the high exposure to chemicals and toxic waste in the water treatment process, resulting in diseases such as cancer and fetal harm (El Wali et al., 2021). Besides, women working in low-wage production activities in the manufacturing sector often face various types of harassment, such as physical, sexual, mental, and emotional threats and retaliation (Fröhlich, 2022; Wils, 2010). Literature also revealed that although globalization has increased flexible employment practices in the workplace, it has worsened labor conditions for female employees, such as a lack of job security and lower wages (Prieto-Carrón, 2008). These meso-level organizational barriers collectively underscore that gender disparity is deeply rooted within manufacturing and operations (Keller, Joshi, Joshi, Goldmann & Riar, 2024).

At the macro level, women's participation is hindered by sociocultural norms, infrastructural deficits, and institutional shortcomings. One significant barrier is the patriarchal norms and stereotypes that shape the perception of women's capabilities and roles, contributing to existing inequities and making women's access to different life domains complicated (Ma et al., 2021). Misconceptions about women's roles in various industries limit their opportunities and professional growth. As such, a study highlighted that the number of female truck drivers is surprisingly low in the trucking industry, indicating the misconception that male drivers drive better and are more suited to this sector, leading to negative impacts such as increasing scarcity of truck drivers, restricting innovation, and creating an unfriendly environment for women (Scott & Davis-Sramek, 2023).

The ideological perceptions of society enforce gendered divisions of labor and limit women's participation in organizations and their access to and control over resources (Schiffer et al., 2022). A study investigated women's contribution in the supply chain of energy-access technology and highlighted that women face patriarchal challenges leading to structural exclusion from decision-making processes, inhibiting their access and ownership to various energy technologies and infrastructure (Orlando et al., 2018; Schiffer et al., 2022). Further, lower levels of education, early marriage, and family obligations inhibit female participation in organizations (Azima & Mundler, 2022; Gupta & Kiran, 2023). Women struggle to balance work and family responsibilities; however, cultural and traditional norms often influence their contributions (Etim, 2020). In this regard, a study by Fernández et al. (2024, p. 6) highlighted the 'macho behavior of the men' leading to unequal load sharing of household work as a key problem faced by females working in the aquaculture industry, where women also manage the household tasks and deal with their work responsibilities. Accordingly, women sometimes lack time or opportunity for professional development due to the responsibility of raising children and caring for their families, despite an interest and motivation for their growth and professional development (Gupta & Kiran, 2023).

The extant literature revealed infrastructural and institutional barriers linked with the macro level. A study conducted in the agriculture industry in Nepal highlighted a lack of infrastructure, such as transportation facilities, mobility issues, and distance to markets, posing significant challenges for female farmers in selling agricultural products (Kjeldsberg et al., 2018). In addition, existing studies highlighted a lack of organizational and institutional policies hindering women's participation in the OM domain. For example, a study conducted in the cotton-farming sector in India highlighted inadequate supportive policies and frameworks regarding women's contribution to agricultural decision-making, equality in crop diversification, and equitable distribution of landholding rights as key barriers (Keller et al., 2024). Additionally, women's work is often undervalued, unseen, and either underpaid or entirely unpaid in various industries, such as agriculture, textile, and aquaculture, which could be attributed to a lack of institutional policies, monitoring, and regulatory

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frameworks (Andrade et al., 2021; Fernández et al., 2024; Zafarullah & Nawaz, 2019). For example, a study in Bangladesh highlighted discrimination regarding the wages paid to women in the readymade garment industry, where female employees were paid irregularly and forced to work overtime and even on holidays to meet production targets (Zafarullah & Nawaz, 2019). Therefore, the above-mentioned macro-level barriers underscore how gender inequality links into cultural norms and institutional infrastructure, inhibiting women's contribution to supply chains.

Research gaps

An in-depth review of selected studies from the SLR revealed the following research gaps.

- Prior studies mainly investigated women's participation and contribution in the agriculture, aquaculture, and food industries, ignoring the other manufacturing sectors. As such, the SLR results highlighted that around 60% of studies were conducted in the agriculture sector (Okoye et al., 2023; Shahbaz et al., 2022; Timsina et al., 2023) followed by 15% studies in the aquaculture and fishing industry (Adam, Sufian & Njogu, 2023; Farnworth et al., 2024; Fernández et al., 2024; Sultana et al., 2023) and 5% energy and livestock sector studies each (Mininni & Transition, 2024; Nagasha et al., 2024; Wijers, 2019). Overall, the SLR findings demonstrated that less than 1% of studies focused on the complex global supply chain in a process manufacturing context, such as in the textile and garment industries (e.g., Gauderman, 2010; Zafarullah & Nawaz, 2019). Nevertheless, manufacturing industries in emerging economies are powerful growth engines and essential entities that link local and global supply chains (Aftab et al., 2023). The extant literature ignores the issues of gender diversity and women's participation in the manufacturing sector in developing economies, which is evolving due to the changing global production regimes and a gradual shift of working conditions in developing economies (Barrientos, 2014; Denu et al., 2023). Therefore, understanding barriers to women's participation in the manufacturing industry is crucial in fostering gender equity and improving economic status and women's empowerment.

- Most studies were conducted in developing economies such as Ethiopia, Nepal, India, Nigeria, South Africa, Indonesia, Bangladesh, Iran, Vietnam, Ghana, Kenya, and Mali (e.g., Adam et al., 2023; Adam & Shackleton, 2016; Farnworth et al., 2024; Keller et al., 2024; Wijers, 2019). Notwithstanding, to the best of our knowledge, none of the existing studies investigated the challenges regarding women's participation and contribution to Pakistan's manufacturing industry. Global Gender Gap Report (2024) notes that Pakistan is ranked 145 out of 146 nations on the gender parity index, and the country also holds the lowest position (7th rank) among South Asian countries (World Economic Forum, 2024). These findings provide convincing evidence that gender exclusion has intensified to a deeply concerning level, and therefore, it is imperative to examine barriers to women's participation and contribution in the Pakistani process manufacturing industry context (Aftab et al., 2023). As such, the manufacturing sector is a key driver of Pakistan's economic development, contributing approximately 13–14% of the country's gross domestic product and providing around 14% of employment opportunities (Aftab et al., 2023). Various manufacturing industries, including packaging, textile, pharmaceutical, leather, and Fast-Moving Consumer Goods, significantly contribute to Pakistan's economic and industrial growth (ITA, 2024; Ohly et al., 2023). Nevertheless, women's participation in Pakistan's industrial sectors, such as textile, is lower than the male contribution compared to other countries such as India and Bangladesh (Fontana, Atif & Sarwar, 2024; Shafi, Devadason & Govindaraju, 2024), which suggests an investigation into the factors impeding their engagement in the manufacturing industry.

- While female workers comprise a significant proportion of the global supply chain workforce, they are often disproportionately vulnerable to severe labor exploitation (LeBaron & Gore, 2020). It should be emphasized that the existing literature on modern slavery in supply chains does not explicitly address gender diversity issues (Paiva et al., 2020).

- Application of theoretical lenses is critical as it allows for a deeper understanding of the structural, cultural, and institutional factors that shape women's participation in manufacturing and supply

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chains. Further, applying theoretical lenses allows the researchers to go beyond surface-level observations (McAdam & Hazlett, 2010) and critically analyze gender disparities, power dynamics, and the shaping of gender norms in organizational practices. Few studies so far have applied theoretical lenses such as social justice and fairness theory, feminist theory, human capital theory, and stakeholder theory (Kroes et al., 2024; Naguib, 2022) to discuss and understand gender roles, their contribution and influence on supply chains concerning macro-level factors, such as sociocultural challenges inhibiting women's participation and contribution in OM (Fernández et al., 2024; Schiffer et al., 2022). However, limited studies have explored the barriers at the micro and meso levels, i.e., at the individual and organizational levels (Naguib, 2022) that inhibit women's participation. Scholars have also highlighted the lack of studies on the behavioral and people dimension in OM and SCM (Storey et al., 2006). Therefore, using the research gaps identified above as the starting point, we apply multiple theoretical lenses to provide a more balanced and holistic understanding of gender roles and women's participation in the Pakistani manufacturing industry. Below, we provide a detailed explanation of theoretical lenses and their relevance to the study.

Theoretical lens

The current study employs multiple organizational theories, including BRT, ICBV, and ITBV, to understand the multidimensional barriers at the micro, meso, and macro levels that inhibit female participation, which are difficult to comprehend using a single organizational theory. Each theory offers a unique perspective and helps provide a comprehensive understanding of the concept of 'gender role' in OM. Hence, relying on a single theory may lead to bias and not fully explore diverse barriers at different levels. Exploring gender-related topics that transcend different sociocultural, infrastructural, individual, and organizational factors requires a broader, contextual, and interdisciplinary approach, which can be effectively covered by applying multiple theories. For example, BRT can help in understanding the importance of individual behavior such as self-efficacy, reasoning, and the motivations behind the career choices. Since exploring micro-level barriers is associated with a wide range of individual attributes, values, and perceptions, it is more feasible to apply BRT (Bendoly et al., 2006). Similarly, for a thorough understanding of meso-level barriers, mainly at the organizational level, applying ICBV is more suitable since it focuses on firms' policies, procedures, cultures, and facilities and provides a better explanation about the human and structural capital within organizations. Similarly, the application of ITBV helps unravel the barriers at the macro level, where individual, institutional, and broader societal aspects are involved (Bruton, Ahlstrom & Li, 2010; Dhir, Koshta, Goyal, Sakashita & Almotairi, 2021). Further, it examines how institutional pressures (e.g., regulation, global standards) shape gender roles and access in OM contexts and links it to organizational practices that might lead to mimetic, coercive, and normative isomorphism across the firms (Croson et al., 2013). The complementarity between these theories is that BRT highlights internal motivations and barriers at the micro level, and ICBV connects individual capabilities to the meso level by examining how women's contributions are leveraged as value to the organization. Similarly, ITBV by diving deep into the institutional norms and policies explains how organizational strategies through institutionalization impact the women's participation in operations and supply chains. While each theoretical lens is distinct, they offer a multilevel framework (micro, meso, and macro) and provide a holistic understanding of gender disparities in organizations by linking individual behavior, organizational practices, and institutional contexts. Below, a detailed explanation of the individual theories is provided.

The BRT is a theoretical framework that facilitates examining the context-specific reasons of individuals behind their actions (Dhir et al., 2021; Sahu, Padhy & Dhir, 2020; Westaby, 2005), building on attitudes, behavioral intentions, reasons, and values. Behavioral intentions are recognized as the tendency of an individual to participate in an action or activity (Kim, Lee, Petrick, Hahn & Marketing, 2018). On the other hand, attitude refers to the degree of assessment of the positive or negative outcome of the behavior of individuals that results in their engagement or nonengagement

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(Sahu et al., 2020). Further, reasons are identified as the significant predictors of individuals' behavior and context-specific factors (either facilitators or inhibitors) that understand and justify their actions and intentions while participating in a task or activity (Claudy, Garcia & O'Driscoll, 2015; Sahu et al., 2020; Westaby, Probst & Lee, 2010). Similarly, values play a significant role in shaping individuals' decision-making that could influence their personal and professional lives (Dreezens, Martijn, Tenbült, Kok & De Vries, 2005). In addition, values can be understood as 'abstract cognitions that provide a way for life' (Dhir et al., 2021, p. 3). In the predominantly male-dominated field of OM, understanding the perceptions, reasons, attitudes, and motivations that impact women's participation is crucial for fostering a more inclusive and equitable environment (Westaby, 2005).

The ICBV highlights the significance of an organization's intangible resources in achieving a competitive advantage and sustainable development (Tze San, Latif & Di Vaio, 2022). Prior studies classify structural capital as one of the salient dimensions of the ICBV (Chen, 2007; Edvinsson & Malone, 1997; Roos & Roos, 1997) that refers to an organization's culture, leadership, systems, infrastructure, processes, procedures, policies, and traditions that are embedded in an organization to support human capital and motivate employees (Farrukh, Mathrani & Sajjad, 2023b; Tze San et al., 2022; Yusoff, Omar, Kamarul Zaman & Samad, 2019). Previous studies have revealed that organizational factors significantly prevent women's participation in the OM (Sachdeva et al., 2022). For example, women may not feel encouraged to participate in the OM field if organizations are entrenched in traditional gender stereotypes, when leadership is biased against women, or if the firm does not provide a supportive work environment. Therefore, utilizing the ICBV's structural capital can help understand the meso-level challenges, including organizations' infrastructure, culture, leadership support, policies, resources, processes, facilities, and systems (Githaiga, Soi & Buigut, 2022).

The ITBV perspective focuses on the formal and informal forces, including regulative and normative factors that significantly affect women's participation and contribution (Bruton et al., 2010; Naguib & Jamali, 2015). The formal pressures include coercive isomorphisms from regulatory authorities and policymakers, such as laws, regulations, and policies. Isomorphic pressures originate from sector-based policies that become routinized and adapted by individual organizations over time. In contrast, informal pressures encompass normative factors related to societal and cultural issues (Naguib, 2022). The literature review emphasized various sociocultural challenges (such as stereotypes and family pressure) (Fernández et al., 2024; Ma et al., 2021; Scott & Davis-Sramek, 2023) and infrastructural and institutional barriers (such as lack of supportive policies and frameworks, inadequate transportation network, and mobility issues) as potential barriers for women's participation (Fröhlich, 2022; Keller et al., 2024; Kjeldsberg et al., 2018). Therefore, incorporating ITBV can help analyze the macro-level challenges hindering women's participation in manufacturing industries.

Research methodology

This study employs an exploratory multiple-case study design to investigate the barriers inhibiting women's participation and contribution to manufacturing organizations in a developing economy context. The rationale behind selecting the multiple-case approach is that it facilitates theory-building efforts, develops in-depth knowledge in a subject domain, and achieves generalizability of the research outcomes compared to a single case study design (Eisenhardt & Graebner, 2007; Yin, 2018). In addition, multiple case studies help understand the differences and similarities across the cases and increase the robustness of the findings by replicating the patterns emerging from the data (Yin, 2018). We considered a qualitative approach to contribute to the emerging literature discussing engagement and participation-related obstacles women face in the process manufacturing industry.

Furthermore, 24 semi-structured interviews were conducted with senior corporate managers from the textile, packaging, leather, and fertilizer industries to gain in-depth insights into women's issues in manufacturing organizations (Table 1). The rationale for selecting cases from diverse industrial sectors is to achieve analytical generalization and extend the study findings to other industries with complex supply chain operations, facing similar social sustainability issues, particularly related to

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Table 1. Details of case companies and participants in the manufacturing sector

Sector	Case companies	Participants	Years of experience	Position	Interview duration (minutes)
Textile	TA	TA-1	4	Production manager	63
		TA-2	7	Deputy HR manager	66
		TA-3	10	Senior HR manager	50
	TB	TB-1	13	Sustainability manager	74
		TB-2	3	HR manager	52
		TB-3	18	Head of compliance	47
Packaging	PA	PA-1	21	Supply chain manager	71
		PA-2	6	Health, safety, and environmental manager	51
		PA-3	7	Senior HR manager	65
	PB	PB-1	3	Production engineer	71
		PB-2	5.5	HR manager	40
		PB-3	11	Compliance manager	72
Leather	LA	LA-1	10	HR manager	65
		LA-2	8	Production manager	54
		LA-3	12	Senior HR manager	62
	LB	LB-1	9	Compliance manager	66
		LB-2	13	Director	81
		LB-3	6	HR manager	56
Fertilizer	FA	FA-1	3	Production engineer	75
		FA-2	3.5	Compliance and safety manager	61
		FA-3	5	Deputy HR manager	45
	FB	FB-1	6	Health and safety manager	64
		FB-2	4	Senior executive	70
		FB-3	8	Supply chain manager	73

gender (Huisingh et al., 2015). Moreover, these sectors belong to the process industry with common operational characteristics such as continuous manufacturing, long durations, multiple tiers, and complex operations (Farrukh et al., 2022, 2023a). Conversely, the underlying reason behind selecting two case companies, each from different industrial sectors, is to achieve replication, gather in-depth information, and highlight the similar and contrasting patterns in the data (Kumar & Rodrigues, 2020; Yin, 2003).

We utilized a purposive sampling technique to select the case companies and recruit suitable research participants for this study (Saunders et al., 2015). Accordingly, large-sized multiple organizations (with more than 250 employees) in the process industry were selected to provide a holistic understanding of the research phenomenon. We also defined the following criteria for selecting participants to ensure the internal validity of samples (Yin, 2018), which include (a) must be working in the process manufacturing industry, (b) must have more than two years of experience in executing OM practices, and (c) must be working in managerial positions. The rationale for selecting senior managers is to have a holistic understanding of the organization's OM and internal and external SCM activities. Senior executives ensure the implementation of organizational strategies and practices on the operational and technical level and drive change management in their organizations. In addition, they have a psychological and sociological inclination to avoid conflict and adopt linear and rational thinking (Mabe & Bwalya, 2022; Toubes et al., 2023). Hence, selecting senior managers as study participants can provide rich insights into the challenges faced by female employees.

Data collection

Empirical work involving interviews with senior managers was conducted between June 2023 and May 2024. We adopted a semi-structured interview approach as it provides the openness and flexibility required to understand the underlying issues better and develop rich insights into the research phenomenon (Fontana et al., 2024). We formally invited interviewees to participate in the study and provided them with relevant information, including an interview guide and a consent form, prior to conducting the interviews. An interview guide was developed using an extensive review of emerging literature focusing on women's participation and contribution in manufacturing settings. We recorded and transcribed all interviews, which averaged 62 minutes.

Additionally, an interview database was maintained to ensure the reliability of the study, including interview recordings and field notes as primary data, as well as secondary data such as publicly available information from designated organizations suitable for research inquiries (Yin, 2018). Moreover, the above data sources (primary and secondary) address the construct validity concerns in a qualitative research design (Creswell, Hanson, Clark Plano & Morales, 2016). Furthermore, we implemented ethical considerations, ensuring participants' anonymity and confidentiality of the research data and personally identifiable information.

Data analysis

We employed a thematic analysis technique to analyze the interview data and identify salient themes that reflect the barriers hindering women's participation and contributions in selected organizations. We conducted data analysis at two levels – within-case analysis and cross-case analysis (Eisenhardt, 1989). In this regard, we followed Braun and Clarke's (2006) step-by-step data analysis approach to identify, assimilate, and report key themes. In the first stage, interview data were transcribed and read several times to interpret the information articulated in participants' responses for each case. In the second stage, the abductive coding methodology – a combination of deductive and inductive coding processes – examined barriers hindering women's participation and contribution (Farrukh et al., 2023a; Graebner et al., 2012). Microsoft Excel sheets were used to

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streamline the data analysis process after transferring the transcribed data, which aided in structuring the information and systematic manual coding of the data (Castleberry & Nolen, 2018). In the third stage, different emergent and priori codes were assigned to specific issues, which later were merged into second-order themes representing a set of topics with similar focus and are classified into different categories at the micro, meso, and macro levels that constrained women's participation across different process manufacturing industries in Pakistan (Bree & Gallagher, 2016; Farrukh et al., 2024; Pope et al., 2000). For example, stereotyped perceptions and ideological issues, family responsibilities, and societal pressure were synthesized under the sociocultural barriers. In the fourth stage, themes were reviewed and refined. In the last stage, key themes were finalized, including individual, organizational, sociocultural, infrastructural, and institutional-related barriers.

The above-mentioned steps were followed at two levels of analysis. First, we performed a within-case analysis approach to organize the relevant barriers for each case given its unique context. Eisenhardt (1989, p. 540) suggested that the within-case analysis process helps identify 'the unique patterns of each case to emerge before investigators push to generalize patterns across cases' and cross-case comparison. Next, for cross-case analysis, interconnecting and distinguishing themes (across a series of cases) from the within-case analysis were assimilated to create the aggregate dimension. Figure 2 presents the thematic analysis process.

Findings

Textile industry

The two cases from the textile industry highlighted the individual barriers at the micro level that inhibit women's participation in Pakistan's textile industry. In this context, TA-1 acknowledged that women are reluctant to participate in various events or opportunities, which could be associated with their individual preferences, values, and cultural norms, '*women may not participate in office gatherings due to the presence of male colleagues, and they may feel uncomfortable in certain professional settings*.' Further, TB-2 stated, '*there are many issues that women can only discuss with other females comfortably, and that is why many instructors and trainers are women in our stitching unit*.' On the other hand, TA-1 mentioned that the lack of self-confidence and self-efficacy in women employees is a barrier to expressing their feelings, thoughts, and emotions. '*Men may sometimes express their anger or frustration in the workplace, including addressing employees more harshly. However, women tend to be polite as they hesitate to assert their authority and command respect in the workplace due to low self-confidence*.'

In addition, women face several organizational barriers at the macro level while working in textile organizations related to a glass ceiling, workplace layout, occupational health and safety, and harassment impeding their participation in the textile industry. TB-2 noted that Pakistani women face more significant challenges in attaining leadership roles in textile operations, '*out of 60 or 70 people, there is one Pakistani woman*.' TB-1 discussed the reluctance of top management to promote women in decision-making roles due to conflicting desires to empower women and maintain the status quo, '*I think they want to empower women but are afraid of empowered women in the textile industry … which makes it challenging to promote diversity and gender equity*.' On the other hand, TA-3 emphasized the inadequate workplace layout as a significant barrier to retaining female workers in the manufacturing industry, such as in textile,

> The floor was so congested in the finishing department of denim manufacturing due to the placement of machines next to each other as there was no place even to walk … we used to advertise and visit the villages to convince females to work in the textile industry. However, they quit the jobs saying that the reality is entirely different from how it was portrayed during training and recruitment campaigns.

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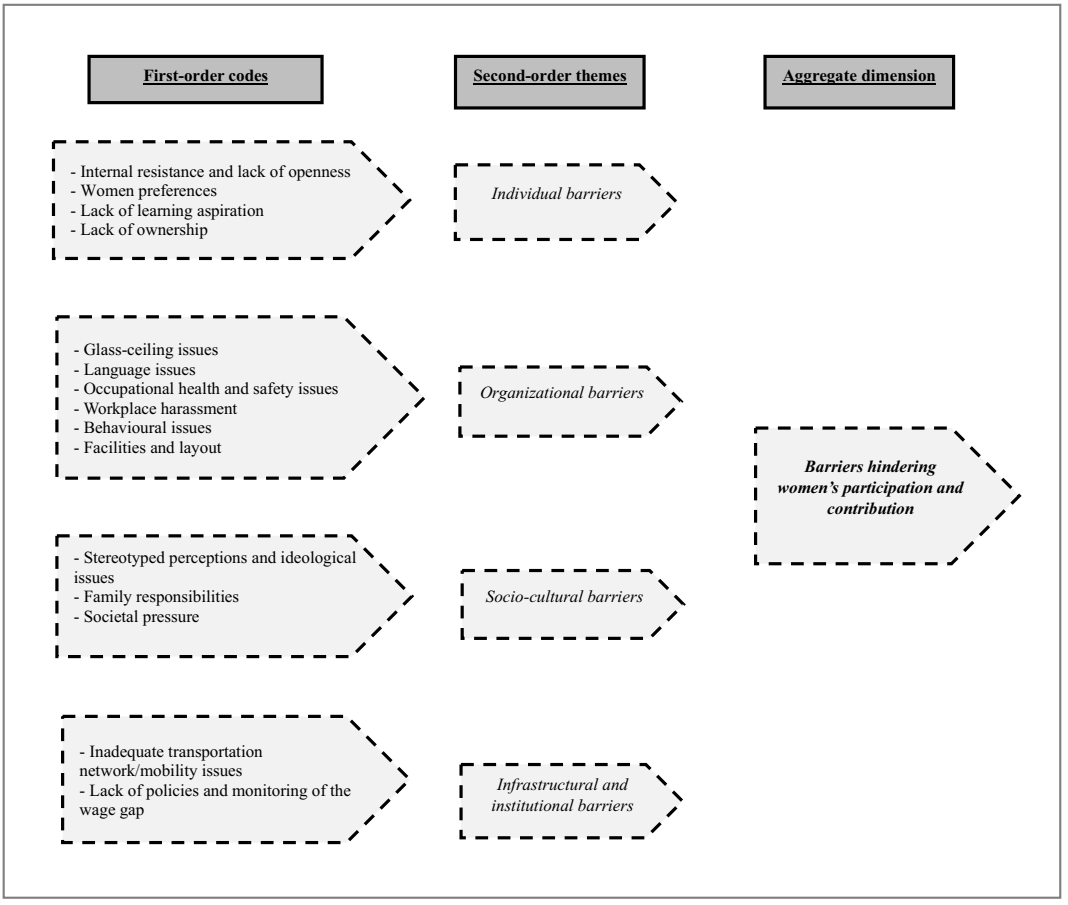

Figure 2. Thematic analysis process.

Participants also highlighted issues resulting from the lack of organizational policies addressing harassment in textile operations. For instance, TA-3 demonstrated the sexual exploitation of female workers by male supervisors in the workplace, '*in the textile industry, workers get the wages as per the piece rate. Sometimes, the supervisor tells female employees,'You have to accept the work conditions; otherwise, I will reduce your pieces or piece rate.' The participants highlighted the challenges female employees face in the workplace related to facilities.*' TB-3 noted that '*the new block is male-oriented. Few female workers have recently been hired to work in that block. However, there are no separate washroom facilities for women. They had to walk for almost 100 meters to use the female washrooms.*' In addition, TA-3 highlighted the health issues faced by children in a daycare center as a significant concern for female workers.

> We noticed that the number of children was decreasing day by day due to the odor of chemicals, diesel, and paints. I remember one of the floor workers left her child in the daycare for one day, and the next day, the employee complained about an allergy issue with the child. A few days later, the employee left her job because she did not want to leave her child in daycare.

Participants from both case companies emphasized several macro-level sociocultural barriers hindering women's participation in production operations in the textile industry. TA-1 stresses the role

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of societal perceptions in inhibiting women's career progression, noting that women are often perceived as less capable of leading effectively compared to men, '*people believe that even if some of them can, the majority of women cannot lead the organization. Therefore, people think that women should not be placed in high positions in the textile firms*.' In Pakistan, societal expectations and traditional gender roles often result in women leaving the workplace to fulfill familial obligations. In this regard, TA-2 highlighted, '*women stay in the textile industry in Pakistan for a short period of time as they are forced to prioritize family responsibilities over professional pursuits, leading to high turnover rates and a lack of female representation in textile organizations*.'

Additionally, the participants discussed the challenges females face regarding mobility, particularly related to transportation network constraints. In this context, TA-1 shared an example of a female colleague experiencing difficulties while commuting to the workplace: '*one of the female workers faces mobility issues as she travels from the other end of the city. The bus drops her far from the destination, so she has to travel by another bus for one hour.*' Along with the infrastructure issues, participants acknowledged the institutional and policy barriers at the meso and macro levels in the process manufacturing industry in Pakistan, hindering female contribution and growth in this sector. TA-1 raised concerns about the persistent wage gap in textile organizations and the lack of organizational and institutional policies, '*male workers are paid higher*.' Similarly, TB-1 shared their observations on the wage gap and inadequate organizational and institutional frameworks: '*I see gaps in the wages paid to men and women; nevertheless, there are no organizational policies and monitoring from regulatory authorities*.'

Packaging industry

The two packaging cases demonstrated a few individual barriers inhibiting women's participation in this sector. For instance, PA-1 stressed the internal resistance of female workers as there are mainly male employees in the packaging industry, which makes them uncomfortable. 'Sometimes *they [females] find it difficult to talk with male colleagues due to their conservative beliefs and attitude. Working in such an environment was initially difficult for women, but some accepted it as a challenge. I found a good career in the supply chain for women*.' In a similar vein, PB-2 explained the behavioral intentions that women are not keen to learn new things, hindering their professional growth in the packaging industry, '*I feel that the majority of the female employees are not interested when it comes to learning opportunities. With the male colleagues, it does not matter whether they are asked to open the pump in the machine or operate the machine*.' PB-1 emphasized the lack of ownership by female employees as a barrier hindering their growth and participation related to their behavior and attitude. PB-1 asserted that a while ago, there was some issue with a machine in the flexible packaging unit, and the production engineer was a woman. However, she was home by 5:00 pm even though the maintenance manager said, '*the issue is in your own machine; you should stay,*' but she said, '*this is concerned with the engineering department, so you guys deal with it.*'

The participants from both companies highlighted various organizational barriers hindering women's participation and contribution to the packaging industry. The participants emphasized the glass ceiling issue associated with a lack of willingness from top management to promote women in higher positions and recruit females in such positions with a lack of career growth. For example, PA-1 posited,

> Most female workers are hired in the quality assurance domain, which I would say is becoming a stereotype because after going into quality, you get a sort of full stop in your career in Pakistan. Where would a quality manager go from there? They would likely stay in that position. There is no career growth in it. So, you become a manager, and top management says, 'we cannot give you further promotion in this field.'
>
> Similarly, PB-3 noted that in their company, women are not in higher positions like brand managers,

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> I have seen that women are frequently shifted from department to department within the company as compared to male employees. For example, recently, one female employee got pregnant, and when she returned from maternity leave, she was shifted to a new department in a similar position. Her promotion plans were further delayed when she started in the new department. Due to this reason, she left the job'

While discussing the organizational structural barriers, PA-2 emphasized the occupational safety risks as a critical barrier while performing the finishing operations in the corrugation unit, '*they must run machines, for example, flatbed die cutting machines, in which there are safety risks involved, such as a worker's hand may be cut. Some women consider it a challenge, but overall, it is a difficult task that may hinder their participation*.' The participants highlighted the sociocultural barriers hindering women's participation in the packaging industry in Pakistan. As PB-2 stressed the ideological perceptions of society, '*there is a limitation in people's thought; for example, if a female employee has done something, then people will feel like she has done something good. It would not be their expectation that she could have done it. However, if there is a male employee, then there will be an expectation that he can do this job*.' The participants emphasized family responsibilities as a significant factor impeding women's contribution to the continuous process industry. PA-1 explained an incident of a female employee leaving the job, '*one of our female employees had to leave the job because her husband did not allow her to continue after marriage. After four months, she called me and said she wanted to join the company again; however, there were no vacancies left then, so we had to reject her application*.'

The two cases from the packaging industry emphasized the infrastructural challenges at the meso and macro levels related to transportation and mobility. PA-1 explained, '*the company provides transport facility only on certain routes due to which female workers face mobility issues*.' On the other hand, PA-2 stated, '*another female worker lived far away, and due to lack of transportation network and infrastructure, she often considers leaving her job*.' PB-1 noted that one of the female employees recently transferred from the sister company, which is outside the city. She talked about the mobility issues as one of the significant challenges, '*women try to move to the parent company near the main city. Whenever there is a chance, they move to the parent company because that [sister company] is located in a rural area and it has a longer commute time and safety concerns*.'

Leather industry

As far as the microlevel barriers are concerned, the cases from the leather industry stressed women's preferences regarding comfort zones as their primary concern in this sector. LA-2 explained that there are separate production lines for male and female workers in leather goods manufacturing operations, considering the women's personal choices and internal resistance. LB-1 stressed the resistance and lack of openness as a key barrier hindering their participation in the leather industry, '*females resist in asking about their wages and are willing to work on lower wages*.' The participants highlighted the organizational barriers in the form of occupational safety issues as a significant obstacle hindering women's participation in this sector. As an example, LB-2 explained that tannery operations in the leather industry are complex and include several health and safety issues due to the use of chemicals and hazardous substances, '*there are not a lot of women in the tannery operations due to the risk of chemical exposure as compared to the leather garment manufacturing*.'

Similarly, LA-2 discussed that women are underrepresented in tanneries in the leather industry due to working with hides and semi-processed materials such as wet blue leather (unfinished hides – dehaired and tanned with chromium). In addition, these tasks involve ergonomics, such as heavy lifting and loading skins on different machines, which are often seen as unsuitable for female workers. LB-3 stated, '*women cannot participate in this industry due to the safety issues related to working on different machines such as shaving and buffing machines, which require heavy work*.' LA-3 noted that in shoe manufacturing operations, a few women are involved as compared to good manufacturing, '*in shoe manufacturing, there are some processes, such as shoe lasting in which muscular power is needed,*

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and many machines are involved so women avoid such operations.' Participant LA-2 emphasized the glass ceiling as another barrier in confluence with health and safety issues, '*I have not seen women-specific organizational policies regarding promotions and recruitment*.'

While discussing the sociocultural barriers such as stereotyped perceptions and ideological issues, LA-1 highlighted, '*there is a prevailing belief in the manufacturing sector that it is a male-dominated industry, and women are better suited for certain sectors such as information technology, education, and healthcare rather than leather manufacturing*.' The participants also emphasized that the early marriage of female workers from rural areas in the leather industry resulted in limited opportunities for financial inclusion, career growth, and economic independence, ultimately hindering their overall empowerment. LA-3 suggested, '*family pressure poses significant challenges for women striving to balance their personal and professional lives*.' On the other hand, LA-1 noted the inadequate transportation network as a key infrastructural barrier, '*there are challenges such as female workers commuting from rural areas*.' In addition, the participants discussed the lack of institutional and organizational policies to address wage gap issues as an obstacle impeding women's participation in the leather industry. According to LB-1, '*along with the health and safety issues, low wages and harassment are the key issues in the leather industry*.' In a similar vein, LA-2 highlighted the lack of female-centric policies addressing the wage gap in the manufacturing industry as a significant concern, '*I see gaps in the wages paid to men and women*.'

In addition, the participants emphasized the lack of supportive regulatory policies and increased taxes as a potential barrier impeding women's participation in the leather sector. LA-2 cited,

> We are facing issues due to increased operational costs such as electricity prices and taxes. Several companies prefer women employees in the finishing department in leather goods and garment manufacturing operations, as female workers are more concerned and focused on producing quality products. However, female employees fear losing their jobs due to a gradual export decrease. Other industries such as pharmaceutical, fast-moving-consumer-goods, textile, agriculture, and packaging are not facing such issues due to high consumption of their products in the local market [Pakistan] compared to leather because our products are mainly exported.

Fertilizer industry

The two cases from the fertilizer industry highlighted individual barriers related to women's preferences, values, and internal resistance. FA-1 stressed that since fertilizer production is a male-dominated sector, a female worker has to deal with male workers, which is quite challenging for them, '*a female has to work with the field workers [male], and for this purpose, she needs to learn how to talk to them which is hard in the beginning as most female workers resist in conversing with male workers*.' On the other hand, FB-2 explained that their company ensures that women are comfortable working with male workers and participate in activities in a co-working space during the recruitment process. The participants from both companies discussed several organizational barriers hindering women's contribution to the fertilizer industry. For example, FA-1 highlighted the language barrier on the floor, '*people are hired from Sindh, and they prefer speaking Sindhi instead of Urdu. However, female workers often ask them to speak in Urdu because they do not understand Sindhi, leading to a communication problem*.'

FA-2 explained that although their company gives significant importance to the employees' health and safety aspects, working in the production department on night shifts upsets the sleeping cycle, '*health issues are triggered by working in night shifts. It is the most concerning issue for a woman as it negatively affects her work-life balance and health*.' Similarly, FA-1 explained that while working in production operations in the fertilizer industry, women have to face occupational safety challenges such as they need to climb monkey ladders, '*we have a tower with a height of about 50 meters, and she needs to climb it. I remember a female engineer who had a height phobia before joining this industry*.' In

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a similar vein, FB-3 elaborated, '*when you are working near the compressor turbine, it can be a humid environment, and there could be a risk of dehydration; therefore, often women are unable to perform such difficult jobs*.'

While discussing the glass ceiling issues in the fertilizer industry, FB-1 stated, '*unfortunately, I have not seen any female in a top management position in the fertilizer sector. As a woman, you will be working in a team of engineers, and they will have one male manager leading the team*.' FA-1 explained that the glass ceiling problem could be caused by a female needing a lot of experience, such as almost 10–15 years, to get to a managerial position. Moreover, in the initial stage of their career, they need to work up to 12–15 hours daily to learn several technical aspects of the plant and lead a group of workers, '*though I have seen women leading small projects, the line manager is usually a male employee. I have not seen women in this position*.' Along with the above challenges, FB-2 highlighted the workplace harassment issues and explained that few female employees are hired since the lower-level workers [technicians] know that the new female workers have a one-year contract, '*others may leave; they use that opportunity to be rude and harass the female trainees. The technical staff tries to test female internees, observe their tolerance level, and use slang and slurs. Some verbal comments can be frustrating*.' On the other hand, the trainees avoid reporting such incidents due to the fear of their job loss, '*female trainees are afraid that if they report, their managers can backfire on them. They might favor the workers since they have known them for a long time*,' FB-2 cited.

Both cases from the fertilizer industry highlighted several sociocultural barriers hindering women's participation in production operations. In this regard, FA-2 stated that people often criticize women working in fertilizer and chemical industries due to the stereotypes and social norms, '*they question such as why a female needs to work in such an industry and develop her career*.' In a similar vein, FB-3 stressed the societal issues, '*I've seen that male workers are encouraged. They always have positive reinforcement from their families [such as they can do it] compared to females. So, a negative perception regarding women's abilities is developed, and at the end of the day, it creates doubts in their [female] mind*.' FA-2 highlighted that women generally do not prefer working in the production department in the process industry, such as the fertilizer sector, due to the long working hours in different shifts, as they need to support their families and raise their children. FB-1 demonstrated that societal norms, values, and culture may inhibit women's contribution to the fertilizer industry in Pakistan, '*I think they [females] join the company with ambition, but eventually, family pressure plays a key role. I have seen parents saying, "you are living too far from us, and it is too difficult … You do not even need to work.*"'

In addition, none of the participants highlighted the wage gap in the fertilizer industry. FA-2 cited, '*it depends on your performance … wage gap is not an issue in the fertilizer sector*.' However, FB-2 discussed the government's lack of infrastructural facilities and policies considering the safety issues while traveling to the organization, '*the fertilizer industry is situated in remote locations, far away from cities, and hence traveling is very difficult. Even though the company facilitates, women can only travel after sunrise and before sunset due to safety concerns outside the city*.' Similarly, FB-1 emphasized the security concerns, '*we face several safety issues in Sindh due to the presence of thugs in this region. In political unrest, they start attacking engineers and other employees that do not make sense*.'

Table 2 presents illustrative quotes on the barriers hindering women's participation and contribution in manufacturing.

Discussion

Our findings revealed various individual, organizational, sociocultural, infrastructural, and institutional obstacles at the micro, meso, and macro levels that inhibit women's participation and contribution across different manufacturing industries in Pakistan. Building on the BRT, the findings highlighted that individual barriers at the micro level are prevalent in the textile, packaging, leather, and fertilizer industries. These barriers include women's preferences, internal resistance, a

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Table 2. Illustrative quotes on barriers impeding women's participation and contribution in the manufacturing sector

Barriers hindering women's participation and contribution			Illustrative quotes	Organizational theory
Micro level	**Individual barriers**	Women preferences	'*We need to focus on areas where women are willing to participate and feel comfortable.*' TA-2 '*The lack of participation could be because they do not feel themselves in their comfort zone.*' TB-3 '*Smoking in the production halls of fabric manufacturing creates an uncomfortable environment for women in the workplace.*' TB-2 '*Biologically, women have a stronger stimulus for smell than male workers; therefore, they are not often seen in tanneries. However, leather product manufacturing has a strong female workforce, and it includes leather garments, footwear, and gloves.*' LA-1	**Behavioral reasoning theory**
		Internal resistance and lack of openness	'*Female workers in the middle-level management resist and find it challenging to guide them [male technicians] on what actions are required, as it is a male-dominated industry.*' FA-1 '*Some female employees are reluctant to participate in the organization's activities, and we have to force them to do so. We need to foster a sense of comfort and inclusivity to promote active participation among female employees.*' TA-1	
		Lack of learning aspiration	'*They bound themselves around their job description and perform along those lines. They are reluctant to learn.*' PB-2 '*Female colleagues become rigid in their tasks as they are not open to learning. If you tell them to do something new, they will say, "this is not my job." I have never heard that from male employees.*' PB-2	

(*Continued*)

Table 2. (*Continued.*)

Barriers hindering women's participation and contribution			Illustrative quotes	Organizational theory
Meso level	**Organizational barriers**	Glass-ceiling issues	'*I asked one of my colleagues if she knew a female employee was more deserving and had more experience, but why did she not get this promotion? Why was this male employee who had less experience promoted? He said, 'Three years ago, this woman said she had a newborn and could not travel.' I said, 'Well, three years ago, that child was a newborn, and now that kid is not a newborn anymore. Did anybody ask her if she has the same traveling issues now?.' My colleague said, 'No, they did not ask her because they used that as a base case that she will generally have limitations.*' PB-1 '*It's a glass ceiling problem, where on the one hand, they are making you happy [through promotion] that you have become a manager, while, on the other hand, they have promoted you as a manager in a position where you both know there's no career growth from here onwards.*' PA-1	**Intellectual capital-based view (structural capital)**
		Workplace harassment	'*People comment on their looks. They [female workers] face these challenges daily.*' TA-1 '*Female interns may face verbal and emotional harassment. Unfortunately, it is considered an open culture; however, I think there should be an extent to the openness, and there are some boundaries,*' FB-3.	
		Behavioral issues	'*It is a major issue, as one female was stopped from participating in a recreational event due to her manager's orders to complete the project and then join the rest of the employees.*' TB-1 '*They face issues such as discrimination in a daycare facility, as the mothers from upper and middle-level management demand a separate daycare facility. "They do not want to raise their children with non-management mothers – lower-level female workers in textile manufacturing."*' TA-2	

(*Continued*)

Table 2. (*Continued.*)

Barriers hindering women's participation and contribution		Illustrative quotes	Organizational theory
	Occupational health and safety	'*Tanneries have a challenging work environment due to the presence of hazardous substances. Consequently, women's participation in this sector is discouraged.*' LA-1 '*Women must run up and down the stairs and climb the monkey ladders. It is a very tough job, and she needs to be physically fit.*' FB-1 '*In the fertilizer production process, hydrogen and ammonia are produced. Therefore, the temperatures are very high, ranging from 110°C to –32°C. These are critical plants with several safety hazards compared to any other industry. I believe this is the most critical sector to work in.*' FB-2	
	Language barrier	'*I've often seen technicians speaking Punjabi or some other language, so female workers have to deal with them all the time. They [females] mostly face this issue in the maintenance department.*' FB-1	
	Facilities and layout	'*The company offers limited transportation for women working at a lower level or middle management. However, now the company plans to accommodate more women in the future, to address transportation-related challenges and promote a more inclusive work environment.*' TB-3	

(*Continued*)

Table 2. (*Continued.*)

Barriers hindering women's participation and contribution			Illustrative quotes	Organizational theory
Macro level	**Sociocultural barriers**	Stereotyped perceptions and ideological issues	'*A woman is treated in the manufacturing sector in a way that she can't perform those tasks.*' PB-1 '*There's a question of whether women can handle emergencies. For example, if they need to make an immediate decision in an emergency, will she be able to handle it [such as to shut down the plant or not]?.*' FB-2 '*We identify easy jobs such as computer operators, measurement supervisors, and representatives in marketing, HR, and compliance departments.*' TB-3 '*I think the societal factors play a significant role in hindering women's participation in the fertilizer industry, as there's an expectation for women that operational activities in production are impossible for them.*' FB-2 '*Maybe women are new to the production side. Still, we have women in other departments like sales for a long time.*' PA-1	**Institutional theory (Normative and coercive isomorphism)**
		Family responsibilities and pressure	'*I believe that 95% of the time, women discontinue their jobs because of family responsibilities.*' PA-3 '*Women cannot leave their homes to work due to societal expectations and gender norms in a male-dominated society.*' TB-3 '*Due to domestic limitations or responsibilities, they cannot show that flexibility. For example, if you're a mother, you feel obligated to return to your child. The packaging industry that operates 24/7 requires flexibility, which is lacking in the female workers.*' PB-2 '*Women's ability to contribute to Pakistan's economy and support their families is directly impacted by family constraints. The pressure to prioritize family responsibilities over professional aspirations can hinder women's economic empowerment, perpetuating gender inequities in the workforce.*' TB-2 '*The reason behind the few women employees in production operations in the packaging industry is associated with family responsibilities as a silent establishment sort of issue.*' PB-2	
	Infrastructural and institutional barriers	Lack of policies and monitoring of the wage gap	'*The wage gap exists, and we need to work on it.*' TB-2 '*In terms of duties, I think female wages are not given considering the equity. There is definitely a wage gap between genders.*' TA-3 '*Nearly 40–45% of workers in the leather industry are female who contribute to different operations such as sewing, stitching, and finishing in the leather garment and good manufacturing such as footwear, gloves, jackets, wallets, bags, and accessories. However, this sector is declining due to a lack of institutional policies.*' LB-3	

lack of learning aspiration, and a lack of ownership, which limit their professional development and contribution to the manufacturing sector. Our findings from all cases revealed that women experience a lack of openness in the presence of male colleagues and prioritize their comfort zone, leading to self-efficacy and low self-confidence (Germain et al., 2012; Gupta & Kiran, 2023; Sachdeva et al., 2022). According to Potnis (2016), psychological inequalities, such as male dominance, are key obstacles that hamper women's participation in organizations. These behavioral reasons can be attributed to their personal values and attitudes linking with the BRT and to the societal and cultural norms, traditional gender roles, and prevailing societal perceptions (e.g., portraying women as inherently weak) associated with the normative isomorphisms of ITBV. Further, in developing economies, a lack of self-confidence in women employees is determined as a critical barrier due to their strong engagement in family systems (normative aspects) that play a psychological factor inhibiting their participation in the organization's activities (Naguib, 2022).

While the literature revealed that women are keen to participate in innovation and learning activities (Adam et al., 2023; Fernández et al., 2024), our findings (from the packaging industry cases) revealed a lack of learning ambition and ownership as the significant individual-level barriers related to their intentions and attitude hindering their participation in the manufacturing domain. This could be attributed to women getting involved in these jobs only to improve their financial situation and household income. From a global perspective, more women than men are in poverty and thus are more concerned with strengthening their economic position (Plambeck & Ramdas, 2020). This finding aligns with the BRT, which emphasizes that the motivations and intentions of individuals' engagement and tendency to participate depend on context-specific factors (Westaby, 2005). However, these findings are lacking in extant literature. Building on the above discussion, we propose:

Proposition 1: *In an emerging economic context, individual-level behavioral barriers such as low self-efficacy, internal resistance, and lack of learning aspirations significantly inhibit women's participation in manufacturing operations. These barriers are shaped not only by personal motivations but also by sociocultural and normative institutional forces.*

The study results indicated that occupational health and safety issues are significant challenges for women across all manufacturing industries. Drawing on the structural capital of ICBV, these challenges can be linked to the processes and characteristics of manufacturing operations, including ergonomics, long working hours, heavy tasks, and masculine activities, as part of the process industry requirements that inhibit women's participation in this sector (El Wali et al., 2021; Fernández et al., 2024). Since the process industries include complex operations, women hesitate to work in demanding environments such as high temperatures and heavy tasks; however, these findings are lacking in the existing body of knowledge, as prior studies mainly highlighted the extreme weather conditions in the agriculture and horticulture industries (Ali et al., 2023; Keller et al., 2024). Beyond the infrastructure, the lack of Personal Protective Equipment and inadequate facilities that expose female workers to direct exposure to chemicals and safety risks further illustrate deficiencies in organizational structural capital. Further, female workers' reluctance to perform tasks involving physical risk (e.g., heavy lifting or exposure to chemicals) in the leather and packaging industry aligns with BRT, where individual attitudes and perceived behavioral control shape intentions (Fernández et al., 2024).

Findings from these industries have also exposed the 'glass ceiling' issues, particularly in the fertilizer and packaging industries, where limited promotion pathways and opportunities for leadership, a lack of engagement in decision-making, are prevalent. This is related to the culture and leadership aspects of an organization's structural capital that hinder women's growth and contribution in the manufacturing sector (Ruel & Fritz, 2021; Souissi et al., 2024; Yang et al., 2024). However, the glass ceiling issue is more prevalent in fertilizer and packaging cases than in textile and leather since women

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in these sectors are generally from rural areas. Further, they do not feel motivated to go for promotions if they are satisfied with their income, contributing financially to running the daily chores of the house. On the other hand, from the fertilizer and packaging cases, though the glass ceiling aspect is related to organizational structural barriers such as top management reluctance linking with ICBV, it can also be associated to a lack of motivation for career growth (Sharari, 2025) which can be linked with the behavioral intensions (BRT) of female employees. In addition, normative routines such as family obligations and traditional gender roles inhibit female participation in organizations, aggregating the glass ceiling issue on the meso level (organizational barrier), linking with ICBV theory (Azima & Mundler, 2022; Gupta & Kiran, 2023).

The findings also revealed the organizations' infrastructural issues, particularly in the textile and packaging industries, that include workplace layout, lack of facilities (such as female washrooms), hygiene issues in the daycare centers, and transportation and mobility challenges for female workers. These findings are aligned with prior studies highlighting the poor working conditions, transportation facilities, and mobility issues as significant barriers to women's participation in the manufacturing sector (Andrade et al., 2021; Uddin, Ahmed & Shahadat, 2023). In addition, harassment such as sexual exploitation, as well as verbal and emotional harassment in textile, leather, and fertilizer cases, can be attributed to inadequate organizational harassment policies and systems linked to the structural capital facet of ICBV. Further, women working in multitiered supply chains and male-dominated industries (such as textile, agriculture, and garment) are more vulnerable to human rights violations (McClenachan & Moulton, 2022; Sachdeva et al., 2022), inhibiting their participation in the OM (Fröhlich, 2022; Rustagi et al., 2013; Uddin et al., 2023). Therefore, based on the findings we can argue that not only a lack of organizational policies (ICBV) but also a lack of support from public authorities – coercive isomorphism of ITBV, exacerbate poor working conditions in workplace (e.g., sexual violence and exploitation) hindering female participation in OM (McNamara et al., 2023), thus complementing the ICBV (in terms of employee exploitation in organizations). The above discussion leads to the following:

Proposition 2: *The interplay of weak structural capital within organizations (e.g., inadequate policies, poor infrastructure, and limited leadership access), behavioral intentions of female workers (e.g., limited motivation and self-efficacy), and coercive and normative institutional pressures (e.g., lack of regulatory oversight and persistent sociocultural norms) jointly perpetuates meso-level barriers to women's participation in manufacturing. Addressing these barriers requires integrated organizational reforms and robust public policy interventions.*

Building on the ITBV perspective and based on the findings, we can argue that weak regulatory frameworks, inefficient institutional policies, and monitoring mechanisms contribute to wage disparities and unequal pay in the process manufacturing industry, especially in the textile and leather sectors, in comparison to the packaging and fertilizer industries. These gaps indicate inadequate coercive isomorphisms, such as regulatory enforcement and fragmented labor policy, that are critical for ensuring fair labor practices. The unregulated nature of the supply chains in complex industries further exacerbates these institutional voids, making them vulnerable to social sustainability issues (Charter, Pan & Black, 2023). Moreover, female workers who are often less educated and employed in low-wage production operations roles (such as the textile and leather industry) face financial constraints and tend to avoid questioning their wages (Fröhlich, 2022; Zafarullah & Nawaz, 2019). This reluctance acts as a weak driver for institutions to consider women's labor rights in the workplace. Along with the coercive isomorphism (regulatory), the behavioral aspects, including the values and attitudes of female workers (BRT) as well as normative isomorphism of ITBV, such as societal norms and stereotypes, and lack of organizational policies (structural capital of ICBV), further exacerbate the macro-level challenges such as the wage gap issue.

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In addition, the findings highlight significant coercive institutional gaps that hinder women's participation in process manufacturing industries. In the leather industry, insufficient government support for exports and increased taxation have led to a sectoral downturn, directly impacting employment and reducing women's contribution. From the ITBV perspective, this reflects a failure of coercive institutions, highlighting the inability of the government to implement regulatory and economic policies that could result in gender-inclusive employment. Across all sectors studied, mobility issues due to inadequate infrastructure and the absence of supportive public policies were recurring barriers. However, the fertilizer industry cases mainly emphasized safety concerns while traveling to the workplace in remote locations, attributed to the inconsistency in government infrastructure policies. Perhaps this is due to the inconsistent policy measures taken by the government, especially in terms of building better infrastructure that can provide safety for women when traveling – a coercive barrier. These findings are unique as they have not been reported in the previous literature from an emerging country perspective. Therefore, we propose:

Proposition 3: *Macro-level barriers to women's participation in manufacturing are due to coercive institutional voids (e.g., lack of regulations, infrastructure, and policy consistency) and normative societal constraints. Addressing these barriers requires coordinated public policy reforms, improved governance of supply chains, and targeted improvement initiatives to strengthen institutional accountability and labor equity.*

Drawing on the normative isomorphisms of the ITBV perspective, findings from the textile, leather, packaging, and fertilizer sectors highlighted the sociocultural barriers that significantly inhibit women's participation in manufacturing. These issues include traditional gender roles, stereotyped perceptions regarding the competence of female employees in technical and leadership positions, unequal distribution of domestic responsibilities, and family-imposed constraints (Andrade et al., 2021; Etim, 2020; Fernández et al., 2024; Gupta & Kiran, 2023). Such societal norms not only prevent women's careers and their continuity to top management and leadership roles, but also impose internalized self-limitations. These embedded cultural expectations further exacerbate gender bias, particularly in leadership and decision-making roles, contributing to the glass ceiling effect, which links to the structural capital weaknesses within the organizations (ICBV). Moreover, the social norms and expectations prioritizing marriage and family responsibilities cause women to leave their jobs or face difficulties entering the manufacturing sector of the OM.

In Pakistan, gender roles are clearly demarcated; women are primarily viewed as homemakers and do not often venture into outside work unless they need to support their families financially. Hence, the role of gender, as defined by societal norms, serves as a precursor to the institutionalization of discriminatory work practices that hinder women's participation and contribution in the OM sector. Therefore, we propose:

Proposition 4: *Overcoming macro-level barriers requires dismantling normative institutional pressures through societal awareness and strengthening organizational structures to promote women's participation in manufacturing sectors.*

The above discussion and analysis also highlighted the relationship among BCT, ITBV, and ICBV, enhancing the analytical generalization of the study findings. Despite their distinctive natures, these theories can complement each other while examining the reasons for barriers at micro, meso, and macro levels, hence providing a holistic understanding of individual, organizational, sociocultural, infrastructural, and institutional barriers.

Table 3 demonstrates the outcome of the cross-case analysis in the form of a heat map illustrating barriers hindering women's participation and contribution in the manufacturing sector. Drawing on the results from the cross-case analysis, the key individual-level barrier to women's participation

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Table 3. Heat map of barriers hindering women's participation and contribution in the manufacturing sector

Manufacturing sector	Barriers hindering women's participation and contribution in the process industry														
	Micro level				Meso level						Macro level				
Textile	5	3	0	0	2	1	4	3	2	4	4	3	4	4	4
Packaging	2	0	4	3	5	0	4	0	0	3	3	1	5	3	0
Leather	4	3	0	0	1	0	3	1	0	0	2	1	1	2	3
Fertilizer	5	0	0	0	4	4	6	3	0	0	5	5	3	4	0
	Resistance and lack of openness	Women preferences	Lack of learning aspiration	Lack of ownership	Glass-ceiling issues	Language issues	Occupational health and safety issues	Workplace harassment	Behavioral issues	Facilities and layout	Stereotype perceptions and ideological issues	Societal pressure	Family responsibilities	Inadequate transportation network/ mobility issues	Lack of policies and monitoring of the wage gap
	Individual barriers				**Organizational barriers**						**Sociocultural barriers**			**Infrastructural and institutional barriers**	

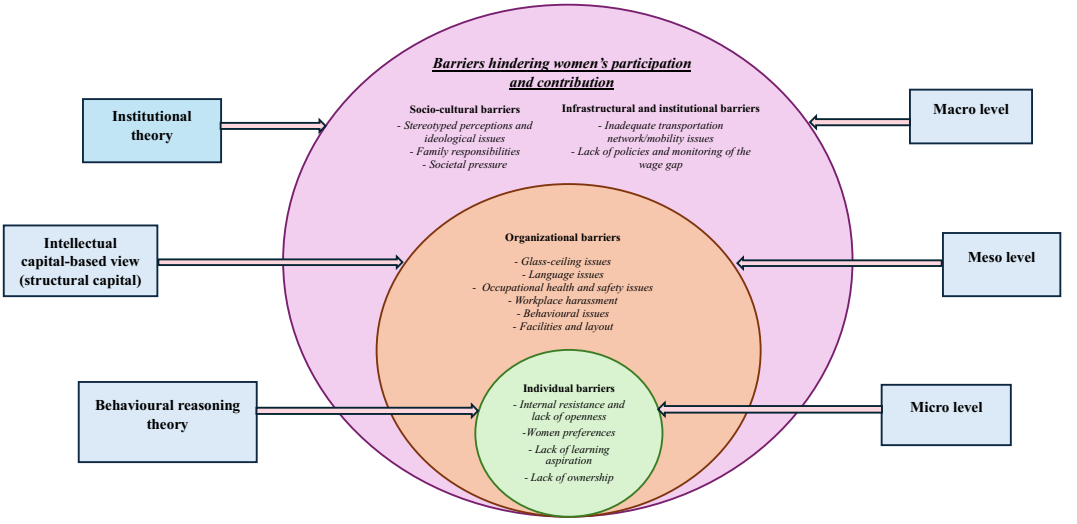

Figure 3. A holistic view of barriers impeding women's participation and contribution in the manufacturing sector.

includes a lack of openness among women which is prevalent in all cases. Similarly, the glass ceiling barrier and occupational health and safety issues are significant organizational barriers. In addition, stereotyped perceptions, family responsibilities, and societal pressure are key sociocultural obstacles, followed by inadequate transportation networks, which are significant infrastructural and institutional barriers hindering female participation in all cases.

Incorporating the study findings with the critical aspects of the BRT, ICBV, and IT, Figure 3 presents a multilevel integrative model of barriers to women's participation and contribution in the manufacturing sector.

Conclusion, implications, and future research directions

This study examined several individual, organizational, sociocultural, infrastructural, and institutional challenges at the micro, meso, and macro levels that hinder women's participation and contribution to the manufacturing sector in an emerging economy. Drawing on different facets of BRT such as intentions, reasons, values, and attitudes, the study revealed individual barriers such as internal resistance and lack of openness, women's preferences, lack of learning aspiration, and lack of ownership. Similarly, using the structural capital-based view of ICBV, the findings include glass-ceiling issues, occupational health and safety issues, workplace harassment, behavioral issues, and lack of facilities as the organizational barriers. Building on the coercive and normative isomorphisms of ITBV, our findings emphasized inadequate transportation networks, a lack of policies and monitoring of the wage gap, stereotyped perceptions and ideological issues, family responsibilities, and societal pressure as sociocultural, infrastructural, and institutional challenges.

This study has several theoretical, practical, and policy implications. From a theoretical perspective, the present study is one of the early investigations into the barriers that impede women's participation and contribution to the manufacturing sector, particularly in the process industry, which is vastly underrepresented in the existing literature. Second, using multiple organizational theories to understand the barriers at the micro, meso, and macro levels also contributes to the existing body of knowledge. Third, the multilevel integrative model (Figure 3) can guide researchers in future studies of other complex industries, such as construction, mining, and chemicals, which share similar characteristics with the process industry.

Furthermore, the findings can inform corporate managers about the barriers that hinder women's participation in manufacturing operations within the process industry. Senior executives such as

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human resource managers, operations and supply chain managers, compliance managers, and health and safety managers can use the findings from this study to formulate supportive organizational policies and occupational strategies relating to health and safety that could help overcome gender disparities in their respective supply chains. Given the study's adoption of a multiple case study design aimed at achieving analytical generalization, practitioners working in diverse industrial sectors such as textile, leather, cement, fertilizer, chemical, and pharmaceuticals can use study findings to improve female-related work issues and advance broader social sustainability aspects. By addressing diverse barriers at the individual, organizational, societal, and institutional levels, industry stakeholders can foster more inclusive operational environments in manufacturing industries, particularly in emerging economy contexts characterized by gender disparity and sociocultural constraints. In addition, the proposed holistic framework can be used as a starting point to develop organizational strategies that enhance structural capital, thereby improving opportunities for female workers to achieve career growth and professional development.

Finally, the findings can guide policymakers in recognizing the institutional and infrastructural barriers and developing adequate policies and frameworks to enhance female participation and contribution in manufacturing organizations. In this regard, policymakers can use the findings to develop regulatory policies to address issues relating to female workers' exploitation, workplace harassment, and wage gap. In addition, policymakers and decision-makers can initiate societal awareness programs to overcome the challenges of gender-biasedness, stereotypical perceptions, and traditional societal norms. Further, policymakers can improve the infrastructure to overcome female employees' commute and mobility issues, both in urban and rural areas. Policymakers and decision-makers can also enhance stakeholder collaboration, including organizations, nongovernment organizations, and the development sector, to initiate capacity-building programs for improving female employees' technical, operational, and managerial skills, contributing to their career development and advancement in the manufacturing sector.

The qualitative nature of this research is a limitation; therefore, future studies may benefit from adopting a quantitative approach for statistical generalization. Additionally, future studies can investigate the relationship between different barriers using mathematical modeling techniques, such as analytical hierarchy processes and interpretive structural modeling. Future research can also explore micro-, meso-, and macro-level barriers in service industries. Future studies could also investigate the research phenomenon concerning ethnic minorities, employees with disabilities, and migrant workers in the manufacturing sector.

Conflict(s) of interest. The authors declare none.

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Appendix

Table A1. Systematic literature review protocol

Systematic literature review protocol	
Unit of analysis	Peer-reviewed journal articles in English language
Search limitation	The search was limited to journal articles
Keywords used	'Women participation', 'barriers', 'challenges', 'production operations', 'manufacturing', 'process industry', 'supply chain', 'obstacles', 'women empowerment', 'manufacturing industry', 'process manufacturing', 'continuous process', 'women engagement', 'female empowerment', 'female participation', 'production', 'women contribution', 'female contribution', and 'female engagement'
Database	Keywords were searched in different combinations from the SCOPUS database
Search fields	Title–abstract–keywords
Boolean operators	AND and OR
Time period	Not specified
Type of analysis	Qualitative
Total number of articles used in the study	81

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