



Modeling Business-to-Business Sharing Drivers Using a Hierarchical Framework Under Uncertainties

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ABSTRACT

This study contributes to assessing sharing economy concepts such as sustainability, organizational efficiency, and stakeholder engagement, and develops business-to-business sharing drivers in a hierarchical structure. Job shop production systems (JPS) are challenged by demand fluctuation and low production capacity. This study adopted the fuzzy Delphi method to arrive at a valid set of attributes and a fuzzy decision-making trial and evaluation laboratory to address the proposed attributes' relationships. The results show that stakeholder engagement and technological performance are important causal aspects, and economic benefits act as a mediating aspect that drives the perceived organizational utility in JPS. The top causal criteria were identified as outsourced labor services, information sharing, digital platforms, workplace vitality, new technologies, and cost efficiency. These criteria provide a practical solution for managers with which to improve B2B sharing practices in JPS.

KEYWORDS

Business-to-Business Sharing, Evaluation Laboratory, Fuzzy Decision-Making Trial, Fuzzy Delphi Method, Job Shop Production System, Rational Choice Theory, Stakeholder Theory, Triple Bottom Line (TBL)

INTRODUCTION

A job shop production system (JPS) is a manufacturing system wherein workstations are designed to provide high flexibility and produce small batches of various products (Sokolov et al., 2018; Xiang and Liu, 2019). In JPS, to achieve a sustainable competitive advantage and prevail in a global competition setting, resources and operations must be optimized. The sustainability of the sector is challenged by demand fluctuation, low production capacity, high production costs, and the unreliability of product/service delivery (Liu et al., 2019). Business-to-business (B2B) sharing relates to the simultaneous and

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balanced management of all three sustainability pillars economic benefits, environmental protection, and social development (the TBL) (Coca et al., 2019). B2B sharing intends to consolidate all three TBL pillars and achieve industrial manufacturing sectors' potential (Lin et al., 2019). Güçdemir and Selim (2017) noted that B2B sharing could play an essential role in enhancing sustainability in JPS because small batches of products have become customary in make-to-order manufacturing systems. Govindan et al. (2020) argued that although there are organizational efficiency advantages to B2B sharing, many JPS lack stakeholder engagement and sharing facilities because of conventional business thinking. The perception is that sharing is riskier in terms of privacy and intellectual property, and less comfortable for organizations. Prior studies have found that the sharing economy is a technology platform for collaboration and sharing resources, but researchers have neglected to provide a hierarchical model of B2B sharing drivers in JPS (Frenken and Schor, 2017; Laukkanen and Tura, 2020). Hence, to implement sustainable B2B sharing in JPS, the drivers should be identified from organizational efficiency and stakeholder engagement perspectives.

In sustainability theory, firms should promote the B2B sharing economy's benefits, maintain a balance between the TBL, and aim to build a long-term, sustainable marketplace (Hu et al., 2019). Tura et al. (2019) argued that digital technology development presents enormous opportunities to incorporate B2B sharing in conventional business models, especially in organizing production firms. The advancement of technologies and information systems makes B2B sharing practices more appealing and provides a new sustainability path (Frenken and Schor, 2017). Biswas et al. (2018) claimed that technology creates a platform for integrating the physical world into the digital world, thus improving productivity, efficiency and aiding economic growth of society. However, while technology provides the infrastructure, organizations should achieve appropriate and balanced levels of TBL efficiency. Coca et al. (2019) noted that, in B2B sharing, sustainability has become a challenge for organizational management. Rational choice theory (RCT) provides a framework for understanding efficiency-seeking organizational design and modeling social and economic decision-making based on the utilitarian analysis of consequences (Zey, 2015; Bolis et al., 2017). Laukkanen and Tura (2020) discussed incorporating B2B sharing drivers into an organization's long-term strategy to decrease risk and uncertainty and increase operational stability. Stakeholder theory suggests that treating competitors as stakeholders rather than adversaries, and in stakeholder engagement, can boost an organization's ability to improve knowledge exploitation and resource efficiency (Lindsey et al., 2018; Veronica et al., 2020). Veronica et al. (2020) argued that stakeholder engagement increases resource efficiency, which entails higher revenue, minimizes organizational costs, and positively influences sustainability. Stakeholder engagement is influential in addressing simultaneous environmental, economic, and social concerns (Bouloiz, 2020; Veronica et al., 2020). Hence, we argue that B2B sharing needs to integrate technological performance, stakeholder engagement, and organizational utility to address the TBL.

Although there have been studies on the B2B sharing economy, only Govindan et al. (2020) have addressed the sharing economy from a manufacturing sector perspective; however, the authors neglected the fuzziness of the linguistic preferences in experts' opinions. B2B sharing drivers are related to multi-attribute decision-making in the presence of multiple and conflicting criteria, require qualitative assessment, and are subject to uncertainty (Li et al., 2019; Bui et al., 2020). The uncertainties are related to the attributes' qualitative nature and the experts' preferences, such as judging the importance level and the influence level. This uncertainty cannot be effectively captured based on formal models and methods, as the unique information sources are the experts who make the decisions. Hence, our study uses a combined method comprising the fuzzy set theory, the FDM, and fuzzy decision-making trial and evaluation laboratory (FDEMATEL) to determine the essential attributes and causal associations among the attributes. The qualitative information is converted into crisp values using fuzzy set theory (Tseng et al., 2019). The drivers should be validated to implement B2B sharing in JPS, however, many attributes proposed in the literature have not been validated, and understanding the criteria is insufficient to guide B2B sharing practices (Govindan et al., 2020). This study collected 43 drivers from prior studies and evaluated them using the fuzzy

Delphi method (FDM) to arrive at a valid set of attributes (Tseng et al., 2020). The FDM is applied to aggregate experts' opinions for the decision-making process, analysis and in examining experts' judgment to validate the results (Bui et al., 2020; Negash and Hassan, 2020). Moreover, to guide the implementation, the complex relationships of the B2B sharing drivers should be clarified. Thus, this study adopts the FDEMATEL to address the proposed attributes' interrelationships (Tseng et al., 2020). The objectives of this study are as follows:

1. To develop a valid set of B2B sharing drivers based on qualitative information.
2. To analyze the cause–effect relationships among the drivers with linguistic preferences under uncertainties.
3. To determine the criteria for practicable improvement despite uncertainty.

The study presents appropriate theory on sustainability, rational choice, and stakeholder engagement to address B2B sharing drivers in JPS. The contributions of the study are in terms of measures, theory, and industry. (1) Measures: we develop a valid set of drivers, applied to determine the causal relationships. (2) Theory: a causal framework composed of environmental protection, economic benefits, social development, technological performance, stakeholder engagement, and organizational utility is developed for JPS sharing using a hierarchical structure with linguistic preferences. (3) Industry: managers can adopt criteria to monitor and evaluate practical improvements. The remainder of this paper is organized as follows. Section 2 reviews the literature on B2B sharing drivers in JPS. Section 3 explains the methods used in this study, FDM and FDEMATEL. Section 4 discusses the results, and the implications are given in Section 5. Finally, Section 6 offers conclusions, limitations, and recommended future research.

2. LITERATURE REVIEW

The theoretical perspectives on B2B sharing drivers in JPS, including proposed attributes and measures employed in this study, are discussed in this section.

2.1. Theoretical Framework

In sustainability theory, firms should balance the TBL and aim to maintain a long-term sustainable marketplace (Hu et al., 2019; Bouloiz, 2020). Nevertheless, in JPS, TBL perspectives are not sufficient due to the unique decentralized nature of B2B sharing, difficulties in stakeholder engagement, and insufficient knowledge. Hence, the integrate technological performance to upgrade TBL (Frenken and Schor, 2017; Tura et al., 2019). However, technical performance is not achieved on its own; organizations' economic models, assets, and organizational culture play a role (Rodríguez et al., 2021). The systematic organization of ideas, resources, and people is instrumental in organizational culture and efficiency. RCT is a basis for decision-making and is commonly used to develop organizations' economic models (Zey, 2015). RCT provide effort to solve problems using universal rules and regulations; decision-making is dependent on a utilitarian analysis of consequences (Bolis et al., 2017). The utilitarian engagement in sharing platforms is lowered by the weak social presence affecting utility metrics that can be interpreted financially and thus are more relevant for shareholders (He et al., 2021). Hence, the integrates RCT with sustainability theory to understand and model B2B sharing drivers in JPS.

In B2B sharing, stakeholder engagement practices positively impact on the three pillars of TBL (Li et al., 2019). Stakeholder engagement capabilities can develop a driver and is a prerequisite to efficiently foster development when encountering underutilized or idle resources such as equipment, materials, and intangible assets (Del Giudice et al., 2019). To develop sustainability-oriented B2B sharing, firms should balance stakeholders' interests and integrate the TBL, technological performance, and utility maximization intentions.

2.2. Business-to-Business Sharing

B2B sharing is an economic model in which underutilized or idle resources such as equipment, materials, machines, knowledge, and experience are shared among industry by joint consensus (Li et al., 2019). B2B sharing significantly affects society, industries, and businesses (Coca et al., 2019). In B2B sharing, organizations are interested in their sustainable development and the surrounding community, marketplace, and business networks (Rodríguez et al., 2021). B2B sharing is implemented in various industries due to recent technological advancements (Güçdemir and Selim 2017). Govindan et al. (2020) argued that a research gap exists in terms of a comprehensive understanding of sharing between two or more parties who are competitors in nature.

Moreover, B2B sharing lacks rules and regulations, capital, trust, and incentive and poses a high probability of risk, making it an unstable business model (Liu et al., 2019; Cheng et al., 2019). Güçdemir and Selim (2017) noted that B2B sharing influences manufacturing capacity, distribution channels, and profit-sharing between the various sectors. Lin et al. (2019) argued that establishing stakeholder engagement capability is a common objective for JPS in order to expand network dependability and minimize B2B sharing costs. In JPS, sharing underutilized or idle resources is an alternative route to sustainability (Hu et al., 2019). Lahkani et al. (2020) claimed that to optimize supply chains, B2B sharing should be used in inventory management, ensuring accounting and planning underutilized or idle resources. Hence, the drivers should be identified to develop strategies and implement B2B sharing in JPS.

2.3. Business-to-Business Sharing Drivers

B2B sharing drivers could stimulate sustainable production practices and enhance and improve resource consumption in JPS (Hu et al., 2019). B2B sharing plays a significant role in the industrial manufacturing sector, and sharing is growing exponentially, yet JPS has been neglected in prior studies (Frenken and Schor, 2017; Sokolov et al., 2018). B2B sharing lacks transparency, proper sharing partners, potential resource flows, and high-risk possibilities, making it more inefficient for JPS (Liu et al., 2019). Toni et al. (2018) recommended that the B2B sharing relevance is linked to waste reduction, resource efficiency, cost efficiency, and surplus utilization so as to mitigate excess consumption and production. B2B sharing needs to integrate technological performance, stakeholder engagement, and organizational utility to address the TBL in JPS (Rose et al., 2018; Lin et al., 2019; Veronica et al., 2020). Coca et al. (2019) argued that JPS is more inclined to reduce sustainability; hence, it is important to deliver a new approach for promoting and implementing B2B sharing. In this study, the propose six drivers in B2B sharing: environmental protection, economic benefits, social development, technological performance, stakeholder engagement, and perceived organizational utility.

2.3.1. Environmental Protection

Environmental protection in B2B sharing encompasses lower resource use, improved operations, and extended product lifecycles, all of which reduce waste and enhance resource efficiency in JPS (Jabbour et al., 2020). Coca et al. (2019) highlighted that, in JPS, interest in creating sustainable value via B2B sharing and environmental protection had increased dramatically. B2B sharing is less resource-intensive and is environmentally friendly, providing stronger social ties between industries (Li et al., 2019). Govindan et al. (2020) stated that, in B2B sharing, underutilized or idle resources shared between two or more firms reduce costs and adverse environmental and societal impacts. Hofmann et al. (2019) claimed that B2B sharing in JPS signifies an additional form of production that avoids mere monetary gain and focuses on environmental problems concerning excessive consumption, degradation of natural resources, and underutilized or idle resource utilization. Thus, B2B sharing allows for efficient utilization of underutilized or idle resources and discourages excessive consumption, promoting environmental protection in JPS.

2.3.2. Economic Benefits

B2B sharing in JPS is crucial but challenging due to the sharing economy's long-term benefits and economic uncertainty (Tura et al., 2019). B2B sharing signifies a new form of economic exchange—that is, cooperative practices are dependent on the standards of short-term access to underutilized or idle resources on digital platforms (Hofmann et al., 2019). Li et al. (2019) argued that B2B sharing is an unregulated marketplace and an economic opportunity for the manufacturing sector to frame JPS as part of an equitable and sustainable economy. Tseng et al. (2019) emphasized that an organization should implement a set of dimensions for policymaking so as to expand and measure profits and ecological protection. The sharing economy can generate demand that did not previously exist through the supply of new products and services. B2B sustainable business creates profit for its stakeholders while protecting the environment and improves resource utilization efficiency and productivity (Bouloiz, 2020). Hence, to guide B2B sharing in JPS, alleviation of unwanted influences on the environment, and enlarge meal of constructive social impacts and economic drivers are needed.

2.3.3. Social Development

Social development is considered an essential and influential driver of B2B sharing in JPS; the primary societal issues are privacy, intellectual property, and a scarcity of social presence (Habibi et al., 2016; He et al., 2021). Frenken and Schor (2017) argued that a lack of trust and social bonds between unfamiliar firms entail higher ethical and moral risk, contractual disputes, and opportunistic behaviors. However, due to the lack of regulations in JPS, some contemporary sharing practices raise concerns about organizational policies and rights, company wellbeing, safety, and unfair competition. Hu et al. (2019) stated that B2B sharing is recognized as a community-driven industry that emphasizes developing cultural and social relationships. Dabbous and Tarhini (2019) emphasized that B2B sharing is an alternative social driver that supports sharing underutilized or idle resources to reduce consumption of materials and waste, providing significant shared benefits and social order. However, the sharing economy has been criticized for paying low wages and offering few benefits; B2B sharing in JPS should balance social development and organizational utility.

2.3.4. Technological Performance

Technological performance benefits B2B sharing, for example, open collaboration, accessible offering, and the efficient usage of underutilized or idle resources (Toni et al., 2018; Lahkani et al., 2020). The technological elements bring firms together to create value and create new forms of social connection. Li et al. (2019) stated that digital technology's rapid development provides B2B sharing to encourage the transformation from a traditional to a modern sustainable industry. However, Tura et al. (2019) argued that the lack of digital technology, knowledge, experience and information interrupts the adoption of B2B sharing in JPS. The technological performance could increase the appeal of B2B sharing in JPS and broadening a prevailing practice to a larger social scale (Kim et al., 2018). B2B sharing enables firms to connect and share underutilized or idle resources, creating incentives, increasing knowledge, and avoiding conflicts of interest (Tura et al., 2018). The rise in technology has had a tremendous impact in the manufacturing sector and in improved standardization and information management (Kitouni et al., 2018; Srinivasa et al., 2018). Hence, technological performance is considered to be among the main drivers of B2B sharing.

2.3.5. Stakeholder Engagement

Stakeholder engagement is considered the most critical driver for B2B sharing (Frenken and Schor, 2017, Veronica et al., 2020). In the sharing economy, the resources accessed are often owned by external stakeholders. Stakeholder engagement aims to efficiently share information, experience, knowledge, and underutilized or idle resources such as equipment and materials (Habibi et al., 2016; Lindsey et al., 2018). Veronica et al. (2020) argued that stakeholder engagement in B2B improves

resource utilization productivity and efficiency, leading to higher revenue and lower costs for firms. Boysen et al. (2019) suggested that stakeholder engagement influences firms to participate in B2B sharing, although they do not have prior connections with one another. Moreover, firms participate in external sharing practices for short interactions, cash trades, and profit objectives (Muñoz and Cohen, 2017). Hence, B2B sharing in JPS, due to its social and technical aspects, emphasizes community-based interactions and dependence on stakeholder engagement with digital platforms.

2.3.6. *Perceived Organizational Utility*

The perceived organizational utility includes brand equity, supply-side flexibility, product development skill, reduced supply dependency, and interactive platforms (Linder and Williander, 2017; Bocken et al., 2016; Onete et al., 2018). Organizational utility comprises metrics that can be interpreted financially and are thus more relevant for shareholders hoping to gain a competitive advantage (Boysen et al., 2019). Generally, businesses believe that new techniques and strategies are riskier and less appealing (Cheng et al., 2019). Li et al. (2018) argued that procuring services from peer organizations in B2B sharing intensifies dependency on service providers and platform providers. In B2B sharing, organizational capabilities such as management of networks, collaboration with partners, and interactive platforms foster the implementation of proactive socio-ecological practices (Linder and Williander, 2017; Onete et al., 2018). Thus, B2B sharing consists of various utilities and provides organizations with multiple nonprofit and profit incentives.

2.4. Proposed Method

Hu et al. (2019) used exploratory factor analysis and confirmatory factor analysis to examine the relationship between sustainable practices applied by sharing economy platforms and customers' intention to in adopt the sharing economy services/products. Toni et al. (2018) used qualitative and quantitative methods to explore the relationship between sustainable practices and collaborative consumption in B2B sharing. Hofmann et al. (2019) employed a qualitative research approach to examine the community's role in the sharing economy and the subsequent implications of public values. Govindan et al. (2020) applied the best worst method and DEMATEL to develop B2B sharing economy barriers.

Previous studies have approached B2B sharing by applying quantitative assessment but have neglected to address the validity of the B2B sharing drivers and lack exploration of the hierarchical relationships between the drivers. Furthermore, the linguistic preferences' fuzziness in experts' opinions is ignored. The development and implementation using quantitative information make it hard to understand B2B sharing economy drivers (Rose et al., 2018; Tura et al., 2019; Veronica et al., 2020). Hence, in this study the use a combined fuzzy set theory, FDM, and FDEMATEL to determine the valid attributes and the causal associations between them. This study is implemented in two stages. In the first stage, FDM is conducted to eliminate invalid criteria based on experts' opinions and to arrive at a valid set of attributes (Bui et al., 2020). Fuzzy set theory is used to transform experts' linguistic preferences into quantitative values and assert their qualitative characteristics under uncertainty (Tseng et al., 2020; Negash and Hassan, 2020). In the second stage, the FDEMATEL method is adopted to integrate B2B drivers in JPS in a hierarchical framework by identifying and examining the relationships between the drivers (Tseng et al., 2020).

2.5. Proposed Measures

This study proposes a set of attributes that comprises six aspects and 43 criteria, including environmental protection (A1), economic benefits (A2), social development (A3), technological performance (A4), stakeholder engagement (A5), and perceived organizational utility (A6), as indicated in Table 1.

Environmental protection (A1) has a significant return in JPS; however, it might be costly in the initial stage of B2B sharing. Firms must formulate and implement policies on environmental protection

Table 1. Initial proposed aspects and criteria

Aspect	Criteria	Reference
(A1) Environmental Protection	IC1 Reduces materials consumption	Kim et al., 2018; Dyck and Silvestre, 2018; Zhang et al., 2019; Li et al., 2019; Tura et al., 2019; Hu et al., 2019; Laukkanen and Tura, 2020
	IC2 Reduces wastes	
	IC3 Increase resource efficiency	
	IC4 Refrain excessive consumption	
	IC5 Environmental wellbeing	
	IC6 Minimize negative environmental impacts	
	IC7 Partnership	
(A2) Economic Benefits	IC8 Business development opportunities	Dong et al., 2016; Ul Musawir et al., 2017; Kim et al., 2018; Onete et al., 2018; Li et al., 2019; Berkowitz and Souchaud, 2019; Laukkanen and Tura, 2020; Jabbour et al., 2020
	IC9 Innovation and synergy	
	IC10 Production and transportation cost	
	IC11 Organizational financial objective	
	IC12 Investors objectives	
	IC13 Generate value	
	IC14 Increases cost-efficiency	
	IC15 Incentives support	
IC16 Multi stakeholders collaboration		
(A3) Social Development	IC17 Social relationship	European Commission, 2014a; Hamari et al., 2016; Kim et al., 2018; Dabbous and Tarhini, 2019; Cheng et al., 2019; Tura et al., 2019; Laukkanen and Tura, 2020; Govindan et al., 2020
	IC18 Willingness to change	
	IC19 Develop culture	
	IC20 Social capital	
	IC21 Workplace and vitality	
	IC22 Market internationalization	
	IC23 Ethical principles	
IC24 Network development		
(A4) Technological Performance	IC25 Information management technology	Ellen MacArthur Foundation, 2013; Ghisellini et al., 2016; Rose et al., 2018; Dabbous and Tarhini, 2019; Tura et al., 2019; Govindan et al., 2020
	IC26 Improves existing operation	
	IC27 Less probability of risks	
	IC28 New technologies	
	IC29 Digital platforms	
	IC30 Need for expertise	
(A5) Stakeholder engagement	IC31 Improve services	Habibi et al., 2016; Acquier et al., 2017; Muñoz and Cohen, 2017; Kim et al., 2018; Lindsey et al., 2018; Tura et al., 2019; Veronica et al., 2020
	IC32 Share information	
	IC33 Share equipment and materials	
	IC34 Share knowledge and experience	
	IC35 Rent/ lease equipment and materials	
	IC36 Outsourced labor service	
IC37 Open collaboration		

continued on following page

Table 1. Continued

Aspect	Criteria	Reference
(A6) Perceived Organizational Utilities	IC38 Company brand	Bocken et al., 2016; Linder and Willander, 2017; Tura et al., 2018; Onete et al., 2018; Boysen et al., 2019; Govindan et al., 2020
	IC39 Strategy and goals	
	IC40 Skills and capabilities	
	IC41 Management of networks	
	IC42 Reduces supply dependency	
	IC43 Interactive platforms	

facilities and environmentally friendly technology (Jabbour et al., 2020; Laukkanen and Tura, 2020). Reducing material consumption (IC1) and increasing conservational materials' usage are crucial concerns of B2B sharing in JPS (Zhang et al., 2019). Sharing underutilized resources, equipment, and employee skills helps organizations save resources and reduce waste (IC2) (Li et al., 2019). Laukkanen and Tura (2020) suggested that sharing services, by-products, and materials can increase resource efficiency (IC3) in B2B sharing. B2B sharing services in JPS can discourage excessive consumption (IC4) of materials and resources and contribute to environmental sustainability (IC5) by addressing biodiversity issues (Dyck and Silvestre, 2018; Kim et al., 2018). B2B sharing has the potential to minimize negative environmental impacts (IC6) and accomplish inclusive conservational purposes through a partnership (IC7) between industries (Hu et al., 2019).

Firms should promote the economic benefits (A2) of B2B sharing in JPS and sustain a balance between the organizational capabilities and the community's social development (Hu et al., 2019). B2B sharing tends to provide new business development opportunities (IC8) and markets and has the potential for innovation and synergy (IC9) opportunities in JPS (Dong et al., 2016). Due to the sharing of underutilized or idle resources, labor and equipment production and transportation costs (IC10) are minimal, which reduces the environmental impact (Jabbour et al., 2020). The policies, value system, responsibilities, and processes help companies to attain organizational financial objectives (IC11) and benefits partners and stakeholders, who can satisfy their investors' objectives (IC12) (Ul Musawir et al., 2017). Kim et al. (2018) found that B2B sharing tends to generate more value (IC13) as compared to ownership economies in JPS, and finding new revenue streams should increase cost efficiency (IC14) (Laukkanen and Tura, 2020). Onete et al. (2018) emphasized that organizations require external funding as incentive support (IC15) to confront the initial monetary disturbances when initiating JPS. Multiple stakeholders' collaboration (IC16) is a standard driver of any new business system, and B2B sharing is no exception (Berkowitz and Souchaud, 2019).

Social development (A3) plays a critical role in B2B sharing, strengthening relationships and developing cultural and social capital with partners. Dabbous and Tarhini (2019) claimed that a typical B2B sharing component offers opportunities to create social relationships (IC17) and in backing financial development between industries. Due to the favorable circumstances of B2B sharing, numerous industries are now willing to change (IC18) to this new framework and develop a shared culture (IC19) by pooling knowledge, experience, and equipment, which are considered beneficial (Hamari et al., 2016; Cheng et al., 2019). Kim et al. (2018) stated that B2B sharing is an alternative consumption paradigm that benefits social networks, subsequently building up social capital (IC20) for the firms. Collaboration, wellbeing, engagement, and productivity are related, creating a state of workplace vitality. B2B sharing can build workplaces and vitality (IC21) in JPS (European Commission, 2014a). Market internationalization (IC22) plays an essential role in increasing the pressure on the organization in finding traditional business alternatives (Tura et al., 2019). The social aspect refers to the accompanying ethical principles (IC23) through not damaging the social order and appealing to open communication and competition (Laukkanen and Tura 2020). B2B sharing helps

develop a network (IC24) between the parties involved in JPS; the network is beneficial mainly due to the proper communication channels (Govindan et al., 2020).

Technology is evolving exponentially, and its use disrupts existing social and business relationships and understandings. Technological performance (A4) has a synergistic effect on organization performance; however, technological innovation comes with costs, especially for JPS, which are mostly resource-constrained. Information management technology (IC25) has enhanced B2B sharing in JPS; hence, advanced technologies support the formation of new services, empower more well-organized processes, and improve existing operations (IC26) (Ellen MacArthur Foundation, 2013). B2B sharing leads to lower risk (IC27) because of mutual consent (Govindan et al., 2020). New technologies (IC28) such as blockchain, IoT, and digital platforms provide solutions for industries and help avoid problems related to information security (Ghisellini et al., 2016). Digital platforms (IC29) develop the accessibility and usability of services by offering web-based services among industries, thus improving the quality of services between partners (Rose et al., 2018). Sharing is relatively new in JPS; hence, unique expertise is needed (IC30) to handle the issues that may emerge (Govindan et al., 2020). Precise and consistent information on the utilizing technology intends to expand technology use and improve service (IC31) efficiency and performance (Dabbous and Tarhini, 2019).

In B2B sharing, stakeholder engagement (A5) contributes to resource efficiency, increasing revenues and lowering expenses for organizations. Sharing valuable information (IC32) with partner firms helps to establish cooperative relationships that develop social capital in JPS (Habibi et al., 2016). For B2B sharing in JPS, stakeholder engagement provides a platform for partners to share equipment and materials (IC33), as well as intangible assets such as knowledge and experience (IC34) (Acquier et al., 2017; Kim et al., 2018). In B2B sharing in JPS, organizations may rent/lease equipment and materials (IC35) and outsource labor (IC36) rather than hiring full-time workers (Muñoz and Cohen, 2017). Tura et al. (2019) claimed that a B2B sharing platform could increase knowledge and technological resources through open collaboration (IC37) and communication in JPS.

Perceived organizational utility (A6) constitutes the essential aptitudes that generate improvement in firms' activities and are relevant for shareholders to develop a competitive advantage. The firms can protect and strengthen the company image, enabling differentiation and company branding (IC38) in B2B sharing (Linder and Williander, 2017). Flexible decision-making and product/service development have changed the organizational structure, culture, strategy, and goals (IC39) (Bocken et al., 2016). Govindan et al. (2020) emphasized that employing B2B sharing involves personnel, skills, and capabilities (IC40), and other potential uses need to be explored. Management of the network (IC41) helps increase knowledge sharing, avoid conflicts of interest, and promotes network involvement within B2B sharing, which is important for JPS (Tura et al., 2018). B2B sharing can reduce supply dependency (IC42) through technological advancement and flexible production systems (Boysen et al., 2019). Interactive platforms (IC43) allow associates to connect and share underutilized or idle resources (Onete et al., 2018).

3. METHODS

The industrial background and methods used in this study, including the fuzzy Delphi method and fuzzy DEMATEL is discussed in this section.

3.1. Industry Background

Small batches of products characterize the small and micro-enterprise sector, and JPS systems designed for make-to-order manufacturing systems are common in India. India's JPS sector has grown to become a critical segment, contributing significantly to employment, technological advancement, innovation, trades, and the economy's comprehensive development (World Economic Forum, 2019). The sector represents 40% of exports and 45% of total manufacturing production, and contributes significantly to GDP (SME Chamber of India, 2020). The sector has shown rapid growth and integration with

major global value chains, contributes 7.09% of GDP, and provides job opportunities for 60 million individuals every year (Business Standard, 2019). The government's "Made in India" initiative seeks to attract more direct foreign investment in manufacturing.

However, the Indian JPS lacks capital and is challenged by external and internal issues such as a lack of innovation, demand fluctuation, poor infrastructure, low production capacity, a lack of technology, and a digital knowledge gap. B2B sharing in JPS is imperative for realizing its potential and ensuring the sustainable growth of make-to-order manufacturing systems. Thus, it is essential to model B2B sharing drivers to achieve sustainable development and competitive advantage. The government of India has made good progress in dealing with this hurdle of the JPS manufacturing system. However, to compete globally, India must choose to engage with B2B, sharing novel techniques in an industrial manufacturing system to fulfill their sustainable activities (Govindan et al., 2020). B2B sharing in JPS is still new in India; therefore, the existing drivers should be identified to support B2B sharing. Hence, this study explores B2B sharing drivers, particularly in India's JPS sectors, and an implementation framework is developed considering the JPS goals.

3.2. Data Collection and Sampling Procedure

The study was implemented in three steps (see Figure 1 for the study framework):

1. A proposed B2B sharing driver was collected from the literature, and focus groups consisting of industry professionals, doctoral students, and academicians were conducted. The experts were asked to assess the criteria based on their academic and practical understanding of JPS. Criteria without consensus were removed, and the 43 criteria considered as relevant are given in Table 1.
2. In the second stage, the Fuzzy Delphi panel consisted of 30 industry experts employed to validate the criteria found from the analysis in step 1. The respondents represent key decision-makers or hold top management positions and are involved in their organization's strategic alliances. Furthermore, the respondents have relevant B2B sharing experience and have a practical and academic understanding of JPS. The respondents for the assessment were selected based on purposive and convenient sampling. The 30 experts had job titles of senior manager (10), manager (4), assistant manager (6), production manager (2), project manager (3), associate manager (3), or general manager (2) with more than five years of experience in JPS (the respondents' profiles are given in Table 2). The Delphi panelists evaluated each criterion's level of importance using the linguistic scale shown in Table 3. They assessed the criteria based on their professional understanding, knowledge, and experience of JPS.
3. In the third stage, we conducted personal interviews with the experts from step 2. The aspects, criteria, and corresponding descriptions are provided, and the respondent evaluated the pairwise influence of aspects and the pairwise influence of criteria. From each respondent, a matrix of order 6 x 6 and 27 x 27 data was collected for the aspects and criteria, respectively.

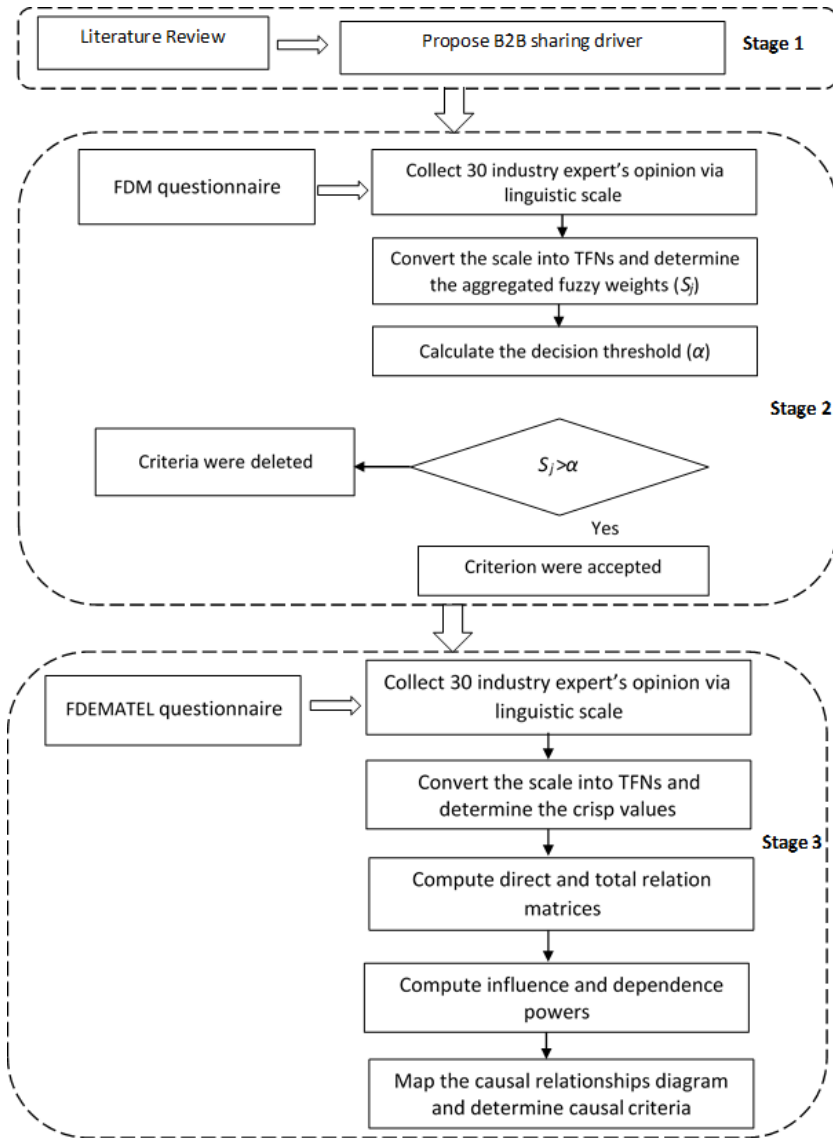
3.3. Analytical Methods

A mixed analytical approach involving FDM and the FDEMATEL method was applied for the data analysis.

3.3.1. Fuzzy Delphi Method

FDM is a combination of fuzzy set theory and the traditional Delphi method. The combination reduces the number of experts and survey time and provides an effective assessment of experts' knowledge (Bui et al., 2020). FDM converts a respondent's opinion into a triangular fuzzy number (TFN) (as shown in Table 3) to analyze the respondent's consensus and screen out nonessential criteria (Tseng et al., 2019). FDM involves the following steps: (1) collecting experts' opinions about each criterion's

Figure 1. Study framework including analytical steps



significance level; (2) analyzing experts' opinions on each criterion based on the threshold value; and (3) revising and deleting unnecessary criteria. The TFN value of criterion α assessed by expert b is given as $j = (x_{\alpha b}; y_{\alpha b}; z_{\alpha b}), \alpha = 1, 2, 3, \dots, n; b = 1, 2, 3, \dots, m$. The weight of element b , j_b is determined using the geometric mean aggregation method as follows:

$$j_b = \left\{ x_b = \min(x_{\alpha b}), y_b = \left(\prod_{\alpha=1}^n y_{\alpha b} \right)^{1/n}, \text{ and } z_b = \max(z_{\alpha b}) \right\} \quad (1)$$

Table 2. Experts' profile from Job Shop Production (JPS)

No.	Experts Position	Highest Qualification	Experience in JPS (Years)
1	Production manager	Master's degree	7
2	Project Manager	Master's degree	8
3	Assistant Manager	Master's degree	5
4	Project Manager	Master's degree	7
5	Senior Manager	Master's degree	8
6	Production manager	Bachelor's degree	7
7	Senior Manager	Master's degree	6
8	Senior Manager	Bachelor's degree	10
9	Assistant Manager	Bachelor's degree	5
10	Project Manager	Master's degree	8
11	Manager	Master's degree	6
12	Associate Manager	Master's degree	7
13	Senior Manager	Ph. D	8
14	Senior Manager	Ph. D	9
15	General Manager	Ph. D	9
16	Associate Manager	Master's degree	7
17	Assistant Manager	Master's degree	5
18	Senior Manager	Ph. D	8
19	Manager	Master's degree	10
20	Senior Manager	Ph. D	8
21	Assistant Manager	Master's degree	6
22	Manager	Master's degree	10
23	Assistant Manager	Master's degree	5
24	Senior Manager	Ph. D	10
25	Associate Manager	Master's degree	6
26	Assistant Manager	Master's degree	7
27	General Manager	Master's degree	10
28	Senior Manager	Ph. D	10
29	Manager	Master's degree	8
30	Senior Manager	Ph. D	10

Table 3. Triangular fuzzy numbers (TFNs) linguistic scale

Linguistic (Influence)	Fuzzy Numbers
Very High	(0.7, 0.9, 1.0)
High	(0.5, 0.7, 0.9)
Low	(0.3, 0.5, 0.7)
Very Low	(0.1, 0.3, 0.5)
No	(0.0, 0.1, 0.3)

We can defuzzify the aggregated fuzzy weights of each criterion (s_j):

$$S_j = \frac{x_b + y_b + z_b}{3} \quad j = 1, 2, 3, \dots, m \quad (2)$$

3.3.2. Fuzzy DEMATEL

The FDEMATEL method analyzes composite and complicated relationships (Lin et al., 2019), and was adopted to arrange the drivers in a hierarchical framework. The responses are presented on fuzzy linguistic scales, as shown in Table 3. The crisp values are transformed from fuzzy numbers using the defuzzification method based on fuzzy set theory. The FDEMATEL method involves normalization. For a group of n respondents, \tilde{z}_{ij}^f represents how the fuzzy weight of the i^{th} attribute affects the j^{th} assessed by the f^{th} member:

$$S = \left(s\tilde{z}_{1ij}^f, s\tilde{z}_{2ij}^f, s\tilde{z}_{3ij}^f \right) \\ = \left[\left(z_{1ij}^f - \min_{1ij}^f \right) / \Delta_{\min}^{\max}, \left(z_{2ij}^f - \min_{2ij}^f \right) / \Delta_{\min}^{\max}, \left(z_{3ij}^f - \min_{3ij}^f \right) / \Delta_{\min}^{\max} \right] \quad (3)$$

where:

$$\Delta_{\min}^{\max} = \max z_{3ij}^f - \min_{1ij}^f$$

We then compute the left (lt) and right (rt) normalized values (Equation (4)) and the total normalized crisp value (Equation (5)):

$$\left(slt_{ij}^n, srt_{ij}^n \right) = \left(sz_{2ij}^f / \left(1 + sz_{2ij}^f - sz_{1ij}^f \right), sz_{3ij}^f / \left(1 + sz_{3ij}^f - sz_{2ij}^f \right) \right) \quad (4)$$

$$s_{ij}^f = \left[slt_{ij}^f \left(1 - slt_{ij}^f \right) + \left(srt_{ij}^f \right)^2 \right] / \left(1 - slt_{ij}^f + srt_{ij}^f \right) \quad (5)$$

We next aggregate the subjective judgment for n assessors and calculate the synthetic value:

$$\tilde{z}_{ij}^f = \frac{1}{f} \left(\tilde{z}_{ij}^1 + \tilde{z}_{ij}^2 + \tilde{z}_{ij}^3 + \dots + \tilde{z}_{ij}^f \right) \quad (6)$$

Next, we obtained an initial direct relation matrix (IDRM), $IDRM = \left[\tilde{z}_{ij}^f \right]_{n \times n}$, and z_{ij} indicate the degree to which criterion i affects criterion j . We can standardize the IDRM $X = \left[X_{ij} \right]_{n \times n}$, $i, j = 1, 2, \dots, n$ as follows:

$$X = \omega \times Z \quad (7)$$

where:

$$\omega = \frac{1}{\max_{1 \leq i \leq f} \sum_{j=1}^f \tilde{z}_{ij}^f}$$

Then we obtained the total relation matrix as follows:

$$Y = \lim_{f \rightarrow \infty} (X + X^2 + \dots + X^f)^n = X(I - X)^{-1} \quad (8)$$

To map the causal relationships, an influential relation map is generated from the values of (D + R, D - R). The x-axis (D + R) represents “prominence” and shows importance. The y-axis (D - R) represents “relation” and sorts the criteria into cause and effect groups. If (D - R) is negative, it is in the effect group; if it is positive, it is in the causal group:

$$D = \left[\sum_{j=1}^n X_{ij} \right]_{n \times n} = [X_i]_{n \times 1} \quad (9)$$

$$R = \left[\sum_{j=1}^n X_{ij} \right]_{n \times n} = [X]_{1 \times n} \quad (10)$$

3.4. Analytical Steps

The analytical steps used in FDM and FDEMATEL methodology are illustrated below:

1. We used 43 criteria of B2B sharing drivers based on prior studies and conducted focus group discussions that followed a questionnaire for linguistic evaluation based on respondents' experience and knowledge of JPS.
2. Interviews were conducted to confirm the information's validity and improve the data source's reliability. The linguistic terms were transformed into their corresponding TFNs, as shown in Table 3. FDM analysis was conducted to eliminate invalid criteria by applying Equations (1) and (2).
3. We conducted interviews with the same experts to identify relationships between aspects and criteria for practical improvements in B2B sharing. The FDEMATEL method was utilized to analyze experts' linguistic preferences, which were converted into TFNs. The TFNs were then normalized into crisp values using Equations (3)–(5). Subsequently, we aggregated the subjective judgments from n respondents and calculated the synthetic value using Equation (6).
4. IDRМ was obtained and standardized using Equation (7), and the total relation matrix was obtained using Equation (8).
5. We created cause–effect relationship diagrams using Equations (9) and (10).

4. RESULTS

1. FDM was used to eliminate invalid criteria with a threshold of 0.625 by applying Equations (1) and (2). Hence, 27 criteria were accepted, and 16 were rejected. The accepted criteria were renamed and are presented in Table 4.

Table 4. Valid attributes for B2B sharing drivers in JPS

Aspects		Criteria	Experts Decision	
(A1) Environmental Protection	C1	Reduces materials consumption	0.779	Accepted
	C2	Reduces wastes	0.693	Accepted
	C3	Increase resource efficiency	0.779	Accepted
	C4	Environmental wellbeing	0.678	Accepted
(A2) Economic Benefits	C5	Business development opportunities	0.779	Accepted
	C6	Production and transportation cost	0.777	Accepted
	C7	Organizational financial objective	0.670	Accepted
	C8	Increases cost-efficiency	0.697	Accepted
(A3) Social Development	C9	Social relationship	0.687	Accepted
	C10	Willingness to change	0.659	Accepted
	C11	Develop culture	0.662	Accepted
	C12	Social capital	0.693	Accepted
	C13	Workplace and vitality	0.660	Accepted
	C14	Market internationalization	0.799	Accepted
	C15	Network development	0.693	Accepted
(A4) Technological Performance	C16	Improves existing operation	0.709	Accepted
	C17	New technologies	0.773	Accepted
	C18	Digital platforms	0.703	Accepted
	C19	Need of expertise	0.775	Accepted
(A5) Stakeholder engagement	C20	Share information	0.691	Accepted
	C21	Share equipment and materials	0.695	Accepted
	C22	Share knowledge and experience	0.703	Accepted
	C23	Outsourced labor service	0.710	Accepted
(A6) Perceived Organizational Utilities	C24	Company brand	0.694	Accepted
	C25	Skills and capabilities	0.670	Accepted
	C26	Management of networks	0.701	Accepted
	C27	Reduces supply dependency	0.695	Accepted
		Threshold	0.625	

2. Twenty-seven validated criteria were used to formulate the FDEMATEL questionnaire. The experts' evaluations of the relationships between the aspects and criteria were obtained on linguistic scales, as shown in Table 3. The driving and dependence power of the aspects were determined, as shown in Table 5.
3. Step 2 was repeated, and the driving and dependence power of the criteria were determined, as presented in Table 6.
4. The x-axis (D + R) represents "prominence," and the y-axis (D – R) represents "relation." The cause–effect diagram of the aspects was drawn based on (D + R) and (D – R) using Equations (9) and (10), and presented in Table 6. The cause–effect diagram of the aspects is mapped in Figure 2, which indicates that stakeholder engagement (A5), economic benefits (A2), and technological

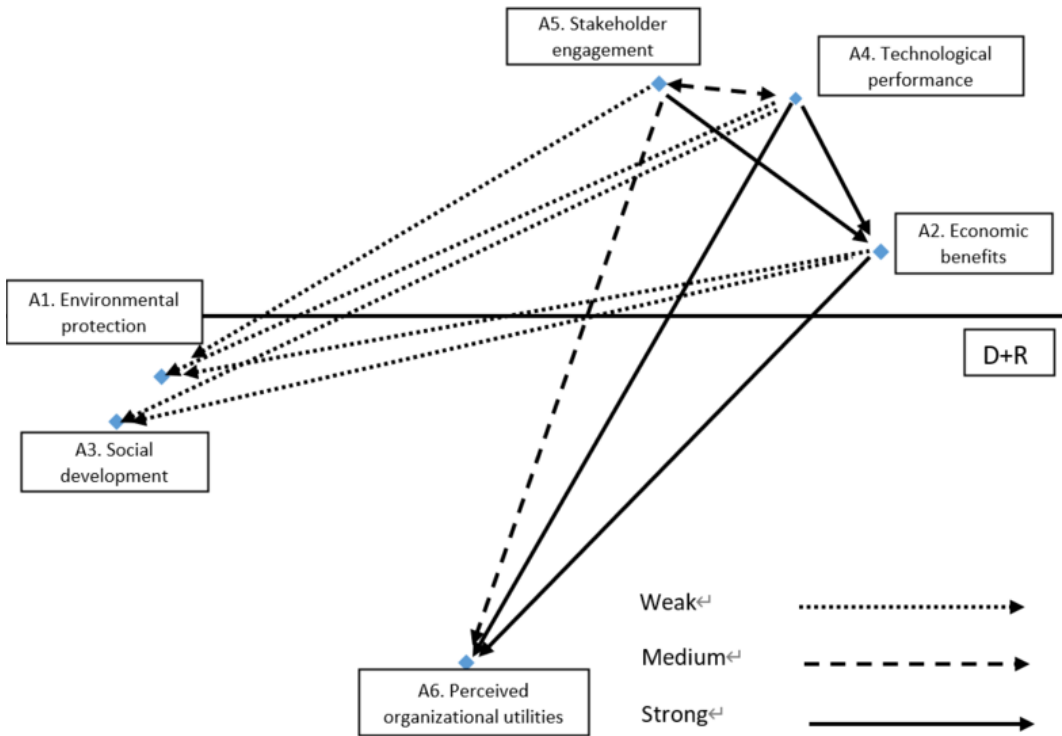
Table 5. Causal-effect interrelationship among aspects

	D	R	D+R	D-R
A1	15.266	15.487	30.754	(0.221)
A2	17.190	16.955	34.145	0.235
A3	15.078	15.466	30.544	(0.389)
A4	17.268	16.472	33.740	0.796
A5	16.974	16.122	33.095	0.852
A6	15.457	16.729	32.186	(1.273)

Table 6. Causal-effect interrelationship among criteria

	D	R	D+R	D-R
C1	8.469	8.440	16.908	0.029
C2	8.356	8.298	16.653	0.058
C3	8.295	8.480	16.776	0.185
C4	9.253	8.517	17.770	0.736
C5	8.806	10.148	18.954	1.342
C6	9.015	8.648	17.662	0.367
C7	8.051	9.444	17.495	1.393
C8	9.389	9.220	18.609	0.169
C9	8.854	8.791	17.645	0.064
C10	9.520	5.774	15.294	2.500
C11	8.504	9.053	17.557	0.549
C12	7.811	9.314	17.125	1.503
C13	9.899	9.022	18.921	0.878
C14	9.325	10.223	19.547	0.898
C15	9.322	9.658	18.981	0.336
C16	9.671	9.914	19.585	0.243
C17	9.512	9.259	18.771	0.253
C18	9.468	8.609	18.078	0.859
C19	9.201	6.741	15.942	2.460
C20	9.676	8.255	17.930	1.421
C21	9.235	9.261	18.496	0.025
C22	8.442	10.070	18.512	1.628
C23	9.928	8.308	18.236	1.620
C24	7.368	10.095	17.464	2.727
C25	8.347	8.126	16.473	0.221
C26	8.777	9.554	18.331	0.777
C27	8.745	10.018	18.762	1.273

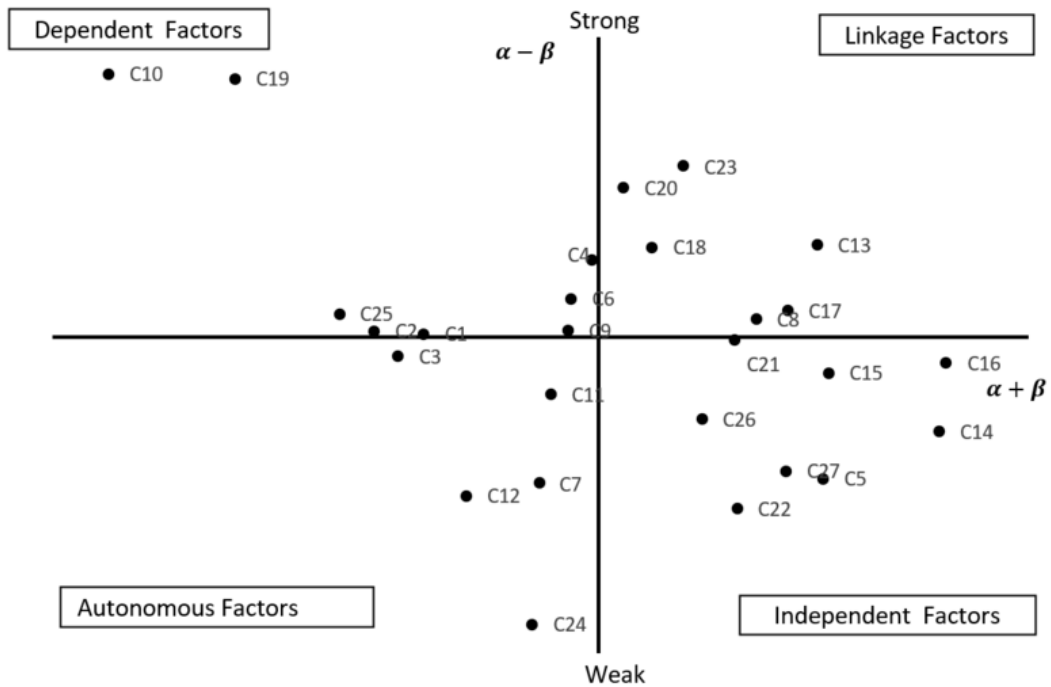
Figure 2. Cause and effect diagram for aspects



performance (A4) belong to the cause group. Environmental protection (A1), social development (A3), and perceived organizational utility (A6) fall into the effect group. The relationship between aspects is as follows: stakeholder engagement has a strong effect on economic benefits and a medium impact on technological performance and perceived organizational utility, but a weak influence on environmental protection. Technological performance has a strong effect on perceived organizational utility and economic benefits and a weak effect on environmental protection and social development. Subsequently, economic benefits have a strong effect on perceived organizational utility and a weak impact on environmental protection and social development.

5. Similarly, a cause–effect diagram of the criteria is presented in Figure 3, which indicates that the criteria fall into four separate quadrants. Quadrant 1, or the linkage/causal criteria, possesses strong driving power and high importance to the B2B sharing system. Quadrant 2, or the dependent criteria, has strong driving but lower importance to the system. Quadrant 3, or the autonomous criteria, has weak dependence and is relatively disconnected from the system. Quadrant 4, or the independent criteria, can only be improved indirectly through the quadrant 1 criteria. The results show that C23, C20, C18, C13, C17, and C8 belong to quadrant 1, or the linkage criteria; C10, C19, C4, C6, C25, C2, C1, and C9 are in quadrant 2, or the dependent criteria; C3, C11, C7, C12, and C24 belong to quadrant 3, or the autonomous criteria; and C21, C15, C16, C26, C1, C27, C5, and C22 belong to quadrant 4, or the independent criteria. However, the outsourced labor service (C23), share information (C20), digital platform (C18), workplace and vitality (C13), new technologies (C17), and increased cost efficiency (C8) have the highest importance among the linkage criteria. The main criteria for B2B sharing drivers in JPS lie within the cause group. The causal criteria include outsourced labor service (C23), shared information (C20), digital platform (C18), workplace vitality (C13), new technologies (C17), and increased cost

Figure 3. Cause and effect diagram for criteria



efficiency (C8). Quadrant 1 criteria with both strong dependent and driving power are essential for industry to monitor and evaluate practical improvements in JPS.

5. DISCUSSION

The theoretical and managerial implications of the study are discussed in this section.

5.1. Theoretical Implications

This study contributes to the literature by providing a theoretical understanding of the relationships between aspects of the B2B drivers in JPS. The results indicate that stakeholder engagement (A5), technological performance (A4), and economic benefits (A2) are the drivers that support B2B sharing in JPS.

It is found that stakeholder engagement (A5) is the most vital causal attribute that supports B2B sharing. In B2B sharing, stakeholder engagement is related to technology performance and positively impacts on environmental protection, economic benefits, and social development to support the transformation from a traditional to a modern, sustainable industry (Li et al., 2019). Stakeholder engagement creates a mutually beneficial platform for organizations to strengthen relationships in JPS. The results also confirm that stakeholder engagement in B2B sharing improves resource utilization efficiency, which leads to higher economic benefits and lower costs for organizations and enhances organizational utility (Li et al., 2019; Veronica et al., 2020). Stakeholder engagement helps organizations to manage inventory, supply raw materials, and reduce supply dependency. Stakeholder engagement involves the interaction and participation of unfamiliar organizations in sharing underutilized or idle resources such as information, knowledge, experience, and labor services to achieve monetary benefits and to reduce the need for individual ownership (Lindsey et al., 2018).

Hence, in B2B sharing, stakeholder engagement has become increasingly important in helping to achieve an organization's long-term financial objectives by moving from individual ownership to partnership in JPS.

The technological performance (A4) is a causal aspect of B2B sharing drivers in JPS. It has a strong effect on economic benefits and perceived organizational utility and a moderate impact on stakeholder engagement. Technological performance improves the organization's utility, including brand equity and product development skills, and has direct economic implications, making it more relevant to shareholders and the helping an organization to gain a competitive advantage (Onete et al., 2018; Boysen et al., 2019). Technological performance plays a significant role, especially in developing economies, and the advancement of innovation makes B2B sharing practices more competitive between organizations (Kim et al., 2018). The results also emphasize that new technology provides opportunities to share underutilized or idle resources that create economic benefits and influence organizational networks in B2B sharing (Toni et al., 2018; Tura et al., 2019). Technological performance and digital platforms can potentially address uncertainties in B2B sharing that can help an organization make its operations more competent and efficient in JPS. The technological performance improves existing operations and enhances the appeal of B2B sharing in JPS, leading to more extensive collaboration (Kim et al., 2018). However, B2B sharing practices typically face a lack of technological resources and external funding in the early phases. These challenges can be mitigated through mutual consent and open collaboration between organizations.

Economic benefits (A2) are another causal aspect of B2B sharing drivers in JPS; they have a strong effect on perceived organizational utility and a weak effect on environmental protection and social development. B2B sharing is an economic system in which firms share underutilized or idle resources to decrease resource consumption and achieve organizational financial objectives. However, high costs related to technological advancement and economic uncertainty still exist in JPS, but B2B sharing practices can help to alleviate them. Technology is a driver and prerequisite for economic benefits. Economic gains depend on the technological infrastructure that provides open collaboration, accessible offerings, and the efficient usage of underutilized or idle resources. The results suggest that B2B sharing is a collaborative practice in which economic benefits play an important role in gaining trust and building business relationships to attain a sustainable economy that stimulates the future development of JPS (Hofmann et al., 2019). B2B sharing practices in JPS provide business development prospects, reduce production and transportation costs, and increase cost efficiency to enhance organizations' utility. B2B sharing has become an attractive platform that offers opportunities to support economic growth and to establish a sustainable social relationship between organizations. In JPS, stakeholder engagement, technological performance, and economic benefits need to be recognized as important.

5.2. Managerial Implications

This study provides practical suggestions for managers to improve B2B sharing practices in JPS in India. The important causal criteria are increased cost efficiency (C8), workplace vitality (C13), new technologies (C17), a digital platform (C18), shared information (C20), and outsourced labor (C23).

B2B sharing is correlated with cost efficiency (C8) and a reduction of excess consumption and production. It is found that B2B sharing in JPS delivers business development opportunities that decrease manufacturing and transportation costs and increase cost efficiency to improve organizations' utility. Cost efficiency can be attained by absorbing demand fluctuation, low production capacity utilization, high production costs, and product delivery unreliability. Hence, JPS resources can be utilized effectively to find new income streams, reduce waste, improve technologies, and collaborate with partners in JPS. B2B sharing discourages excessive consumption, promotes environmental protection, and allows for efficient utilization of resources in JPS. B2B sharing in JPS provides business development prospects, reduces production and transportation costs, and increases cost efficiency to enhance organizational utility.

Workplace vitality (C13) is a critical asset of firms and has a strong connection with job satisfaction, leading to a better bottom line in JPS. Workplace vitality requires employee collaboration, wellbeing, engagement, and productivity. Furthermore, B2B sharing in JPS increases the complexity of work, technology, mobility, and demands on cooperation and productivity. Hence, an environment in which employees feel good about their job, themselves, and their organization is essential for achieving results. This study suggests that firms should foster a friendly workplace environment to generate long-term values that will allow them to succeed in a competitive and dynamic B2B sharing environment.

The advancement of technologies and information systems makes B2B sharing practices more appealing and provides a new sustainability path. It is suggested that technology can help JPS focus on core activities, ease of doing business, enhanced productivity, and participation in B2B sharing. New technologies (C17) provide interactive platforms for firms to interact and connect with partners. They play a crucial role in B2B sharing and help firms to share underutilized or idle resources, knowledge, and experience with unfamiliar partners. New technologies help B2B sharing to influence capital in smarter ways. The Indian JPS lacks capital and are challenged by external and internal issues such as a lack of innovation and technology, poor infrastructure, and a digital knowledge gap.

In India, the rapid development of digital technology allows JPS to transform from a traditional to a modern, sustainable industry. Digital technology development presents enormous opportunities to incorporate B2B sharing in conventional business models, especially when organizing production firms. Digital platform (C18) interfaces with firms to share underutilized or idle resources with new partners lessens material utilization and improves efficiency. The rapid changes in the business landscape due to the digital revolution have caused dismay in the JPS sector. In B2B sharing, digital platforms improve the accessibility and usability of underutilized or idle resources and services between firms, thus developing business relationships among partners. Digital platforms lessen the exchange cost and allow JPS to undertake practices remotely by sharing underutilized or idle resources.

Sharing valuable information (C20) with associates/partners helps create supportive relationships that develop societal assets in JPS. These criteria play a significant role in B2B sharing, as sharing relevant information between partners enables firms to encourage practices that prioritize access over ownership in JPS. Currently, JPS lacks the willingness to share valuable information and facilities because of conventional business thinking; the perception is that sharing is riskier and less comfortable for manufacturing organizations. Sharing information and knowledge improves productivity and innovation, opens up opportunities for alliances, builds a complex labor force, allows for internal enhancements, and improves practices in JPS.

Outsourcing labor (C23) refers to employing workers or groups of people outside the organization to perform specific tasks rather than hiring full-time workers. In India, the JPS sectors' sustainability is challenged by low production capacity and high production costs. Outsourcing labor in JPS brings firms opportunities to look for reliable associates, thereby decreasing costs and enhancing firms' outcomes. Outsourcing labor helps firms to keep costs relatively low as compared to full-time labor or permanent employees. Furthermore, B2B sharing is relatively new in JPS; firms require sharing expertise to handle issues that may emerge over time. In B2B sharing, outsourcing labor permits firms to centralize knowledge into a single center; the knowledge can be outsourced within the B2B sharing community. Outsourcing provides firms with a measure of economy and cost construction so as to gain competitive advantages in the global market, and develop their brand and business. Hence, this study suggests that outsourcing labor allows JPS to control capital financial plans, intensifies efficiency, emphasizes core business, and decreases organizational risk.

6. CONCLUSION

B2B sharing is on the rise and is playing a vital role in the industrial manufacturing sector. However, prior studies have neglected to examine B2B sharing drivers in JPS from sustainability, organizational

efficiency, and stakeholder engagement perspectives. Furthermore, in previous studies, the relationships between the B2B sharing drivers with linguistic preferences are neglected. In this study, we have assessed the following attributes in JPS: environmental protection, economic benefits, social development, technological performance, stakeholder engagement, and perceived organizational utility. We employed fuzzy set theory, FDM, and FDEMATEL to provide guidelines for implementing B2B sharing in JPS. Fuzzy set theory was applied to collect experts' linguistic preferences with qualitative information and translate it into comparable crisp values. FDM was conducted to eliminate invalid criteria, and the FDEMATEL method was used to determine the relationships between the attributes. Hence, this study is a pioneering work to provide guidelines for implementing B2B sharing in JPS, as previous studies lack an exploration of the validity of the B2B sharing drivers and the hierarchical relationships between them.

A set of B2B sharing drivers in JPS comprising six aspects and 27 criteria was validated. This study showed that stakeholder engagement, economic benefits, and technological performance are the causal aspects. These aspects play a central role in B2B sharing drivers in JPS because their effects are strong in B2B sharing. The results indicated that stakeholder engagement and technological performance are important causal aspects, and economic benefits act as a mediating aspect that drives the organizational utility in JPS. The 27 criteria were divided into cause and effect groups. The top causal criteria were identified as outsourced labor, shared information, a digital platform, workplace vitality, new technologies, and increased cost efficiency. These criteria provide practical solutions for managers looking to improve B2B sharing practices in JPS in India.

The contributions of this study can be understood in terms of theory, measures, and industry. In terms of the measures, this study develops a valid set of B2B sharing drivers applied to determine the causal relationships. A causal framework composed of environmental protection, economic benefits, social development, technological performance, stakeholder engagement, and organizational utility was developed for JPS sharing using a hierarchical structure with linguistic preferences from a theoretical perspective. In terms of industry, managers can adopt the criteria to monitor and evaluate practical improvements. We present a set of B2B attributes to recognize cause–effect relationships among attributes created based on linguistic preferences and qualitative information of experts in JPS. Specifically, stakeholder engagement, economic benefits, technological performance, and the top six causative criteria can help decision-makers to improve performance in JPS.

This study has a few limitations. First, the presented attributes were collected from the literature, which could lead to an overdependence on existing studies. Second, the study was limited to 30 experts in India, so the results might not apply to other countries. Therefore, more attributes should be included in future studies to comprehensively assess the relationships between attributes. A comparison study is required in the future to obtain more appropriate and conclusive results.

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