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Decoding start-up failures in Indian start-ups: Insights from Interpretive Structural Modeling and Cross-Impact Matrix Multiplication Applied to Classification

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Abstract

PURPOSE: *Start-ups are widely acknowledged as crucial catalysts for innovation and drivers of economic progress. However, their vulnerability to failure continues to pose a persistent and significant obstacle. In light of this, the study intends to ascertain the various elements responsible for the elevated incidence of start-up failures and examine their contextual associations. It further aims to establish the hierarchical structure and identify the crucial factors of start-up failure.* ***METHODOLOGY:*** *The paper uses the Interpretive Structural Modeling (ISM) approach to determine the structural hierarchy and interconnections among the causes of start-up failures identified through the comprehensive analysis of existing literature and experts' opinions. MICMAC (Cross-Impact Matrix Multiplication Applied to Classification) analysis is also being utilized to categorize these identified failure causes into autonomous, independent, dependent, and linking factors by their driving and dependency powers.* ***FINDINGS:*** *A structural framework depicting the interrelationships among the factors has been derived, showing the failure factor, 'poor market positioning' factor at the highest level, and the 'lack of entrepreneurial efficiency' at the lowest level of the model. The results also revealed that lack of entrepreneurial efficiency, poor management, and external environmental issues are the most significant independent factors upon which all other failure factors rely. It also categorizes 'poor market positioning' as the dependent factor, signifying its passive role in the failure of start-ups.* ***IMPLICATIONS:*** *As previous literature has discussed the various factors responsible for the failure of start-ups in isolation, the current study fills out the gap in the literature by establishing linkages among those factors. The study's insights emphasize the value of effective management teams and entrepreneurial skills in averting start-up failures. It highlights the importance of skill development and mentorship to enhance the capabilities of entrepreneurs and their teams. Furthermore, the research indicates that policymakers and support groups can create focus initiatives addressing issues like market validation, team dynamics, and financial management to enhance the start-up environment. These initiatives may encompass entrepreneurship training, financial assistance, and mentorship through the 'Start-up India' Program, Bharat Fund platform, etc.*
ORIGINALITY AND VALUE: *Previous studies on entrepreneurial failure are based on AHP (Analytical Hierarchical Process), content analysis, and quality management methodologies. This is potentially the first study using the ISM-MICMAC approach that explores the complex world of start-up failures in India and illustrates the relative influence and interdependence of various failure factors of start-ups through a hierarchical model.*

Keywords: *start-ups, failure factors, start-up failures, Interpretive Structural Modeling, ISM, Cross-Impact Matrix Multiplication Applied to Classification, MICMAC, entrepreneurial efficiency, market positioning, management competency, external environmental issues, failure prevention strategies, Indian, entrepreneurship skill development.*

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INTRODUCTION

Over the last two decades, a noticeable surge in academic research on entrepreneurship has contributed to advancing a solid theoretical foundation within the field. Entrepreneurship has significant importance in fostering economic growth and facilitating the overall development of an economy through the creation of more employment opportunities, the enhancement of national production, the attainment of international competitiveness, and the advancement of the quality of life (Arenius & Minniti, 2005; Koellinger & Thurik, 2012). Entrepreneurial start-ups can create fresh job opportunities (Singh, 2017) and serve as platforms for the exploration and application of creative potential. Start-ups are seen as human organizations that develop novel goods or services while actively seeking viable business models within very unpredictable circumstances (Blank, 2013; Ries, 2011). These companies are in their initial stages of operations and are based on innovation and creativity (Skala, 2019). They engage in the process of "technovation," combining technology and innovation capabilities (Kalyanasundaram, 2018). Technovation is the synergistic process by which organizations combine the innovative and technological capacities of their operations and produce new products, services and processes (Ndesaulwa & Kikula, 2016). Start-ups are growing rapidly all over the world. They have emerged as a significant source of innovation, creativity, job opportunities, and economic growth for developed, as well as developing economies (Franco & Haase, 2010; Liao et al., 2008).

The start-up ecosystem in India is making a drastic improvement in terms of the number of start-ups, a more conducive environment, better investment, etc. It exhibits a wide array of innovations that merge technology-centric solutions with grassroots advancements. As of May 31, 2023, India had over 99,000 DPIIT (Department for Promotion of Industry and Internal Trade)-recognized enterprises distributed over 670 districts, establishing India as the 3rd largest start-up globally (Invest India, 2022). The Indian start-up ecosystem has experienced tremendous expansion over the past few years (2015-2022), with a 15-fold increase in total funding, a 9-fold increase in investors, and a 7-fold expansion in the number of incubators (Start-upindia.gov.in, 2024). It has demonstrated its capacity to generate globally competitive firms with billion-dollar values by having more than 100 start-ups as Unicorns (BusinessToday, 2023). Unicorns are start-up companies with a valuation of more than one billion US dollars. The entry of more start-ups into the market leads to further expansion in entrepreneurship, employment, and the economy (Acs & Szerb, 2007; Decker et al., 2014). To drive economic growth, more start-ups are needed to evolve into larger enterprises (Valliere & Peterson, 2009; Wennekers et al., 2002). However, according to Kalyanasundaram (2018), the entrepreneurial path of transforming ventures into established large corporations is fraught with numerous personal, cultural, financial, and legal obstacles. It is very common for new businesses to start up everywhere, but it is also true that there are failures everywhere. According to (Pena, 2002), since start-ups often have a poor survival rate, many are vulnerable to the hardships of failure. According to a study conducted by Forbes magazine in 2015, it was noted that around 90% of start-ups experience failure within the initial five years of their establishment in the United States (Patel, 2015). This tendency is also evident in the Indian setting (Cherian, 2017; Sreekumar et al., 2022). The scenario in other economies exhibits similar characteristics (Calderón et al., 2019; DemandSage, 2024; Devece et al., 2016; Start-up Genome, 2022).

The phenomenon of entrepreneurial failure has received significant scholarly attention and has emerged as a crucial subject in recent times (Klimas et al., 2020). The substantial incidence of failure in start-up ventures, estimated to be about 90% worldwide, is a significant concern that warrants careful consideration (Bajwa et al., 2017; Cotterill, 2012; Shepherd et al., 2000). The term 'start-up failure' or 'entrepreneurial failure' is a multidimensional concept (Johnson, 2010) that typically means the discontinuation of activities or the closure of a firm, resulting from an incapacity to attain enduring expansion, profitability, or feasibility in the market (Jenkins et al., 2014; Rodrigues & Stevenson, 2013). The consequences of entrepreneurial failure transcend the boundaries of the firm and exert a significant impact on employment and the overall economy. Timely help and minimal effort might potentially rescue several failing firms from imminent collapse (Al-Alawi et al., 2023). At the macroeconomic level, the reduction of failure rates can considerably impact the success of both enterprises and entrepreneurs in their endeavors to establish and develop start-ups. At the micro level, pinpointing the reasons for failure may be useful in creating reliable procedures, minimizing the socioeconomic costs of failure, and providing future entrepreneurs with valuable insights (Singh et al., 2015).

Existing literature has extensively examined the multitude of elements contributing to the failure of start-ups. Some of the commonly identified factors include lack of financial resources, inadequate sales, insufficient market demand, poor business development strategies, and technological difficulties (Goswami et al., 2023; Pisoni et al., 2020). Studies have also mentioned the impact of inexperienced entrepreneurial teams, competition, limited resources, poor business planning,

inadequate government backing, and legal, accounting, and tax concerns (Denton, 2020; Nigbor-Drożdż & Łukasiński, 2023; Santisteban et al., 2022). Prior research has predominantly concentrated on pinpointing the specific failure elements of start-ups and studying them in isolation. It is evident that a single element is typically not solely responsible; instead, a multitude of interconnected forces are responsible for start-up failures (Al-Shami et al., 2019). However, there is a dearth of knowledge about the hierarchical connections and dependencies among those factors. Therefore, to fill these gaps, the present study examines the factors that lead to start-up failures, creates interconnecting links between them, and constructs a hierarchical theoretical framework among these contextual variables. Here, the word 'contextual' means interrelated within the particular context or environment that surrounds start-up failures rather than being distinct. The study presents a thorough structural framework that facilitates a more holistic understanding of the dynamics underlying start-up failures. The research questions (RQs) proposed for the study are:

RQ1: What are the crucial factors that explain the failure of start-ups?
RQ2: What connections exist between the factors identified by the MICMAC method?
RQ3: What is the hierarchical structure of the contextual/context-specific variables that provide strengthening levels according to dependence and driving force?

The study utilizes the ISM (Interpretive Structural Modeling) and MICMAC (Cross-Impact Matrix Multiplication Applied to Classification) techniques. The ISM approach is suitable for analyzing complex interconnections among factors and identifying their hierarchy (Thennal VenkatesaNarayanan et al., 2021). It efficiently addresses the intricate issues, making it an ideal choice for the present study (Goel, Kumar et al., 2022). Similarly, The MICMAC approach is deemed appropriate due to its ability to categorize components as independent, dependent, autonomous, or linked, identifying their impact inside intricate systems (Choudhary et al., 2022). This categorization is relevant for the study because it facilitates the comprehension of the hierarchy of components and adds to a thorough investigation of the dynamics and interactions found in entrepreneurial environments.

This research study makes a noteworthy scholarly addition to the established body of information within the realm of entrepreneurship by expanding beyond the single-variable studies found in previous studies. Outlining the interrelationships and interdependencies among the factors, the study seeks to provide a distinct viewpoint on the intricate realm of start-up failures. It identifies crucial factors of start-up failure and provides actionable information for practitioners to prioritize areas requiring attention to decrease start-up failures. The present research aims to provide entrepreneurs, investors, and policymakers with valuable insights regarding start-up failure factors, thereby, facilitating better decision-making and nurturing a supportive start-up ecosystem. Though the present study originates from within the Indian context, the observations and suggestions of the study align with common issues faced by start-ups worldwide, making the findings applicable and adjustable to the global setting. Practitioners throughout the globe may adapt the priority tactics, emphasize skill development, and utilize hierarchical connection insights to improve the success of start-ups.

The present study has been structured as follows: The next section describes and highlights the literature relevant to contextual determinants of start-up failure. Subsequently, the methodology adopted in this paper is outlined, with the following sections delving into the results and discussion part. Then, the theoretical and practical implications are elaborated upon. Lastly, the research concludes with a discussion of its limitations and future directions.

LITERATURE REVIEW

Entrepreneurial or start-up failure has emerged as a significant area of research, but there are still several uncertainties regarding understanding this field (He et al., 2018; Jenkins & McKelvie, 2016). Start-up failure does not have any standard definition in the literature, and it is defined as a multidimensional concept. In broad terms, it involves discontinuation or termination of a firm. But, in specific terms, start-up failure is defined as per three different perspectives (Lattacher & Wdowiak, 2020). First, few researchers define start-up failure as the complete withdrawal of the business from a particular market. They consider market persistence as a fundamental factor in determining business failure (Perkins, 2014). The second lens examines organizational failure, which refers to the termination of a firm (Bruno et al., 1992; He et al., 2018; Singh et al., 2015). This dimension generally encompasses financial terms such as bankruptcy, liquidity, discontinuity, and death (Jenkins et al., 2014; Rodrigues & Stevenson, 2013). It also includes cases when enterprises have not yet achieved insolvency but experience financial losses and lack economic viability (Ucbasaran et al., 2013). Lastly, the individual

perspective emphasizes failure as the failure to meet objectives subjectively recognized by the entrepreneur, irrespective of the company's survival (Chermack et al., 2007; Jenkins et al., 2014; Ucbasaran et al., 2013). The present study considers the viewpoint of the second group and describes start-up failure as the closure or discontinuance of a firm due to failure to meet financial or economic viability (Lattacher & Wdowiak, 2020).

Existing literature shows that there are multiple reasons responsible for the failure of new firms known as start-ups. Research has studied and classified these factors from different perspectives. For instance, some studies have classified failure reasons as objective-subjective elements (Jenkins & McKelvie, 2016), while others have highlighted environmental issues (Franco et al., 2021; Khelil, 2016) or individual (Rahman et al., 2020) and organizational viewpoints (García-Ramos et al., 2017; Klimas et al., 2021). Some scholars have classified them as deterministic-nondeterministic-emotional (Khelil, 2016; Mellahi & Wilkinson, 2004) and controllable-uncontrollable categories (Kasema, 2021). However, these failure factors are majorly categorized as internal and external elements (Klimas et al., 2021; Zacharakis et al., 1999), where internal causes are under the direct control of the firm, and external causes are beyond the firm's control (Atsan, 2016). The absence of a clear goal and competent entrepreneurial education, insufficient institutional funds, flaws in the business model, lack of marketing expertise and managerial experience, poor management, low-quality employees, etc., are a few examples of internal causes of start-up failure (Gaskill et al., 1993; Lussier, 1995; Omorede, 2021; Wagner, 2013). External causes of failure include economic conditions, shifts in government policies, and unforeseen events (Cardon et al., 2011; Gaskill et al., 1993).

According to the extant body of knowledge, many aspects of start-up failure exist, as explained above. However, the primary factors attributing to the failure of start-ups in India may be listed below (refer to Table 1):

Table 1. Failure factors of start-ups

Code	Failure factors	References
S1	Poor management	Bruno and Leidecker (1988), Gaskill et al. (1993), Arasti et al. (2014), Ooghe and De Sofie (2008), Bednár and Tarišková (2017), Franco and Haase (2010), Ihua (2009), Al-Shami et al. (2019), Lukason and Hoffman (2015), Giardino et al. (2015)
S2	Poor market positioning	Akter and Iqbal (2020), Triebel et al. (2018), Calderón et al. (2019), Franco and Haase (2010), Cantamessa et al. (2018), Theng and Boon (1996)
S3	Fierce market conditions	Akter and Iqbal (2020), Triebel et al. (2018), Franco and Haase (2010), Ihua (2009), Kasema (2021), Vesper (1990), Lukason and Hoffman, (2015)
S4	Financial issues	Akter and Iqbal (2020), Triebel et al. (2018), Calderón et al. (2019), Franco and Haase (2010), Lussier (1995), CB Insights (2021)
S5	Inefficient human capital	Akter and Iqbal (2020), Calderón et al. (2019), Sheldon (1994), de Winne and Sels (2010), Amankwah-Amoah (2016), Phaladi and Wellington (2008)
S6	Lack of institutional support	Franco and Haase (2010), Arasti et al. (2014), Ghobadian and Gallear (1996)
S7	Poor networking	Akter and Iqbal (2020), Franco and Haase (2010), Atsan (2016), Baum et al. (2000), Cennamo and Santaló (2015)
S8	Lack of innovation	Franco and Haase (2010), Cantamessa et al. (2018), CB Insights (2021) Fu et al. (2017), Dokko and Wu (2017)
S9	Lack of entrepreneurial efficiency	Theng & Boon (1996), Calderón et al. (2019), Franco and Haase (2010), Kasema (2021), Arasti et al. (2014), Duchesneau and Gartner (1990), Phaladi and Wellington (2008)
S10	Poor business model	Cantamessa et al. (2018), Bajwa et al. (2017), Kasema (2021), Doganova and Eyquem-Renault (2009), Cennamo and Santaló (2015), Baecker (2023)
S11	External environmental issues	Theng and Boon (1996), Akter and Iqbal (2020), Calderón et al. (2019), Ihua (2009), Kasema (2021), Arasti et al. (2014), Liao (2004), Gaskill et al. (1993), Strotmann (2007), Nigbor-Drożdż and Łukasiński (2023)

S1. Poor management: A management team has always been an important part of a business. It is vital for deciding the success or failure of a firm. A management team with a lack of clear vision and strategy can leave start-ups directionless, resulting in resource wastage, confusion among stakeholders, and poor performance (Franco & Haase, 2010; Nobel, 2011; Safari & Das, 2023). Lack of managerial skills and expertise (Al-Shami et al., 2019) results in ineffective decision-making, absence of a business model, and financial mismanagement, finally leading to the failure of firms (Al-Shami et al., 2019; Cantamessa et al., 2018; Larson & Clute, 1979; Mantere et al., 2013). There is a need for strong passion and commitment in the management team (Arasti et al., 2014) to prevent start-up failure.

S2. Poor market positioning: When a start-up lacks knowledge of its target market (Franco & Haase, 2010) and launches its product at the wrong time (Bruno et al., 1992; CB Insights, 2021; Vesper, 1990) without analyzing the market needs (Cardon et al., 2011; Lukason & Hoffman, 2015), the problem of market-product misfit arises (Bruno et al., 1992). Failure to implement proper marketing and sales strategies (CB Insights, 2021) results in poor product positioning, causing product failure and, eventually, failure of a start-up because of reduced revenue and competitiveness (Feinleib, 2012; Klotins et al., 2019).

S3. Fierce market conditions: The success or failure of a company can be significantly impacted by prevailing market circumstances. Start-ups often enter markets crowded with established players (Almakenzi et al., 2015; Lukason & Hoffman, 2015), and competing with them can be highly challenging, making it tough for new participants to gain a foothold. The high entry rate of new start-ups in the market makes it even tougher for them to survive (CB Insights, 2021; Skeldon, 2019). Low customer demand leads to low sales and revenue, forcing start-ups to slow down their operations (Choshin & Ghaffari, 2017; Long et al., 2018; Pisoni et al., 2020). These fierce market conditions demand adaptability, innovation, and resilience from start-ups, otherwise, they will fail.

S4. Financial issues: Financial issues for start-ups encompass challenges related to initial funding, securing external investment, mismanagement of funds, excessive spending, and the consequential cash burn situation (Stice et al., 2023). Many start-ups suffer from inadequate initial funding as they only utilize their own funds or family and relatives' money to launch a venture (Safari & Das, 2023). The inability to secure funding from external sources like venture capital, investors, etc., makes it difficult for them to innovate and scale up their businesses (Lussier, 1995). Also, the rapid depletion of limited funds due to mismanagement of funds (Cooper et al., 1994; Giardino et al., 2015) and excessive spending on unnecessary expenses (Cardon et al., 2011) may lead to a cash burn situation (CB Insights, 2021; Krishna et al., 2016) causing wasted capital and missed growth opportunities. All these financial issues can impede a start-up's ability to operate effectively, grow, and adapt in a competitive market, leading them toward failure.

S5. Inefficient human capital: Existing literature recognizes the significance of human capital in determining the achievement or downfall of firms (Semadeni et al., 2008). Since recruiting, maintaining, and motivating staff members is essential to any company's success, effective administration of human resources plays a pivotal role in determining the sustainability of a start-up (Bruderl et al., 1992; Priyanka et al., 2023). Employees might provide a competitive edge (de Winne & Sels, 2010), therefore, they should be involved in the decision-making along with higher authorities and managed properly (Sheldon, 1994). Inefficient human capital, such as a lack of knowledge and capabilities of employees, leads to poor market positioning, lack of innovation, and poor networking (de Winne & Sels, 2010). In light of evolving workplace demands, there is a need for skill updation and upgrading to be competitive and minimize the risk of failure (Amankwah-Amoah, 2016).

S6. Lack of institutional support: Institutional support plays a pivotal role in nurturing start-ups, providing them with essential resources, guidance, and funding, but their absence may contribute to failure. Businesses are normally skeptical about external support (Ghobadian & Gallear, 1996). Insufficient institutional support, coupled with a lack of relevant information about the support and time to benefit from them, hinder businesses' survival and development (Arasti et al., 2014). The absence of institutional support can have a detrimental effect on entrepreneurial activity that may potentially hinder the success of businesses (Chambers & Munemo, 2019).

S7. Poor networking: Effective networking supports start-ups with access to valuable resources like mentors, investors, suppliers, and potential customers (Baum et al., 2000) and valuable social, technical, and economic competitive advantages that often need significant operational experience to obtain (Ahuja, 2000). It provides new opportunities, partnerships, collaborations, and market insights to the start-ups and complements their internal management capabilities (Safari & Das, 2023). Issues like conflict among partners (Cennamo & Santaló, 2015), inadequate social capital, and weak investor connections hinder the flow of decision-making (Atsan, 2016), resulting in a lack of cooperation and contracts. Poor networking poses the risk of lack of funding, limited market reach, and missed opportunities for start-ups, forcing them to go alone and increasing the risk of failure (Ferreira et al., 2022).

S8. Lack of innovation: Innovation has the potential to provide novel market prospects (Mehralizadeh et al., 2006) and improve the performance of start-ups (Aminova & Marchi, 2021). Creating a sustainable business model is vital in a start-up's early stages (Dokko & Wu, 2017). Start-up products and services can stagnate without innovation, losing market attractiveness that may reduce their market relevance and customer interest (Cantamessa et al., 2018; CB Insights, 2021). Therefore, innovation in products, processes, and business models is important for companies to survive and succeed (Akter & Iqbal, 2020; Fu et al., 2017; Long et al., 2018).

S9. Lack of entrepreneurial efficiency: Entrepreneurial efficiency, sometimes referred to as entrepreneurial competence, encompasses the skills, expertise, and personality traits of an entrepreneur (Barazandeh et al., 2015). It generally pertains to the capacity of entrepreneurs to efficiently employ resources and make optimal choices in pursuing entrepreneurial objectives (Takii, 2011). Eunice Abdul (2018) stated that entrepreneurial skills and expertise are necessary for enterprises as they generate revenue and scale up the venture by predicting the probable risks. New businesses fail because the founder may lack the entrepreneurial skills to take it from conception to rapid expansion (Nair & Blomquist, 2019). Lack of business experience, entrepreneurial abilities, and lack of readiness, imitation, poor judgment, inventiveness, and tenacity are the main reasons for start-up failure (Bushe, 2019). Sometimes, entrepreneurs are overconfident (Hayward et al., 2006; Mantere et al., 2013), lack commitment (Cennamo & Santaló, 2015; Van Gelderen et al., 2006), and show unwillingness to take advice from professional experts advice (Kalyanasundaram, 2018; Khelil, 2016), that also pose the risk of failure for new ventures.

S10. Poor business model: The business model elucidates how a firm generates and provides value to consumers (Seddon et al., 2004). Business models have the potential to drive innovation and provide a competitive edge to start-ups (Zott & Amit, 2008), the absence of which might impede innovators (Doganova & Eyquem-Renault, 2009) from successfully implementing and extracting value from their inventions (Teece, 2010). A poor business model usually denotes shortcomings or errors in the planning (Kasema, 2021) and implementation of crucial elements, which cause operational inefficiencies and make success more difficult. It encompasses insufficiencies in the identification of target markets, revenue streams, cost structures, or overall viability (Baecker, 2023; Bajwa et al., 2017). A poor business model can hinder a company's capacity to make money, stand out from the competition, and adjust to changing market conditions which in turn leads to start-up failure (Cantamessa et al., 2018).

S11. External environmental issues: The survival of start-ups, especially for businesses with low resources, is significantly impacted by external factors, including unfavorable economic conditions and inadequate infrastructure (Ooghe & Prijcker, 2008; Oparanma et al., 2010), excessive restrictions and insufficient legislation (Arasti et al., 2014; Bushe, 2019). Government support is essential for any new business to thrive outside (Garg & Shivam, 2017; Gaskill et al., 1993; Khelil, 2016). Studies have identified three key environmental factors that affect the outcomes of small enterprises: lending rates, taxes, and the absence of government support (Ibrahim & Goodwin, 1986; Nigbor-Drożdż & Łukasiński, 2023). Any changes in government policies and unexpected events would affect a firm's business model and management and disrupt operations, thereby increasing the chances of business failure. As their external environment evolves, start-ups need to monitor it and adjust accordingly to be viable and competitive.

METHODOLOGY

The present study adopts a qualitative and exploratory research design. This study employs a thorough examination of existing literature in conjunction with interviews conducted with experts in the field to figure out and verify the factors contributing to the failure of start-ups. Brainstorming sessions with 18 experts, involving academicians, industry experts, and entrepreneurs, were conducted to identify the relationships among the failure factors. These selected experts' profiles are mentioned in Annexure I. Purposive sampling was used to select initial participants based on their expertise and skills. After that, snowball sampling was applied due to a lack of awareness about the experts in this area. The snowball sampling approach was also used in other studies that followed the ISM methodology (Gan et al., 2018; Goel et al., 2022). ISM technique requires a brainstorming session with selected experts from the respective field (Goel et al., 2022). The data was collected from a self-structured questionnaire comprising factors contributing to start-up failure. Statements explaining the research objective and the factors based on the literature review were broadly explained along with the questionnaire to ensure the clarity of the context. In the questionnaire, the failure factors were listed in the rows and columns and labeled as S1, S2 ... S11, as shown in Annexure II. Experts were asked to complete a pairwise comparison of the 11 failure factors based on the type of relationships among factors. The experts were briefed to compare the row statement to the column statement for each cell on the questionnaire and to select an appropriate symbol from symbol sets V, A, X, and O (as explained in Annexure II). Experts were asked questions separately to mitigate the potential influence of one's personal views on others. Consensus analysis was applied to eliminate experts' subjectivity and validate the data (Ma et al., 2019). Subsequently, all the responses were reviewed, and the opinion-receiving experts' consensus was used to formulate interpretive structural modeling.

Then, the factors identified were examined using the ISM methodology, which facilitates the construction of a visual representation illustrating the relationships and dependencies among them. It involves the transformation of disorganized and unstructured system models into systematic and hierarchal models (Attri et al., 2013). Finally, MICMAC analysis was conducted to categorize identified failure causes into autonomous, independent, dependent, and linking factors based on their dependency and driving power. The study has used the ISM-MICMAC approach because it provides a nuanced understanding of complex relationships in situations requiring a holistic and comprehensive decision-making approach (Sarvari et al., 2023; Sreenivasan et al., 2023).

Interpretive Structural Modeling (ISM)

ISM is a well-recognized qualitative technique that makes the investigation and comprehension of intricate connections between diverse components of a system easier. The notion of ISM was initially introduced by Warfield (1974) as a scientific implementation of graph theory (Sindhu et al., 2016). This modeling technique involves organizing a collection of many aspects that are both directly and indirectly connected into a complete and systematic model (Sage & Smith, 1977; Warfield, 1974). The technique uses experts in the relevant subject to break down a complicated structure into various components and construct a hierarchical conceptual framework (Mannan et al., 2016). This model aids in comprehending the interdependencies of a complicated set of factors and examining the impact of an element on other elements (Mandal & Deshmukh, 1994; Shitika et al., 2013; Singh et al., 2003). The levels of hierarchy symbolize the magnitude and direction of connections among those identified factors. The ISM approach involves many steps listed below:

1) ISM process begins by identifying the variables relevant to the study objective or problem by conducting an extensive assessment of the available literature in the field.
2) After identifying a set of variables, contextual links among the variables are established by relying on experts' opinions. Then, a structural self-interaction matrix (SSIM) representing the pair-wise connections between the variables identified is constructed (Mandal & Deshmukh, 1994; Singh & Samuel, 2018).
3) The results obtained from the SSIM are then converted into binary values (0, 1) to get the initial reachability matrix. Subsequently, the transitivity rule is employed to generate the final reachability matrix (FRM).
4) After that, the FRM is partitioned into multiple tiers through level partitioning.
5) Then, a conical matrix is formed by organizing elements at the identical level throughout the rows and columns of the FRM.
6) Using the conical matrix, an initial digraph is prepared, which includes transitivity relationships, and then the final digraph, excluding these transitive links, is prepared.
7) Finally, the digraph undergoes a transformation process in which nodes are replaced with phrases, resulting in the formation of an ISM structure. This ISM framework shows a hierarchical structure that is established by organizing factors into several levels, which indicates the nature of the interaction between them.

Cross-Impact Matrix Multiplication Applied to Classification (MICMAC)

MICMAC, abbreviated from "Matrice d'Impacts Croisés-Multiplication Appliquée à un Classement" in French, also translated as "Cross-Impact Matrix Multiplication Applied to Classification" in English, is a method for classifying and analyzing the relationships between variables in a system or problem. It is frequently employed as an addition to the ISM technique to further comprehend the functions and significance of ISM-identified factors. It is a prominent methodology devised by Duperrin and Godet (1973) that employs the features of matrix multiplication (Nandal et al., 2019). MICMAC analyses variable driving and dependent power to find and classify important variables into four distinct groups-autonomous, independent, dependent, and linkage factors (Choudhary et al., 2022).

RESULTS

The current section presents the research findings based on the data collected and analyzed using the ISM and MICMAC approaches. First, the ISM approach is utilized to construct a hierarchical model that represents the interconnections between various failure factors of start-ups as a directed graph. Based on existing literature and brainstorming sessions with esteemed professionals and experts, eleven factors leading to the start-up failure were found. These factors were coded as S1 for poor management, S2 for poor market positioning, S3 for fierce market conditioning, and so on (refer to Table 1).

Structural Self-Interaction Matrix (SSIM)

SSIM is employed to ascertain the contextual associations between specified elements through the utilization of expert judgments. The SSIM is developed to analyze the pairwise correlations among already identified failure factors by assigning a code based on the predetermined set (V, A, X, O). These four possible pairings between variable p and variable q are as follows:

- V: variable p leads to variable q;
- A: variable q leads to variable p;
- X: variable p and q mutually impact each other;
- O: variable p and q do not influence each other.

The overall amount of pairwise comparisons in the creation of SSIM is represented as ((N)*(N-1)/2), where N represents the number of essential elements (Choudhary et al., 2022). Based on the above relationship, SSIM for failure factors of start-ups is drawn as given in Table 2. The value O for (S1, S11) factors shows that failure factors S1 and S11 have no relation with each other, value A for (S2, S11) indicates the influence of failure factor S11 on S2, and so on.

Table 2. Structural Self-Interaction Matrix (SSIM)

Failure factors	S11	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1
S1	O	V	A	V	V	V	V	V	O	V	
S2	A	A	A	A	A	A	A	A	A		
S3	A	V	O	A	O	O	O	V			
S4	A	A	A	V	A	A	A				
S5	O	A	A	V	X	A					
S6	A	V	A	V	X						
S7	A	X	A	O							
S8	A	A	A								
S9	O	V									
S10	A										
S11											

Initial Reachability Matrix (IRM)

Following the formation of the SSIM, the next stage entails converting the SSIM into the IRM matrix. This conversion involves substituting the V, A, X, and O with the binary values 1 and 0, respectively, following the provided conditions (Table 3). For instance, the code for (S1, S11) is O in SSIM, and it will be transformed into 0 for both the entries (S1, S11) and (S11, S1) in the IRM matrix.

- if the value of (p, q) pair in SSIM is V, then (p, q) will be coded as 1, and (q, p) will be coded as 0 in IRM;
- if the value of (p, q) is A, then (p, q) will be coded as 0, and (q, p) will be coded as 1 in IRM;
- if the value of (p, q) is X, then both (p, q) and (q, p) relations will be coded as 1 in IRM;
- if the value of (p, q) is O, then both (p, q) and (q, p) relations will be coded as 0 in IRM.

Table 3. Initial Reachability Matrix (IRM)

Failure factors	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
S1	1	1	0	1	1	1	1	1	0	1	0
S2	0	1	0	0	0	0	0	0	0	0	0
S3	0	1	1	1	0	0	0	0	0	1	0
S4	0	1	0	1	0	0	0	1	0	0	0
S5	0	1	0	1	1	0	1	1	0	0	0
S6	0	1	0	1	1	1	1	1	0	1	0
S7	0	1	0	1	1	1	1	0	0	1	0
S8	0	1	1	0	0	0	0	1	0	0	0
S9	1	1	0	1	1	1	1	1	1	1	0
S10	0	1	0	1	1	0	1	1	0	1	0
S11	0	1	1	1	0	1	1	1	0	1	1

Final Reachability Matrix (FRM):

After transforming the SSIM into IRM, the subsequent step includes the development of the FRM matrix by taking into consideration all possible transitivity links (Attri et al., 2013). According to the transitivity rule, if M causes N, N causes O, then M will automatically cause O. For example, in the present case, since S1 influences S8 and S8 influences S3, it implies that S1 will influence S3 as per the rule of transitivity. Therefore, entry (S1, S3) is marked as 1* in the FRM. The idea of transitivity is employed to address any potential gaps in the opinions gathered throughout the construction of SSIM (Attri et al., 2013). The symbol "*" in Table 4 shows the presence of transitivity. This final reachability matrix (FRM) assists in allocating the ranks to the factors through level partitioning. In FRM, the total number of rows and columns reflects each factor's driving and dependence power, respectively, which further helps cluster the elements into independent, dependent, autonomous, and linkage factors through MICMAC analysis.

Table 4. Final Reachability Matrix (FRM)

Failure factors	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	Driving power
S1	1	1	1*	1	1	1	1	1	0	1	0	9
S2	0	1	0	0	0	0	0	0	0	0	0	1
S3	0	1	1	1	1*	1*	1*	1*	0	1	0	8
S4	0	1	1*	1	1*	1*	1*	1	0	1*	0	8
S5	0	1	1*	1	1	1*	1	1	0	1	0	8
S6	0	1	1*	1	1	1	1	1	0	1	0	8
S7	0	1	1*	1	1	1	1	1*	0	1	0	8
S8	0	1	1	1*	1*	1*	1*	1	0	1*	0	8
S9	1	1	1*	1	1	1	1	1	1	1	0	10
S10	0	1	1*	1	1	1*	1	1	0	1	0	8
S11	0	1	1	1	1*	1	1	1	0	1	1	9
Dependence power	2	11	10	10	10	10	10	10	1	10	1	

Level partitioning

The FRM enables the derivation of reachability and antecedent groups for individual factors, as Warfield (1974) discussed. The reachability set encompasses the focal element as well as any other elements that it has the potential to impact, while the antecedent set is a collection of the focal element itself plus any other components that could potentially cause the occurrence of that particular element (Attri et al., 2013). Thus, in FRM, all the factors for which there is a '1' in the row

referring to the factor in the consideration will be part of the reachability set, and factors for which there is a '1' in the column referring to the factor in the consideration will come under the antecedent set. For instance, for factor S1 in the study, the reachability set comprises S1, S2, S3, S4, S5, S6, S7, S8, and S10, whereas the antecedent set comprises S1 and S9. Thereafter, an intersection set for each element is derived, which comprises the common elements in the reachability and antecedent sets. The elements exhibiting similar reachability and intersection sets are marked as 'level I' while level partitioning. These elements classified as 'level I' in the ISM model are regarded as high-level factors and include all those elements that do not cause the emergence of other variables but will be influenced by others. After the identification of 'level I' factors, they are eliminated from the table, and the procedure is iteratively repeated to ascertain components at subsequent levels of the hierarchy. For example, in partitioning iteration 1 (see Table 5), factor S2, which has identical reachability and intersection set, is marked as 'level I' and is removed to perform the remaining iterations.

Table 5. Level Partitioning Iteration 1

Failure factors	Reachability set	Antecedent set	Intersection set	Level
S1	1,2,3,4,5,6,7,8,10	1,9	1	
S2	2	1,2,3,4,5,6,7,8,9,10,11	2	I
S3	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S4	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S5	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S6	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S7	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S8	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S9	1,2,3,4,5,6,7,8,9,10	9	9	
S10	2,3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	
S11	2,3,4,5,6,7,8,10,11	11	11	

After removing the 'level I' factor from the table, that is, S2 factor, the intersection set is determined for all the remaining factors in the abovementioned manner. At this stage, factors having the same reachability and intersection set are classified as 'level II' factors (see Table 6). For example, in the present study S3, S4, S5, S6, S6, S7, S8, and S10 factors fall into 'level II' category.

Table 6. Level Partitioning Iteration 2

Failure factors	Reachability set	Antecedent set	Intersection set	Level
S1	1,3,4,5,6,7,8,10	1,9	1	
S2		1,3,4,5,6,7,8,9,10,11		I
S3	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S4	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S5	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S6	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S7	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S8	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S9	1,3,4,5,6,7,8,9,10	9	9	
S10	3,4,5,6,7,8,10	1,3,4,5,6,7,8,9,10,11	3,4,5,6,7,8,10	II
S11	3,4,5,6,7,8,10,11	11	11	

After the identification of 'level II' factors, they are removed from the model, and the same iteration process is followed again. Factors with identical reachability and intersection sets, such as S1 and S11, are ranked as level III (see Table 7) and removed from the further process.

Table 7. Level Partitioning Iteration 3

Failure factors	Reachability set	Antecedent set	Intersection set	Level
S1	1	1,9	1	III
S2		1,9,11		I
S3		1,9,11		II
S4		1,9,11		II
S5		1,9,11		II
S6		1,9,11		II
S7		1,9,11		II
S8		1,9,11		II
S9	1,9	9	9	
S10		1,9,11		II
S11	11	11	11	III

Now, only one factor, S9, remains with identical reachability and intersection sets. Therefore, the S9 factor will be assigned the 'level IV' as shown in Table 8. Once all the factors are assigned to the different levels, this partitioning process comes to an end.

Table 8. Level Partitioning Iteration 4

Failure factors	Reachability set	Antecedent set	Intersection set	Level
S1		9		III
S2		9		I
S3		9		II
S4		9		II
S5		9		II
S6		9		II
S7		9		II
S8		9		II
S9	9	9	9	IV
S10		9		II
S11				III

In this research, a series of four level partitioning rounds have been performed (as shown in tables 5, 6, 7, and 8), and the failure factor S2 has been given level I, factors S3, S4, S5, S6, S7, S8, and S10 have been ranked II, factors S1, S11 has been ranked III, and factor S9 has been ranked last at level IV. This helps in deciding the hierarchy of factors in the structural model, where 'level I' factors will appear at the top and 'level IV' factors at the bottom of the model.

Conical matrix

A conical matrix is created using FRM and iteration levels to ascertain the causal and dependent influence of the various factors. It is constructed by grouping variables from the identical level along both rows and columns of FRM (refer to Table 9). The driving magnitude of a variable is determined by aggregating the count of 1s horizontally, while its dependency magnitude is determined by totaling up the count of 1s vertically (Raj et al., 2008). For instance, Table 9 shows that factor S2 alone is at level I and has been written first. Then, failure factors S3, S4, S4, S5, S6, S7, S8 and S10 have been grouped at level II and written after S2. Subsequently, a similar grouping of factors was done for level III and IV failure factors. The conical matrix exhibits similarities to the FRM matrix, with the notable distinction that the elements in the conical matrix are positioned along the rows and columns according to their respective levels.

Table 9. Conical matrix

Failure Factors	S2	S3	S4	S5	S6	S7	S8	S10	S1	S11	S9	Driving power	Level
S2	1	0	0	0	0	0	0	0	0	0	0	1	I
S3	1	1	1	1*	1*	1*	1*	1	0	0	0	8	II
S4	1	1*	1	1*	1*	1*	1	1*	0	0	0	8	II
S5	1	1*	1	1	1*	1	1	1	0	0	0	8	II
S6	1	1*	1	1	1	1	1	1	0	0	0	8	II
S7	1	1*	1	1	1	1	1*	1	0	0	0	8	II
S8	1	1	1*	1*	1*	1*	1	1*	0	0	0	8	II
S10	1	1*	1	1	1*	1	1	1	0	0	0	8	II
S1	1	1*	1	1	1	1	1	1	1	0	0	9	III
S11	1	1	1	1*	1	1	1	1	0	1	0	9	III
S9	1	1	1*	1	1	1	1	1	1	0	1	10	IV
Dependence power	11	10	10	10	10	10	10	10	2	1	1		
Level	I	II	II	II	II	II	II	II	III	III	IV		

Digraph

A digraph is a graphical representation of factors drawn based on level partitioning (Figure 1). It is a visual depiction of the hierarchical relationships and interdependencies among various factors or variables within a complex system in terms of nodes and edges after removing the transitivity (Thakkar, 2021). In this, the first-level failure factors are put at the highest level of the digraph, followed by the subsequent levels of factors. This procedure is continued until all factors have been positioned in an initial digraph. The initial digraph is transformed into the final digraph by removing all the transitivity links (Raj et al., 2008).

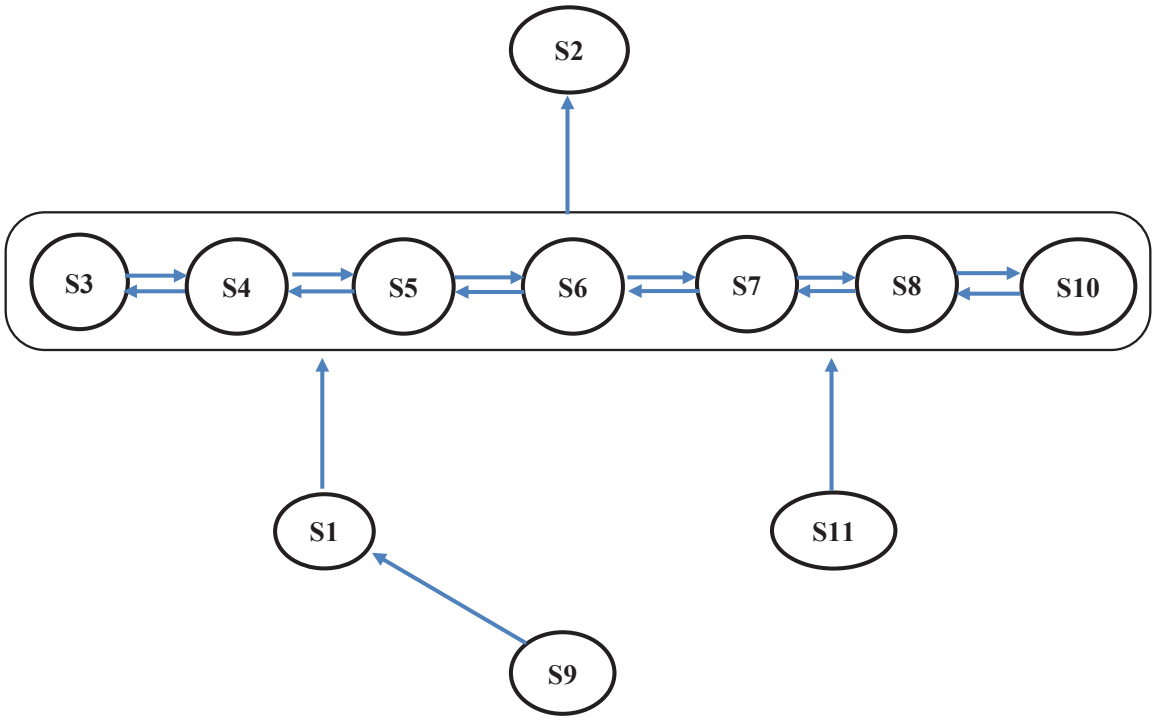

Figure 1. Final digraph indicating the interrelationships among the failure factors

Structural model of ISM

ISM model is prepared by replacing the nodes representing factors in diagraph with the statements (Attri et al., 2013). The ISM framework facilitates the comprehension of the structural hierarchy of failure factors and the interconnectedness that exists among them (refer to Figure 2). This allows decision-makers to strategically plan their start-up activities in the most suitable path.

The ISM model derived in the present study shows that lack of entrepreneurial efficiency, external environmental issues, and poor management are the primary variables significantly contributing to the failure of start-ups. Poor market positioning appearing on the top of the model contributes least to the model as its driving power is lowest and it is dependent on other factors. The study finds that all other remaining factors like fierce market conditions, financial issues, poor networking, lack of innovation, poor business model, etc., are acting as the linkage between the other factors.

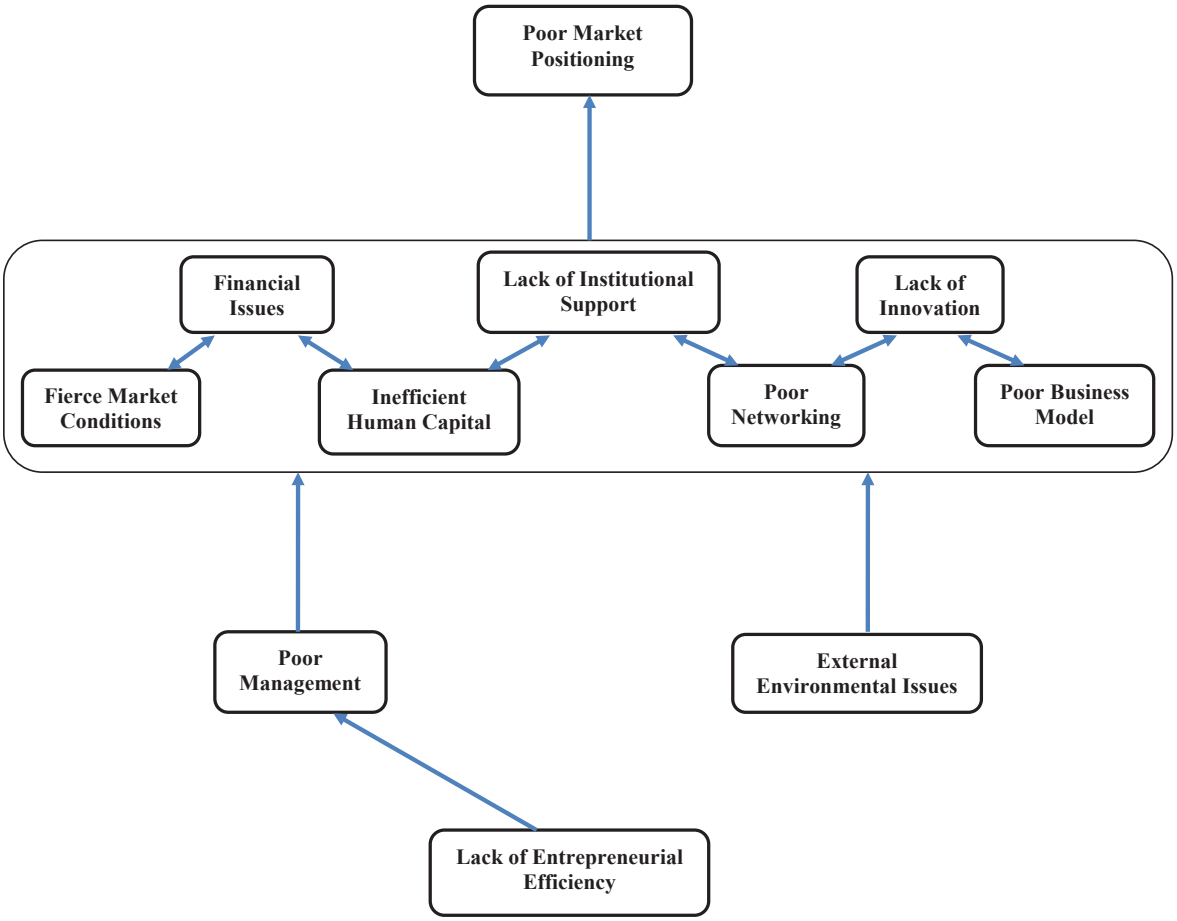

Figure 2. Structural model for critical failure factors of start-ups

MICMAC analysis

Once the structural framework has been derived using ISM, the MICMAC methodology is utilized for analyzing the driving and dependent values of factors, aiding in the determination and categorization of key variables into four categories. It presents the driving values on the y-axis and dependence values on the x-axis and then classifies the failure factors of start-ups identified through ISM into four clusters, answering the second research question of the study (refer to Figure 3):

1) **Autonomous Factors**: These variables have low driving and dependency values, indicating minimal influence and reliance on other factors. Because of the weak linking power, they share with other barriers, these factors have relatively no connection with the overall model. In the present study, no autonomous failure factor is identified.

2) **Independent Factors:** These are the key determinants that exert a significant impact on several other variables. These factors possess a strong driving force and exhibit limited dependency power. In the study, failure factors S9, S11, and S1, such as lack of entrepreneurial efficiency, external environmental issues, and poor management, fall into this cluster. These are the important elements that control how the system functions and greatly influence other variables. If not given adequate attention, these factors will lead to the failure of start-ups.
3) **Dependent Factors:** These elements have a modest driving force but a substantial dependency. These are dependent on others having a minimal influence on the remaining parts of the system. Only the S2 factor, i.e., poor market positioning, is found to fall under this category, signifying that all other factors lead to poor market positioning, and therefore, the S2 factor requires extra focus.
4) **Linkage Factors:** These elements serve as a link between independent and dependent parameters of the model and aid in the transmission of impacts. They have a strong driving force in addition to high dependency. Any change in them will influence other factors, or vice-versa may also happen. In the study, S3, S4, S5, S6, S7, S8, and S10 all these factors are found to be part of this cluster depicting the interconnection between the other remaining failure factors.

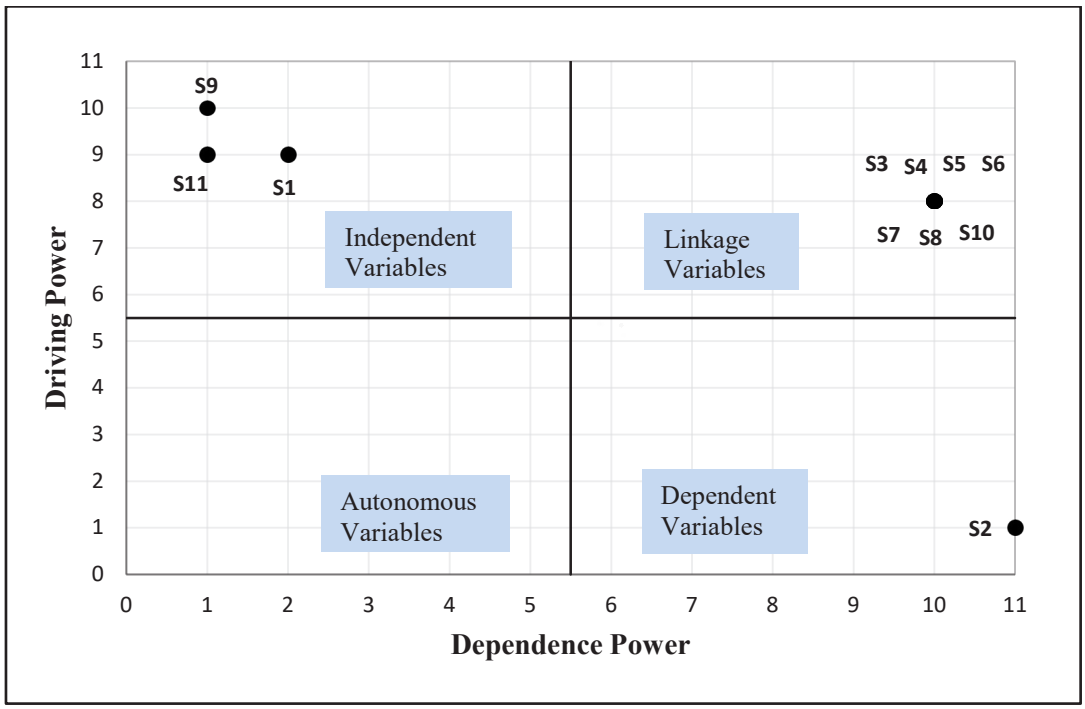

Figure 3. MICMAC analysis

DISCUSSION

The current study identifies the critical elements that lead to start-up failure and establishes the interconnections among them. Start-ups act as an engine of economic growth for India's economy by creating more jobs, enhancing productivity, and increasing GDP (Liao et al., 2008), thus making India a more developed and self-reliant economy. While the global start-up count is on the rise, the rate of their failure remains about the same. Over 9 in 10 *start-ups* globally encounter failure within the initial five years of their existence (Start-up Genome, 2022), which is true in the context of India. Considering the substantial role played by start-ups, it becomes crucial to determine the potential causes of start-up failures in India so that proper action can be taken to mitigate their risk of failure. The current study identifies the factors contributing to the failure of start-ups in India and defines the inter-links among them through the ISM technique. Researchers frequently employ the ISM method to convert a complicated, unorganized model into an organized one (Mannan et al., 2016).

To begin with, based on existing literature and brainstorming discussions with related professionals, eleven start-up failure factors were identified and labeled as S1, S2, S3, … . Then, contextual links among the variables were identified with the assistance of professional judgments, and an SSIM matrix was prepared. Using the ISM technique, a structural

model representing the interconnections among the variables was formed where all variables were partitioned into four levels. This answered the third research question of the study relating to the hierarchical structure of the variables that provide strengthening levels according to dependence and driving force. In the model, lack of entrepreneurial efficiency appears at the lowest level, signifying that it is the primary determinant of start-up failures. The findings align with prior scholarly research that shows the importance of a well-qualified and competent entrepreneur in making a business successful (Barazandeh et al., 2015; Mitchelmore & Rowley, 2010). According to studies by Bruderl et al. (1992) and Alvarez and Busenitz (2001), entrepreneurs exert a direct influence on business operations, assuming a crucial position in the firm's achievement and growth.

ISM technique was supported with MICMAC analysis that was applied to gain a more profound comprehension of the roles and significance of components defined by the ISM. It answered the second research question of the study and classified the identified 11 failure factors into different clusters. The failure factors were divided into four groups, namely autonomous, independent, dependent, and linkage factors, considering their driving and dependence power, mentioned in the final reachability matrix (Table 4) (Attri et al., 2013). Autonomous variables are the ones that have low driving and dependent values. In the findings, not a single factor appears as an autonomous variable. This observation demonstrates that every variable contributes to the model. Therefore, all 11 identified factors that have been discovered substantially impact the failure of new ventures. Lack of entrepreneurial efficiency, poor management, and external environmental issues are part of independent variables. Independent variables are characterized by their strong influence and low level of reliance on other factors. This answers the very first research question of the study and suggests that all these three factors are crucial failure factors on which all other factors depend. Previous research shows that entrepreneurs are the principal players in a business. Their skills and abilities matter (Chowdhury et al., 2015; Hsieh et al., 2019). Studies suggest that a high rate of small business failures is usually attributed to inadequate management, often rooted in a lack of necessary expertise in owners and management teams (Rauch & Rijsdijk, 2013; Shepherd & Wiklund, 2006). Few authors suggest that the general/external environment poses challenges like unanticipated changes in the market, government and legal restrictions, high taxes, etc., and influences entrepreneurs as well as firms (Ibrahim & Goodwin, 1986; Mayr et al., 2017). Sometimes, owners and managers exhibit a lack of foresight in identifying these potential dangers (Amankwah-Amoah, 2015) and fail to develop effective corporate strategies. Consequently, this may result in the mismanagement, financial insolvency, and ultimate demise of these firms (Ooghe & Prijcker, 2008). These researches have further determined that the convergence of deficient management practices, the personal characteristics of owner-managers, and external circumstances together contribute to business failure (Berryman, 1983; Yacoub & Harb, 2023).

MICMAC analysis further classifies 'poor market positioning' as a dependent variable with low driving potential and a high level of dependent power. It means that the other factors influence market positioning. Poor market positioning is characterized by failure to launch products on time, poor marketing mix strategies, failure to have a proper product-market fit, a lack of market research, etc. (CB Insights, 2021). It is the failure of entrepreneurs and managers who lack vision and mission and fail to implement proper strategies (Franco & Haase, 2010; Mukhamad et al., 2020). Due to their inabilities, inexperience, and lack of knowledge, firms fail to build a strong network in the market and lack institutional support. The firms usually sought support in recruiting staff, purchasing equipment, and handling bureaucratic processes (Franco & Haase, 2010). They face the problem of insufficient financial, human, and social capital, which further leads to a lack of business innovation (de Winne & Sels, 2010; Mannan et al., 2016). As a result, firms get outcompeted in the market due to their inability to bring new innovative products and services, face fierce competition from rival firms, and build a strong business model (Cantamessa et al., 2018). Since all these variables are strongly influenced by the driving factors while influencing the dependent variable, i.e., poor market positioning of products, they fall into the linkage factor category (refer to Figure 2).

In sum, the findings of the study help in understanding the complicated web of failure factors in a more simplified and hierarchical manner with the help of ISM and MICMAC approaches. Findings suggest that the abovementioned failure causes are mainly attributed to the venture owner, i.e., the entrepreneur, who lacks the required skill, expertise, and efficiency needed to determine the reasons for the low performance and ultimate collapse of start-up firms (Franco & Haase, 2010). This is the most crucial failure factor out of the three independent factors (i.e., lack of entrepreneurial efficiency, poor management, and external environment issues), as it appears at the bottom of the hierarchical model (level IV). These failure factors altogether influence the market positioning of the start-up firm, which further impacts its performance, lowers sales and revenue, brings the problem of a cash crunch, and finally leads to bankruptcy. These findings are in contrast to the study of Calderón et al. (2019), who identified human capital, organizational, and market

factors as the most important, while personal, financial, and external factors as less significant for the start-up failure in the city of Morelia Michoacán. This research helps broaden the knowledge of existing and potential entrepreneurs, policymakers, and other stakeholders and provides some sound theoretical as well as practical implications discussed in subsequent sections.

Theoretical implications

The present study explores the complex world of start-up failures and uses Interpretive Structural Modeling (ISM) to reveal the structural linkages between several factors that contribute to these failures. Rather than offering widely interpreted ideas, the study offers context-specific factors. The incorporation of qualitative data derived from the literature review and expert interviews, followed by quantitative analysis using the ISM approach, enhances the theoretical foundation of the research. The present study found several key factors that are responsible for start-up failures in India, such as lack of entrepreneurial efficiency, poor management, fierce market conditions, poor business models, external environment issues, etc. It explores the connections between these factors and classifies them into four distinct levels. It identifies lack of entrepreneurial efficiency as the main factor at the lowest level, highlighting the crucial role of highly skilled and capable entrepreneurs in the success of a firm (Barazandeh et al., 2015).

Earlier studies have assessed the main factors of entrepreneurial failure using AHP (Calderón et al., 2019), content analysis against real failure cases, and quality management methodologies (Safari & Das, 2023). This is potentially the first research using ISM, to the best of researchers' knowledge, that illustrates the relative influence and interdependence of various failure factors of start-ups through a hierarchical model. The use of MICMAC analysis along with ISM provides more valuable insights into the classification of elements as autonomous, dependent, linked, or independent and their impact on the ecosystem of start-up failures. The fact that none of the elements seems autonomous emphasizes the interconnected nature of every identified factor and their significant contribution to start-up failure. The present study improves our understanding of challenges that business ventures confront and offers a solid framework for future studies as well as useful suggestions for mitigating and preventing failure. It allows for a more comprehensive knowledge of how these factors interact and cascade to affect failure outcomes, expanding the theoretical understanding of start-up failure beyond single variables.

Practical implications

The research provides an insightful analysis of the complex factors contributing to the start-up failure. The findings have substantial practical implications for entrepreneurs, investors, policymakers, and other start-up ecosystem stakeholders. By comprehending the hierarchical relationships between failure factors, stakeholders can identify the critical failure drivers. This knowledge can contribute to the development of more precise risk mitigation strategies and more informed decision-making. The discovered failure variables and their linkages might help start-up founders and management deploy their resources more strategically. The present study shows the significance of having a good management team and entrepreneurial efficiency in preventing start-up failure. Entrepreneurs should indulge in different mentorship and skill enhancement programs to boost their skills and abilities and train their management team (Theng & Boon, 1996). They can collaborate with industry experts and experienced entrepreneurs to organize frequent workshops on proficient leadership, strategic decision-making, and inventive problem-solving. Training modules encompassing the areas of strategic planning, team dynamics, and successful communication, specifically tailored to enhance management teams' competencies, can also be conducted. For instance, the National Entrepreneurship Network (NEN) may organise skill enhancement programmes in India.

The findings suggest that policymakers and support groups within the start-up ecosystem, such as TiE (The Indus Entrepreneurs), may develop focused programs and efforts (Arasti et al., 2014) that establish a more favorable environment for start-up development by addressing the systemic concerns raised in the research, such as market validation, team relationships, and financial management. This might include providing training in vital entrepreneurship skills, offering financial incentives for start-ups, and connecting experienced mentors with emerging entrepreneurs through mentorship programs. Incubators and accelerators like the Indian Angel Network, Sequoia Capital India, etc., may introduce programs to guide start-ups in conducting market research, ensuring product-market fit, and having better market positioning. Entrepreneurship institutions like the Indian School of Business (ISB) can incorporate the research results in their entrepreneurship curriculum by showing them the hierarchical correlations between reasons for failure. Universities and

colleges can have an entrepreneurship cell within their campus to help budding entrepreneurs grasp their obstacles and avoid pitfalls. In conclusion, all stakeholders can make informed decisions, encourage innovation, and contribute to a more resilient and vibrant start-up ecosystem.

CONCLUSION

Start-ups have emerged as a crucial catalyst for fostering innovation, driving economic expansion, and generating employment opportunities in India (Venkatanarayana, 2016). India is 3rd largest start-up ecosystem worldwide, with more than 99,000 DPIIT-recognised start-ups and 108 unicorns as of May 2023 (Invest India, 2022). It is anticipated that by 2025, there will be over 200 unicorns in India. Despite the prevalent optimism around Indian entrepreneurs, it is projected that over 90 percent of these ventures are expected to experience failure within the initial five-year period (Sreekumar et al., 2022). The research indicates that a significant proportion of newly established businesses encounter substantial difficulties during their first phases, resulting in their ultimate failure. Therefore, understanding the underlying causes of company failure becomes crucial for formulating effective policies and initiatives that foster entrepreneurial endeavors and enhance the viability of these emerging enterprises.

Though there has been much research regarding entrepreneurial failure, there remains a dearth of comprehension regarding the interrelationships among these elements. The current investigation uses the interpretive structural modeling approach to ascertain the interrelationships among the 11 failure variables that have been discovered through an exhaustive analysis of relevant literature and the incorporation of expert viewpoints. The hierarchical model derived using ISM divides the failure factors into four levels (refer to Figure 2). It shows the factor 'lack of entrepreneurial efficiency' (S9) positioned at the lowermost part, indicating the significant influence of an entrepreneur in determining the viability of a firm, upon which all other identified failure factors rely. Poor market positioning (S2) forms the topmost level of the model showing its dependency on all other failure factors. The ISM technique was complemented by MICMAC analysis that categorized all the failure drivers into four distinctive groups by their driving and dependence power. Out of a total of eleven failure factors, S9, S11, and S1, that is, lack of entrepreneurial efficiency (S9), external environmental issues (S11), and poor management (S1) are grouped as independent factors, and only one factor, that is, poor market positioning (S2) falls under the category of dependent factor. All remaining seven factors, fierce market conditions (S3), financial issues (S4), inefficient human capital (S5), lack of institutional support (S6), poor networking (S7), lack of innovation (S8), and poor business model (S10) are classified as linkage factors. No factor was found to fall under the autonomous group, meaning that there is no single factor that does not lead to start-up failures in India.

Thus, the present article provides an insightful analysis of the failure factors and highlights the role of entrepreneurial inefficiency, poor management, external environmental forces, etc. in the failure. By delineating the interrelationships and interdependencies among the factors, this research suggests theoretical and practical implications and helps entrepreneurs, policymakers, academicians, etc. make better decisions, facilitating a supportive start-up ecosystem.

Limitations and future research directions

Despite insightful findings and recommendations, the present study contains a few limitations. First, the formulation of the ISM framework necessitates the opinion of experts in both the technique and the domain under study, which might add subjectivity and bias to the process. This might unintentionally reshape the framework in accordance with their personal viewpoints and experiences, influencing the results. Therefore, one should acknowledge the inherent biases and remain cautious while making broad generalizations based on the findings obtained. Second, despite the comprehensive literature analysis and expert consultation employed in this study, certain variables like socio-cultural shifts, national and international political instability, failure to pivot, etc., may have been inadvertently omitted. Therefore, it is recommended that those potentially neglected elements be incorporated into future studies. Furthermore, this research does not guarantee the statistical validity of the suggested model.

These limitations provide guidelines for further studies. They highlight the need for conducting quantitative research to complement and validate the ISM results so that the biases of experts can be removed. Subsequent investigations might expand on the model's identification and validate it using structural equation modeling (SEM) (Thakkar, 2008). The analytical network process (ANP) and analytical hierarchy process (AHP) may also be utilized to determine the degree of correlation between the variables included in this investigation. Since the current study explores the interconnections

among the reasons for start-up failure in India, the results cannot be generalized in other countries like the U.S. and China, which have different start-up ecosystems. This means that future studies may be conducted beyond national borders in diverse ecosystems to get more insightful findings. Future studies may focus on the following proposed research questions (RQs) to further the understanding of start-up failure:

RQ1: Do certain industries exhibit distinct patterns in the reasons for start-up failures, and how do these patterns differ across sectors?
RQ2: How have the patterns of failed start-ups changed over time, and what external factors have caused these changes?
RQ3: What is the long-term effect of making entrepreneurs more efficient on the growth and survival of start-ups?
RQ4: How does government support (including both financial assistance and regulatory measures) help in minimizing the occurrence of start-up failures?
RQ5: How could diverse start-up ecosystems in different nations impact the frequency and nature of start-up failures?

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ANNEXURE - I

Profiles of 18 experts selected for the study:

Experts	Number (total=18)	Gender	Age	Details	Experience
Academicians	11	Female- 5 Male - 6	38 to 60 years	6 Associate Professors and 5 Professors from reputed Universities and Colleges	More than 10 years of teaching experience in the field of entrepreneurship and management
Industrialists and Entrepreneurs	7	Female – 2 Male- 5	30 to 45 years	3 Industrialists and 4 Entrepreneurs	More than 5 years of business experience

ANNEXURE- II

The following table is intended to document the opinions of academics and professionals working in the fields of entrepreneurship and management regarding the causes of start-up failure. The table reflects the contextual relationship among the factors contributing to the failure of start-ups.

Kindly fill in the table based on the type of relationship between the failure factors. You need to compare the row statement to the column statement for each cell in the table and select an appropriate symbol from symbol sets V, A, X, and O

V: If factor p will influence factor q.
A: If factor p will influence factor q.
X: If factors p and q will influence each other.
O: If factors p and q will not influence each other.

Failure factors	S11	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1
S1											
S2											
S3											
S4											
S5											
S6											
S7											
S8											
S9											
S10											
S11											

Where:
S1 = Poor management, S2 = Poor market positioning, S3 = Fierce market conditions,
S4 = Financial issues, S5 = Inefficient human capital, S6 = Lack of institutional support,
S7 = Poor networking, S8 = Lack of innovation, S9 = Lack of entrepreneurial efficiency,
S10 = Poor business model, S11= External environmental issues.

Biographical notes

Amita Pathania is currently a Research Scholar pursuing her Ph.D. from the Department of Management Studies, Central University of Haryana, India. She has teaching experience in Business Statistics, Financial Management, Entrepreneurship Development, and Accounting. She completed her Master's degree in Commerce in 2017 from Hindu College and her Bachelor's degree in Commerce in 2015 from Deen Dayal Upadhyaya College, University of Delhi, India. She holds meritorious awards for securing the top position in the college during her post-graduation and achieving the highest marks during her undergraduate semesters. Her areas of research interest include entrepreneurial finance, entrepreneurship, and start-ups.

Sunita Tanwar, Ph.D, presently holds the esteemed position of Head of the Department and Associate Professor in the Department of Management Studies at Central University of Haryana, India. She is an expert in organizational behavior, human resource analytics, cross-cultural management, training and development, and entrepreneurship, with 17 years of extensive teaching and research experience. She has earned her Ph.D. in Management from MLSU, Rajasthan, India. She has supervised 7 Ph.D. theses and has published more than 27 research articles in national and international journals. Dr. Tanwar has conducted 5 MHRD-funded programs under the Global Initiative for Academic Networks (GIAN) scheme in collaboration with international faculties from MEXICO, the US, and Spain. She was nominated as a representative from India for the International Training Programme on STI Policy and Management for Developing Countries organized by

ISTIC under the auspices of UNESCO in collaboration with MESTECC, Malaysia, and NAM S&T Centre, India, in 2021. She has also been a Visiting Professor at Technology de Monterrey University, San Luis Potosi, Mexico. She is a certified entrepreneurship educator from the National Entrepreneurship Network (NEN) in association with DST, NSTEDB, and Wadhwani Foundation. She is a lifetime member of the Indian Society for Training and Development, the American Society for Quality, and the National Entrepreneurship Network. Her primary research areas include organizational behavior, human resource management, entrepreneurship, and start-ups.

Authorship contribution statement

Amita Pathania: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Software, Validation, Visualization, Writing Original Draft, Writing – Review & Editing. **Sunita Tanwar:** Formal Analysis, Methodology, Project Administration, Validation, Supervision, Writing – Review**.**

Conflicts of interest

The authors declare no conflict of interest.

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