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Mapping Structural Links from Effectual and Causal Logics to Entrepreneurial Practices: Evidence from Incubator Experts in Sfax, Tunisia

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ABSTRACT

Effective entrepreneurial practices are crucial for early-stage startup development, yet the influence of cognitive logics (effectuation and causation) on actionable entrepreneurial marketing (EM) remains underexplored in emerging economies like Tunisia. This study examines the structural and causal links between these logics and EM using a new integrated ISM–MICMAC approach. Six academic experts are judiciously selected from Sfax incubators provided context-specific information under conditions of resource scarcity and uncertainty. The analysis identifies seven causal effect chains, consolidated into three meta-chains: (1) effectual strategic logic driving value creation, (2) hybrid effectual–causal reasoning shaping opportunity-focused marketing, and (3) partnership-driven innovation and market engagement. The findings offer practical guidance on iterative experimentation, lightweight strategic planning, proactive networking, and early customer engagement, supporting founders, incubators, and policymakers in improving resilience, opportunity recognition, and growth under uncertainty.

Keywords: Entrepreneurial logics; Effectuation; Causation; Entrepreneurial marketing practices; Causal chain; ISM; MICMAC, Early-stage startups, Sfax (Tunisia)

INTRODUCTION

Entrepreneurship drives sustainability by fostering innovation, growth, and employment, particularly in emerging economies where startups encounter high uncertainty and limited resources. Sustainable entrepreneurial practices are most effective when embedded within entrepreneurial marketing (EM), which enables opportunity recognition, market orientation, innovation, and value creation (Reymen *et al.* 2015; Breit, and Volkmann 2024). Thus, EM offers the strategic framework to operationalize sustainability objectives into competitive business outcomes (Hanaysha and Al-Shaikh, 2022; Sam *et al.* 2025).

Cognitive logics also shape entrepreneurial behavior. Effectuation (EFF), a means-driven and adaptive logic, and Causation (CAU), a predictive and goal-driven logic, jointly influence the design of the market strategy. Understanding how these logics interact to generate EM behaviors remains essential, yet empirical evidence is limited (Reyes-Mercado and Verma, 2020). Entrepreneurs rarely rely on a single logic; they alternate or combine both depending on environmental conditions and venture maturity (Shirokova et al. 2021; Galkina and Jack, 2021; Breit and Volkmann, 2025), reinforcing the need for an integrated perspective on how these logics support or compete in shaping EM behaviors (Zhou and Liao, 2021).

Integrating EM with EFF and CAU offers a comprehensive view of entrepreneurial processes, although studies that examine the three jointly remain scarce (Robledo *et al.* 2023; Capeli *et al.* 2025). Entrepreneurial orientation (EO) reflects the strategic position (innovation, risk taking, and proactiveness), while EM operationalizes these tendencies through identification and resource mobilization of resources (Nwankwo and Kanyangale 2020; Andelo *et al.* 2025). Both frameworks conceptually converge, positioning EM as a behavioral extension of the cognitive and strategic orientations of entrepreneurs (Butkouskaya *et al.* 2020; Ghorbel *et al.* 2021; Walker and Lee 2025).

Despite these insights, major gaps persist. Research has not unified all dimensions of EM or mapped their interdependencies with entrepreneurial logics. The relational mechanisms linking EFF, CAU, and EM remain underdeveloped, and evidence from emerging economies is still limited. Addressing these gaps requires a structural analysis of entrepreneurial logic, EM dimensions, mediating mechanisms, and contextual influences. Therefore, this study is designed as a theory-building, structure-exploration investigation aimed at modeling the latent architecture connecting these constructs under uncertainty and resource scarcity.

The study addresses three questions: (1) How EFF and CAU shape the dimensions of EM in early-stage Tunisian startups; (2) which EM factors are the most influential or dependent; and (3) whether causal relationships among these factors can inform evidence-based strategies. To achieve this, it applies an integrated structural modeling approach that combines interpretive structural modeling (ISM) technique and MICMAC methodology (the French acronym being Matrice d'Impacts Croisés Multiplication Appliquée à Un classement).

The remainder of this paper is structured as follows. Section 2 presents the theoretical foundation and reviews the relevant literature, highlighting the role of effectual and causal logics in shaping EM practices in early-stage ventures. Section 3 details the proposed ISM–MICMAC proposed approach, explaining how expert insights were used to map structural relationships between key factors. Section 4 presents the results, describing the findings at each stage of the proposed approach, including the identification of causal-effect chains and metachains. Section 5 provides a discussion of the findings, examining their alignment with existing research and outlining the theoretical and practical contributions of the study. Finally, the article concludes with a summary of the main results, a discussion of the limitations of the study, and suggestions for future research directions.

REVIEW OF THE THEORETICAL FOUNDATION AND LITERATURE

This study integrates multiple concepts, principles, dimensions, and methodologies. To maintain clarity and analytical coherence, the theoretical foundation and the literature review are structured together into five subsections: (1) Effectuation and causation logics, (2) Entrepreneurial marketing, (3) The relationship between cognitive logics and EM practices, (4) Entrepreneurship situation in Tunisia, and (5) Application of structural analysis methods, mainly ISM and MICMAC methods in entrepreneurial research.

Entrepreneurial Cognitive Logics: Effectuation and Causation

Entrepreneurial decision making is generally explained through two distinct logics: causation and effectuation. Causation represents a goal-driven approach in which entrepreneurs set predefined goals and systematically plan and allocate resources to achieve them. It emphasizes forecasting, control, and linear analytical processes.

Effectuation, introduced by Sarasvathy (2001), adopts a nonpredictive, means-driven logic in which entrepreneurs start from who they are, what they know, and whom they know, and co-create opportunities through iteration and stakeholder interaction. Although causation is based on planning and risk management, effectuation stresses flexibility, experimentation, and leveraging of contingencies (Sarasvathy,, 2001; Sarasvathy 2008). Effectuation principles, bird-in-hand, affordable loss, crazy quilt, lemonade, and pilot-in-the-plane, guide dynamic action under uncertainty and enable entrepreneurs to recombine available means to identify and pursue new opportunities (Futterer et al. 2018; Ghorbel et al. 2021).

At the firm level, combining both logics often yields superior results, particularly in SMEs oriented to innovation, where their synergy outperforms any logic applied in isolation (Futterer *et al.* 2018 ; Duening *et al.,* 2012 ; Coudounaris and Arvidsson, 2021 ; Kogut *et al.,* 2021; Bao *et al.,* 2024; Ye *et al.,* 2025). In resource-constrained environments, this combination frequently incorporates bricolage to enhance adaptability and growth (An *et al.*, 2020; Coudounaris and Arvidsson, 2022). At the process level, entrepreneurs alternate between effectual and causal reasoning, relying more on effectuation in early uncertain phases and shifting to causation during scaling (Reymen *et al.*, 2015; Walker and Lee, 2025). This cognitive flexibility, or 'mindful deviation', supports the adaptation to uncertainty (Agogué *et al.*, 2015; Chen and Xu, 2022). Recent evidence also shows that opportunity-driven motivations encourage effectuation, whereas necessity-driven motivations are more closely associated with causal reasoning (Salajegheh *et al.,* 2025).

Table 1. Effectuation principle

Effectuation Principle	Orientation	Brief Definition
Bird-in-Hand	Means Orientation (EFF-MO)	Entrepreneurs begin with the resources at their disposal, their identity, knowledge, and networks, rather than pursuing predefined goals.
Affordable Loss	Affordable Loss Orientation (EFF-LO)	Decisions are guided by limiting potential losses to what the entrepreneur can afford, rather than maximizing expected returns.
Crazy Quilt	Partnership Orientation (EFF-PO)	Partnerships are built with self-selected stakeholders, co-creating opportunities, and sharing risks along the way.
Lemonade	Leveraging Contingencies (EFF-LC)	Surprises and setbacks are leveraged as opportunities, turning contingencies into advantages.
Pilot-in-the-Plane	Control Orientation (EFF-CO)	Entrepreneurs focus on controlling their own actions and shaping the future, rather than predicting it.

In turbulent or transitional economies, hybrid logic becomes a strategic necessity. Effectuation allows entrepreneurs to act and learn under uncertainty, while causation provides the structure and legitimacy needed for scaling and investment (Laine and Galkina, 2017; Yu *et al.,* 2018). The Tunisian context, particularly in Sfax, exemplifies this duality. Entrepreneurs operate amid institutional fragility and market volatility, relying on personal networks and iterative experimentation to create opportunities while adopting causal planning for formalization and internationalization (Haj brahim *et al.*, 2021). Consequently, entrepreneurial success in such settings depends on cognitive agility and balanced integration of both decision logics.

Entrepreneurial Marketing (EM)

EM refers to the process of identifying opportunities, developing strategies, and allocating resources to new ventures, focusing on a more agile, innovative, and resource-constrained approach to marketing than traditional marketing. The seminal work of Morris et al. (2002) provided a critical exploration of EM, proposing a conceptualization based on seven fundamental dimensions and connecting it to the theory of resource advantage. Table 2 fully defines these seven dimensions that include: (1) proactiveness, (2) opportunity-focused, (3) risk-taking orientation, (4) innovation orientation, (5) customer intensity, (6) resource use, and (7) value creation.

Although Hills et al. (2008) argue that established dimensions distinguish EM from traditional marketing, the model has been criticized for overlooking factors especially relevant to SMEs, such as alliance formation and network development, which are vital for resource access and strategic growth. Based on this foundation, Alqahtani and Uslay (2023) outlined a global research roadmap (2023–2026) for the marketing entrepreneurship interface through multistage expert consultations, while Hills et al. (2008) traced the historical evolution and position it as a potential new school of marketing thought. Extending previous frameworks, Nwankwo and Kanyangale (2020) confirmed the seven traditional dimensions of EM and introduced two additional dimensions, alliances, and teamwork, arguing that this expanded nine-dimensional model improves SME innovation and sustainability.

Table 2. The basic seven dimensions of entrepreneurial marketing.

Dimension (EM)	Focus	Brief Definition
Proactiveness (EM-PR)	Future / Market Shaping	Taking initiative to act ahead of competitors, influencing markets and creating new demand.
Opportunity-Focused (EM-OF)	Growth/Market Opportunity	Continuous identification, evaluation, and search for opportunities to drive growth and profit.
Risk-Taking Orientation (EM-RO)	Bold/Uncertainty Management	Engage in calculated bold actions, committing resources to ventures with uncertain outcomes.
Innovation Oriented (EM-IO)	Creativity / Differentiation	Openness to experimentation with products, services, and processes to create unique value.
Customer Intensity (EM-CI)	Customer-Centricity / Loyalty	Continued focus on deep understanding of the customer and long-term relationship building.
Resource Leveraging (EM-RL)	Efficiency / Networking	Creative use and combination of scarce or external resources through networks and partnerships.
Value Creation (EM-VC)	Strategic Value / Competitiveness	Generating offerings that exceed customer expectations and outperform competitors.

In addition, Jones and Rowley (2009) proposed the EMICO framework, which integrates entrepreneurial, market, innovation, and customer/corporate orientations in 15 dimensions. While offering a comprehensive perspective on EM in SMEs, the framework exhibits certain redundancies, highlighting the need for further theoretical refinement. Although comprehensive, the model exhibits redundancies, prompting calls for theoretical

refinement. Furthermore, Breit and Volkmann (2024) conducted a systematic review of 207 peer-reviewed articles (2010–2021), revealing conceptual fragmentation and proposing a tripartite classification, entrepreneurial, business, and market perspectives, to structure the evolution of the field.

Empirical research underscores the critical role of EM in the promotion of innovation and sustainable growth. For example, Hanaysha and Al-Shaikh (2022) highlight that EM enhances the exploitation of opportunities, customer orientation, and value creation, while Tollosa et al. (2024) show that competitive advantage mediates its effect on long-term performance. Despite these contributions, a consensus on a unified EM framework has not yet been established. Consequently, this study adopts the seven core dimensions of EM originally proposed by Morris et al. (2002), which are summarized in Table 2.

The Relationship between Cognitive Logics and EM Practices

The relationship between causation, effectuation, and EM practices has received scholarly attention, but the literature remains fragmented. The previous work can be grouped into three main analytical strands. The first examines how decision-making logic shapes EM behaviors. Foundational studies show that effectuation dominates marketing actions under uncertainty. Read et al. (2009) demonstrate that expert entrepreneurs rely on means-driven reasoning, affordable loss, and stakeholder commitments, rather than predictive planning in market creation. Several contributions argue that EM emerges from hybrid logics that combine causal and effectual reasoning. Reyes-Mercado and Verma (2020) show that entrepreneurs alternate between planning and experimentation depending on the stage of the venture, while case studies in Sweden (Aery, 2017) and Germany (Breit and Volkmann, 2025) confirm that entrepreneurs mix causal reasoning for the creation of goals and values with effectual reasoning for adaptability. Hybrid networking logics also support opportunity development (Galkina and Jack, 2021), improve performance under uncertainty (Shirokova *et al.,* 2021), and shape EM practices in small firms (Capeli *et al.,* 2025). Research in large B2B firms further shows that technology adoption integrates both logics, producing iterative and evolving marketing automation processes (Mero et al. 2020). Similarly, small business EM under uncertainty is driven by iterative interactions between purpose, person, and practices supported by effectual networking (Kubbered et al. 2019).

A second body of research investigates mechanisms linking cognitive logic with EM outcomes. Networking and social capital repeatedly emerge as central mediators. Effectuation improves word of mouth marketing through networking channels (Robledo et al., 2023), while entrepreneurial orientation, grounded in the underlying logic, drives integrated marketing communication and performance (Butkouskaya *et al.,* 2020). Relational capabilities such as communication, collaboration, and stakeholder participation further condition how cognitive logics translate into EM. Market ambidexterity, for example, emerges from relational processes mediating effectuation–performance links (Zhou and Liao, 2021). These studies show that cognitive logics shape EM primarily through relational mechanisms rather than direct effects.

A third strand highlights contextual moderators. Environmental uncertainty, institutional quality, and resource constraints influence which logic becomes dominant and how effectively EM strategies perform (Shirokova *et al.* 2021; Breit and Volkmann, 2025; Capeli *et al.* 2025). Market dynamism conditions the strength of links between entrepreneurial logic and EM indicators (Alqahtani and Uslay, 2023). Context-specific pressures also shape outcomes such as deinternationalization among Thai exporters (Boonchoo, 2025). In general, the effectiveness of causal versus effectual EM strategies depends heavily on the environmental context, especially in emerging economies.

Across these streams, the literature indicates that EM is derived from blended logics whose effects are mediated by relational capabilities and shaped by contextual conditions. This underscores the need for integrative frameworks that capture the dynamic interaction between cognitive logic and marketing behaviors, particularly in environments characterized by uncertainty and resource scarcity, such as Tunisia.

Situation of Entrepreneurialism in Tunisia

In recent years, Tunisia has undergone a significant transformation of its entrepreneurial ecosystem, particularly at the seed and pre-seed stages. The 2018 Startup Act created a supportive legal and institutional framework through fiscal incentives, simplified procedures, and improved access to finance. Designed to stimulate innovation and job creation, the Act led to the registration of more than 1,000 startups by June 2022. The ecosystem is dominated by the crafts sector (10%), followed by technology, health, transport, and business services (around 8%) (Bkassocies, 2022). Entrepreneurs benefit from paid leave to start companies, grants covering salaries, tax and social security exemptions, and support for patent fees and international transactions, along with preferential customs procedures for tech firms (Enpact, 2019).

Growth has accelerated in recent years. The 2024 Global Startup Ecosystem Report (GSER) (African manager, 2024) estimates the ecosystem value at US$ 241 million between July 2021 and December 2023, a 205% increase from the previous period. Investor confidence, rising valuations, and successful exits have contributed to this

expansion, driven by sectors such as AI, Big Data & Analytics, Life Sciences, and the Blue Economy. In mid-2024, 1,046 startups were labeled under the Startup Act, with an 84% conversion rate from prelabel to label; the 'Business Software & Services' sector alone represented 22.1% of labeled startups (Gharbi, 2024).

However, entrepreneurial development remains shaped by socioeconomic and institutional challenges. Women entrepreneurs face insufficient support services (Drine and Grach, 2012), while poverty, corruption, political instability, and bureaucratic norms hinder entrepreneurial intentions (Touzani et al. 2015). Universities can play a strategic role by adopting entrepreneurial orientations characterized by innovation, autonomy, and proactiveness (Sidrat and Boujelbene, 2020). Entrepreneurial support is most effective when tailored and coconstructed, rather than purely procedural (Mtibaa and Boudabbous, 2023). The recognition of opportunities is highly dependent on self-efficacy and previous experience, while formal education and social networks exert limited influence (Karamti and Abd-Mouleh, 2023). Using cognitive mapping, MICMAC and neural networks, Ghorbel et al. (2017) identify key effectuation variables shaping opportunity formation, challenging traditional views of entrepreneurial decision making. Souissi (2025) shows that support networks improve performance by improving financial access and strengthening entrepreneurial capabilities.

Despite clear progress, Tunisia's startup ecosystem remains constrained by structural, regional, and sectoral disparities. Future policies should promote diversification, improve scaling mechanisms, and ensure equitable access to capital and infrastructure. Furthermore, although regulatory reforms allow venture creation, the cognitive and strategic processes that translate entrepreneurial reasoning into actionable marketing practices have not been explored sufficiently. Understanding these mechanisms is essential to guide startups towards adaptive, scalable, and sustainable marketing behaviors in resource-constrained environments.

Structural Analysis Methods for Entrepreneurial Studies

Background of Structural Analysis Methods

Structural analysis methods are designed to manage the ambiguity and interdependence inherent in complex systems by converting qualitative expert judgments into hierarchical, visually interpretable structures. Beyond basic multi-criteria techniques, methods such as DEMATEL, ISM, MICMAC, and the integrated ISM–MICMAC framework are widely used to map causal dependencies (Bagherian *et al.,* 2024).

The ISM, introduced by Warfield in the 1970s (Warfield, 1974), structures system elements into a multilevel model based on expert assessments captured in the SSIM. It produces a binary direct reachability matrix (BDRM) and a digraph that clarifies directional influences and identifies root causes through transitivity (Attri, 2013).

MICMAC follows ISM and quantifies the driving and dependence powers by incorporating direct and indirect relationships through matrix multiplication (Godet, 2007). The method classifies the variables into autonomous, dependent, linkage, and driver factors. In short, ISM provides hierarchical structuring, while MICMAC assigns strategic roles, making the integrated approach an effective tool for diagnosing multifactor systems.

Overview of the literature on Structural Analysis Methods

The use of ISM and MICMAC in entrepreneurship research primarily supports the diagnosis of complex interdependencies. Existing work can be grouped into three thematic areas.

1. ***Macrolevel Ecosystem and Policy Drivers:*** Studies model the systemic conditions that enable entrepreneurial ecosystems, often combining ISM with fuzzy MICMAC to enhance robustness. Sindhu and Mor (2022) examined the enablers of technology entrepreneurship, while Novela et al. (2022) mapped factors driving entrepreneurial university transformation. These works focus on identifying institutional root causes that can trigger system-wide change.
2. ***New Forms of Entrepreneurialism and Technology Adoption:*** Research in this area investigates entrepreneurial models shaped by digital transformation and Industry 4.0, frequently integrating ISM–MICMAC with DEMATEL to quantify causal intensity. Examples include analyses of entrepreneurial factors in future-oriented industries (Chen *et al.,* 2022) and transformational entrepreneurship (Ebrahimi *et al.*, 2023). These studies clarify the technological and cognitive preconditions for emerging entrepreneurial forms.
3. ***Microlevel Performance and Organizational Enablers:*** Firm-level studies use ISM–MICMAC to model internal drivers of sustainable performance. Maleki and Hajipour (2021) examined the determinants of sustainable EO, while Singh et al. (2023) identified founder characteristics and human capital as the primary drivers of entrepreneurial resourcefulness. Ragmoun (2024) developed a three-level hierarchical model of environmental entrepreneurship in Saudi Arabia.

METHODS

The Conceptual Research Model

The conceptual model presented in Figure 1, illustrates the primary hypothesis that the effectuation and causation logics act as the fundamental drivers within the entrepreneurial ecosystem, whose influence is structured and mediated by specific dimensions of EM to produce the final desired results.

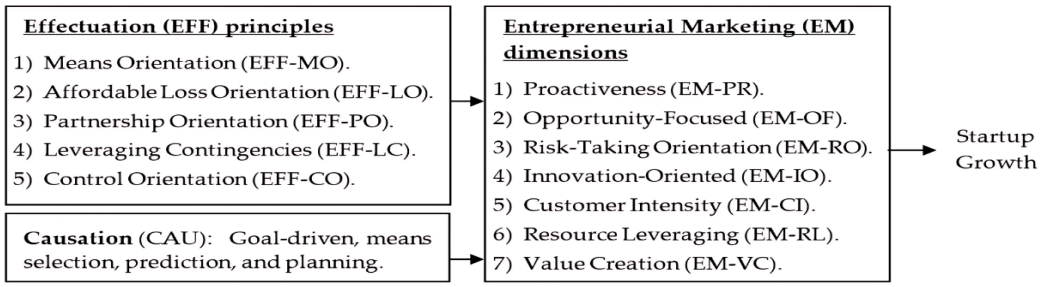

Figure 1. The conceptual model.

Figure 1 presents the conceptual model linking entrepreneurial cognitive logics, effectuation and causation, to the seven dimensions of EM that collectively drive startup growth. Effectuation is captured through its five established principles: means orientation (EFF-MO), affordable loss (EFF-LO), partnership orientation (EFF-PO), leveraging contingencies (EFF-LC), and control orientation (EFF-CO). These dimensions reflect flexible, adaptive, and means-driven decision-making. In contrast, the model includes causal logic (CAU), defined by goal-oriented planning, prediction, and systematic resource allocation.

Both logics function as antecedent drivers shaping the configuration of the seven EM dimensions: proactiveness (EM-PR), opportunity focus (EM-OF), risk taking (EM-RO), innovation orientation (EM-IO), customer intensity (EM-CI), resource leveraging (EM-RL) and value creation (EM-VC). Therefore, the model posits that cognitive approaches influence entrepreneurial marketing behaviors that, in turn, support early-stage venture growth.

To ensure conceptual rigor, all constructs were drawn from established literature. The five effectual principles follow Sarasvathy's canonical framework (Sarasvathy 2001; 2008), while causal logic builds on predictive, goal-driven predictive reasoning as formalized in the same work and refined by Chandler et al. (2011). The seven EM dimensions are adopted from the validated scales of Morris et al. (Morris et al. 2002). No new constructs were created; All variables were adapted from peer-reviewed sources to maintain theoretical consistency and measurement validity.

The Proposed Approach

The methodology of this study is grounded in a combined application of the MIC-MAC and ISM approaches. As mentioned in Figure 2, the process begins with the collection of expert opinions from a selected group of entrepreneurs, whose judgments serve as the foundation for subsequent analyzes.

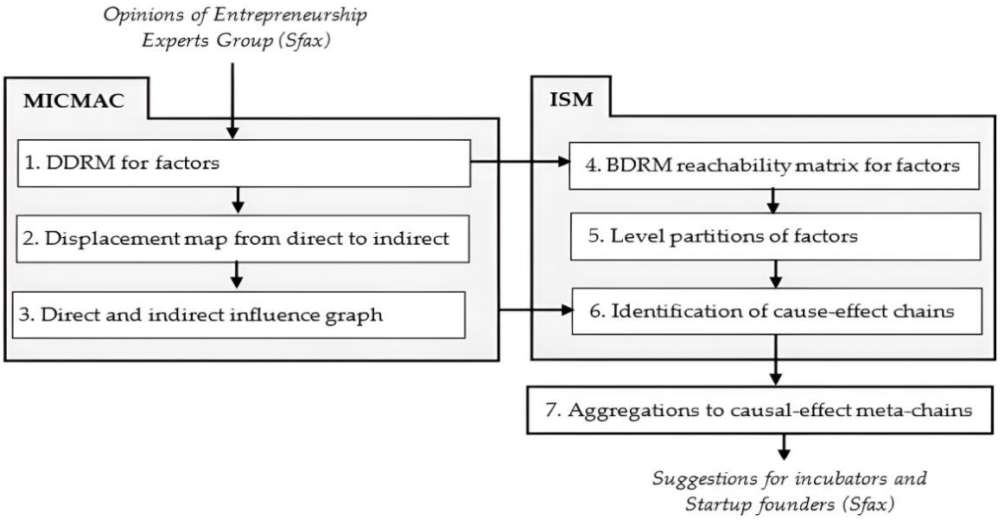

Figure 2. Hierarchy of the proposed ISM-MICMAC approach.

The analysis begins with the construction of the detailed direct reachability matrix (DDRM) within the MICMAC framework, which identifies and structures the relationships between factors. Direct and indirect influence–dependence patterns are then examined to uncover immediate and underlying interactions. Subsequently, a displacement map is developed to visualize the shift from direct to indirect influences.

Then, the direct influence graph (DIG) and indirect influence graph (IIG) are analyzed. The DIG establishes the primary causal structure by showing direct first-order effects (A→B), allowing the identification of initial drivers and dependencies. IIG visualizes cumulative effects transmitted through intermediate factors (A→X→B, etc.), revealing deeper systemic dynamics. Factors that appear moderately influential in the DIG may emerge as strong strategic drivers in the IIG, reflecting their hidden leverage.

The DDRM is then transformed for ISM processing, producing the binary direct reachability matrix (BDRM). Through iterative partitioning, factors are grouped into hierarchical levels that clarify their relative influence and structural position. Based on these levels, cause–effect chains are identified to trace directional pathways across the system. These chains are subsequently refined through MICMAC classification and expert input, improving their robustness and contextual validity.

By integrating ISM and MICMAC, the study produces a coherent structural representation of how effectual and causal logics generate distinct meta-chains shaping EM behaviors. This approach strengthens theoretical clarity and provides empirical insight for emerging economies, where uncertainty, resource scarcity, and institutional fragmentation increase the importance of understanding how cognitive logics translate into actionable marketing practices. The resulting model reveals previously unexamined dependencies and offers a comprehensive framework situating EM within a structured system of entrepreneurial reasoning.

Expert Group Profile and Data Collection

Data were collected between June 2025 and August 2025 from academic experts based in Sfax, Tunisia. Experts were identified from the major public incubators in Sfax (Sfax Innovation I, II and III) and selected through a structured selection process based on the following criteria: (1) at least five years of combined experience in research, training, and mentoring entrepreneurs throughout the startup creation process, (2) a record of at least three peer-reviewed publications in the relevant field, and (3) prior participation in evaluation or modeling studies within at least one domain of entrepreneurialism. This selection process produced a final panel of six experts who met all eligibility requirements. Before participating in the study, these experts presented in Table 3, signed informed consent forms that confirmed that their participation was voluntary and that their responses would be kept strictly anonymous.

As detailed in Table 3, the six-member expert panel comprises a multidisciplinary academic group with extensive experience in entrepreneurship support. Their expertise ensures a comprehensive coverage of the domains critical for assessing the interaction between effectual–causal logics and EM practices, including entrepreneurial strategy, marketing, accounting and finance, human resource development, business simulation, and the integration of cognitive decision-making logics. This diversity ensures that the evaluations are grounded in a comprehensive understanding of the entrepreneurial eco-system in Sfax and adapted to the specific challenges faced by startups in the seed and preseed stages.

Table 3. Expert group profile.

Expert Name	Specialty/Domain	Relevant Experience
Expert 1	Entrepreneurship and Incubation	Assistant professor, Expert in entrepreneurship
Expert 2	Marketing	University lecturer, Expert on marketing
Expert 3	Accounting	University lecturer, Expert in finance
Expert 4	Management and Personnel Development	University lecturer, Expert on management
Expert 5	Entrepreneurship, Management	University lecturer, expert on entrepreneurship
Expert 6	Enterprise Creation Simulation	University lecturer, Expert in Business Simulation

As illustrated in the conceptual model (Figure 1), the system comprises 13 factors: 5 effectuation principles, 1 causation principle, and 7 dimensions of EM, resulting in a total of 13 factors. Each expert independently evaluated the 13 pairwise relationships among these 13 identified factors using the MICMAC integrated influence codification scale (0 = no influence; 1 = weak; 2 = moderate; 3 = strong; P = potential influence), producing a total of 169 cases (13 × 13) corresponding to all possible directional relationships. A standardized guide question was used to avoid interpretation discrepancies: 'What score (between 0 and 4) would you assign to indicate the influence of factor X on factor Y to ensure the growth of early stage (seed or pre-seed) startups in Sfax?'.

Results

Inter-rater Reliability Analysis

Assessing the reliability of expert evaluations was essential to ensure the methodological robustness of the study, as the findings are based on subjective judgements. Because the data consisted of ordinal ratings, the intraclass correlation coefficient (ICC) was selected as the most suitable statistical approach. Unlike Cohen's kappa or the weighted kappa, which are designed primarily for pairwise agreement, the ICC enables simultaneous consistency evaluation between multiple raters and is appropriate for quasi-continuous treatment of ordinal data in psychometric research (Gwet, 2014). A two-way mixed-effects model with a consistency definition was applied, assuming fixed raters and a broader population of cases. This model provides a rigorous tool to determine whether experts show proportionally similar scoring patterns, strengthening the credibility of the expert-based data set used in this study.

Table 4 presents the results of the inter-rater reliability analysis using the ICC performed in SPSS 23 software. The ICC values for a single measure and an average measure are reported along with their 95% confidence intervals and the significance tests F. The single measure ICC of 0.717 (95% CI: 0.665–0.766) indicates substantial agreement between individual experts, while the average measure ICC of 0.938 (95% CI: 0.923-0.952) shows excellent reliability when considering aggregated ratings between the six experts. Both results are highly significant ($F(168, 840) = 16.175$, p-value < 0.001), confirming that expert evaluations are consistent and provide a solid foundation for the subsequent analysis.

Table 4. Intraclass Correlation Coefficient (ICC) Results.

	Intraclass Correlation	95% Confidence Interval (CI)		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	0.717	0.665	0.766	16.175	168	840	0.000
Average Measures	0.938	0.923	0.952	16.175	168	840	0.000

Detailed Direct Reachability Matrix for Factors

The empirical basis of this study is based on the evaluations of the expert panel. To construct the final detailed reachability matrix (13 x 13) for the factors, the evaluations of the six experts were aggregated. Specifically, for each pair of factors, the mean value of the six expert scores was calculated. To avoid penalizing approximate values and to prevent the undue influence of low decimals, a correction rule was applied: The average values were adjusted by adding 0.5 before rounding to the nearest integer (floor function). This procedure ensured both fairness and robustness in the aggregation process. The resulting DDRM, shown in Figure 3, represents the consolidated direct influence assessments across all factors.

The total influence and dependence analysis (Figure 3) shows that the control orientation (EFF-CO) is the dominant driver (influence = 31; dependence = 6), indicating that an entrepreneur's ability to shape events is critical for early-stage startup growth in Sfax. Other effectual principles, such as leveraging contingencies (EFF-LC) and affordable loss (EFF-LO), also exhibit high influence, highlighting adaptability and risk management. Causation (CAU) shows a notable influence, suggesting that predictive planning complements effectual logics. On the contrary, the EM dimensions—particularly resource utilization (EM-RL), value creation (EM-VC), and customer intensity (EM-CI)—show high dependence but low influence, implying that marketing practices are largely the outcomes of underlying entrepreneurial logics rather than the primary drivers at this stage.

From \ To	EFF-MO	EFF-PO	EFF-LO	EFF-LC	EFF-CO	CAU	EM-PR	EM-OF	EM-RO	EM-IO	EM-CI	EM-RL	EM-VC	Total influence
EFF-MO	0	1	2	1	1	1	2	1	1	1	1	4	2	18
EFF-PO	1	0	1	1	1	1	1	1	1	1	3	3	3	18
EFF-LO	2	1	0	1	1	1	2	1	3	1	2	4	1	20
EFF-LC	1	3	1	0	1	1	2	1	3	3	2	2	1	21
EFF-CO	2	3	2	3	0	2	4	4	3	2	2	2	2	31
CAU	1	1	1	1	1	0	3	3	3	2	1	1	2	20
EM-PR	1	1	0	1	1	0	0	3	1	1	2	1	1	13
EM-OF	0	0	0	0	0	0	1	0	1	3	1	1	2	9
EM-RO	0	0	1	0	0	0	1	1	0	1	1	1	1	7
EM-IO	0	0	0	1	0	0	1	1	1	0	2	1	1	8
EM-CI	0	1	0	0	0	0	0	0	0	0	0	1	3	5
EM-RL	1	0	1	0	0	0	0	0	0	0	1	0	3	6
EM-VC	0	1	0	0	0	0	1	0	0	0	2	1	0	5
Total dependence	9	12	9	9	6	6	18	16	17	15	20	22	22	

Figure 3. The final detailed direct reachability matrix (DDRM) for factors.

In general, this preliminary assessment validates expert data and provides an initial structural understanding of how effectuation and causation interact with EM in early stage startups. Subsequent MICMAC and ISM steps will offer more detailed information by uncovering hierarchical levels and cause–effect chains among factors.

Displacement Map from Direct to Indirect

The 13 factors were examined through MICMAC analysis to determine their relative influence and dependence. The results of this analysis are illustrated in Figure 4, which depicts the classification of variables according to their influence and dependence levels. In the figure, the x-axis corresponds to dependence, whereas the y-axis indicates the degree of influence.

Figure 4 classifies the 13 factors into four quadrants based on influence and dependence, showing the shift from direct to indirect effects and providing information on the dynamics of the system (Table 5).

- Zone I (high influence, low dependence): Primary drivers (EFF-CO, EFF-LC, CAU) and intermediate drivers (EFF-PO, EFF-LO, EFF-MO) exert strong influence and are strategic levers for intervention.
- Zone II (linkage factors): Highly interdependent factors that act as both causes and effects. Their absence here is positive, avoiding destabilizing feedback loops.
- Zone III (dependent factors): EM dimensions (e.g., EM-VC, EM-CI, EM-RO) strongly influenced by other variables, representing key outcomes rather than drivers.
- Zone IV (autonomous factors): Low influence and low dependence, including EM-OF initially, and indirectly EM-PR, EM-IO, and EM-RO. These are less critical, but should be monitored.

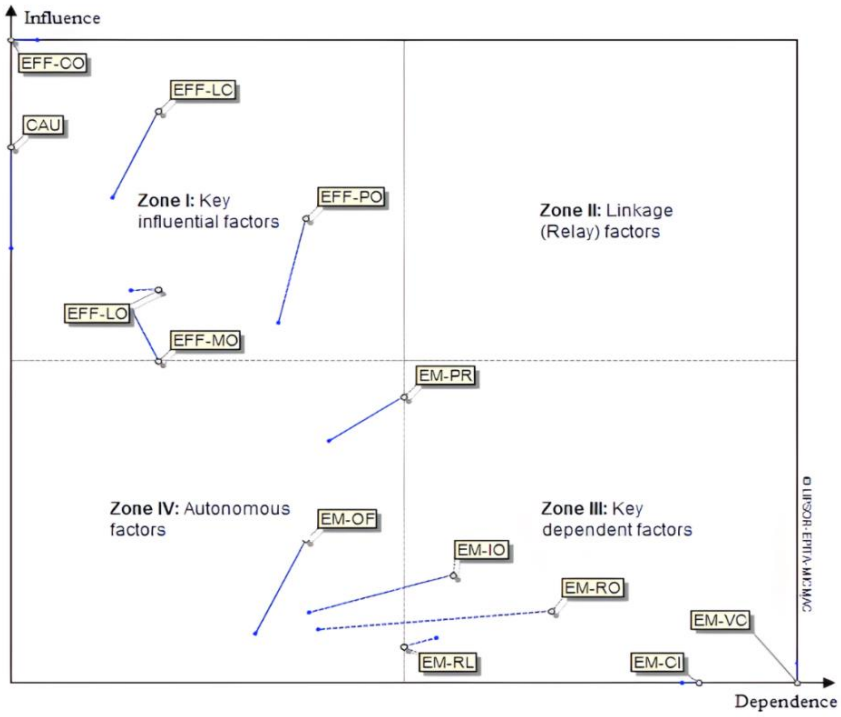

Figure 4. Displacement map from direct to indirect.

In general, the quadrant mapping identifies key drivers, dependent outcomes, and autonomous variables, providing a structured view of the entrepreneurial ecosystem and clarifying which factors drive strategic results versus those reflecting system responses.

Table 5. MICMAC classification.

Classification	Representative factors	Strategic role according to MICMAC analysis
Key influential factors (Drivers): Effectuation and Causation	EFF-CO, EFF-LC, CAU	Driving factors that exert strong control over the system and are priority targets for intervention.
	EFF-PO, EFF-LO, EFF-MO	Intermediate drivers with moderate influence, contributing to system dynamics but less dominant than top drivers.
	EM-VC, EM-CI, EM-RO	Highly dependent factors that represent key outcomes of the system, shaped by other variables.

Key dependent (result) factors: All the seven EM dimensions	EM-PR, EM-OF, EM-IO, EM-RL	Less dependent factors, outcomes influenced by multiple drivers, monitored for system stability but not primary drivers.

Table 5 distinguishes the factors according to their influence and dependence within the system. Key influential factors (drivers) include variables such as EFF-CO, EFF-LC, and CAU, which exert strong control over the system and serve as priority intervention points. Intermediate drivers, including EFF-PO, EFF-LO, and EFF-MO, also contribute to system dynamics, but with comparatively lower influence. Key result factors, or dependent variables, such as EM-VC, EM-CI, and EM-RO, represent critical outcomes shaped by the drivers, while less dependent outcome variables (EM-PR, EM-OF, EM-IO, EM-RL) are influenced by multiple factors and should be monitored to ensure system stability.

Although this classification provides an essential overview, it is necessary to examine the graphs of direct and indirect influence to gain a deeper understanding of advanced causal links. DIG reveal immediate interactions among variables, while IIG uncover feed-back loops, reinforcing chains, and subtler interdependencies that are critical for accurately identifying strategic drivers and predicting systemic behavior. Such a comprehensive approach is fundamental for effective intervention design within the entrepreneurial ecosystem.

Direct and Indirect Graphs

Direct Influence Graph (DIG)

The DIG, as shown in Figure 5, is one of the crucial components of the MICMAC analysis, as it visually represents the immediate unamplified causal relationships between the 13 factors. Each arrow signifies a direct influence, and the consistent weighting ('3' on all lines) indicates that most of these immediate connections are modeled at the same strength level. This graph provides a snapshot of the operational structure, showing which factors directly trigger or enable others.

Figure 5 highlights several key insights:

- ***Centrality of Control Orientation (EFF-CO):*** EFF-CO acts as a primary driver, establishing three strategic pathways. It strongly influences EFF-LO (affordable loss), setting measured risk parameters; EFF-PO (partnership orientation), promoting immediate collaborations to co-create the future; and EM-CI (customer intensity), requiring deep engagement with key stakeholders.
- ***Power of Contingency and Opportunity:*** EFF-LC (leveraging contingencies) drives both EM-IO (innovation orientation) and EFF-PO, turning unexpected events into innovation and partnerships. EM-OF (opportunity-focused) strongly influences EM-VC (value creation), demonstrating that opportunity recognition directly generates value.
- ***Drivers of Value Creation (EM-VC):*** EM-VC is directly shaped by EM-OF, EM-PR (proactiveness), and EFF-PO, indicating that opportunity focus, proactive behavior, and partnerships are necessary and sufficient for value creation.
- ***Causation and Risk Management:*** CAU (causation) directly influences EM-OF, EFF-LO, and EM-RO (risk taking), showing that planning structures opportunity focus and risk management.
- ***Moderate Secondary Effects:*** EFF-LO moderately influences EM-CI and EM-VC, supporting customer engagement and value creation through small-scale experimentation. EM-CI moderately affects EM-RO, suggesting that customer feedback slightly improves risk-taking confidence.

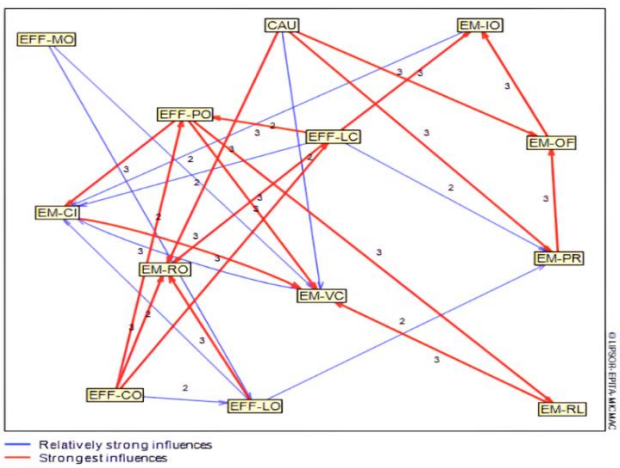

Figure 5. Direct influence graph.

Indirect influence graph (IIG)

Figure 6 shows the IIG generated by MICMAC, illustrating the indirect relationships between the 13 entrepreneurial factors in Sfax, Tunisia. Influence strengths are color-coded from weakest (blue) to strongest (red), highlighting how factors indirectly affect each other within the ecosystem. This systemic view reveals second-order effects not apparent in direct influence analysis, providing insight into how entrepreneurial logics and marketing orientations mutually reinforce each other.

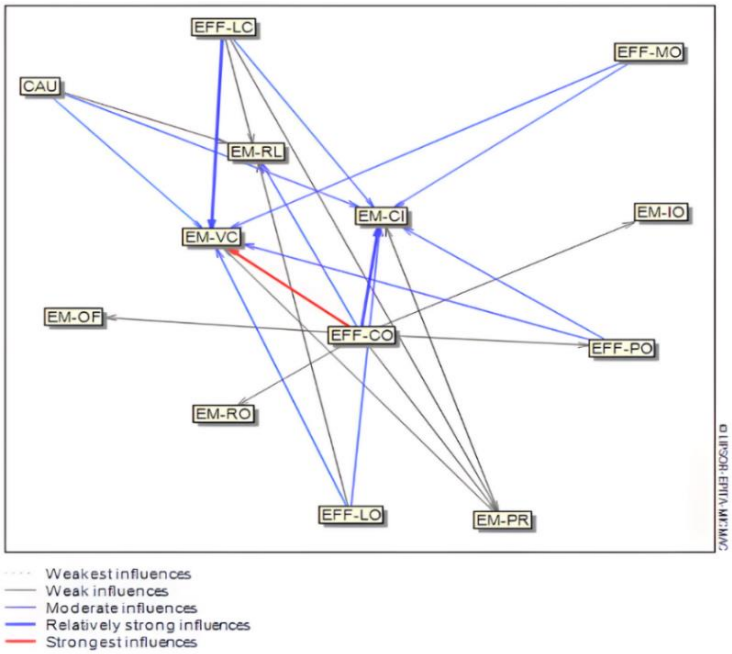

Figure 6. Indirect influence graph

The findings highlight the strategic dominance of effectuation principles as primary long-term drivers.

- ***Systemic Dominance of Effectuation Logic:*** Control orientation (EFF-CO) and leveraging contingencies (EFF-LC) are the most influential indirect drivers, with strong links radiating across the IIG, confirming their role as strategic levers on the displacement map.
- ***EFF-CO as a Value Amplifier:*** EFF-CO shows the strongest overall indirect effect, including a prominent link to value creation (EM-VC), indicating that the entrepreneur's belief in controlling the future indirectly drives value through intermediate actions.
- ***EM-VC as System Output:*** EM-VC receives high indirect influence from nearly all EFF and CAU factors, validating its role as the ultimate dependent variable and demonstrating that sustained performance results from multistep, system-wide efforts.
- ***EM-CI as a Behavioral Relay:*** EM-CI receives substantial indirect influence (eg, from EFF-LC) and channels it to other factors, including EM-VC, highlighting its function in translating high-level strategic principles into operational activities that drive results.

ISM Reachability Matrix for Factors

Given that the ISM method operates on BDRM, a transformation is necessary. Consequently, all non-zero entries in the final direct reachability matrix of the MICMAC analysis (Figure 3) are converted to the value of 1. Zero entries are retained, and all diagonal elements are uniformly set to 1 to signify self-reachability. Following the generation of the BDRM, the reachability set (elements potentially impacted) and the antecedent set (elements that potentially impact it) are determined for each factor using an iterative process.

Level Partitions of Factors

The goal of this iterative process is to partition the elements into different levels based on their driving and dependence power, ultimately forming the hierarchical structure of the ISM model. The main idea involves finding the Reachability Set (R), the Antecedent Set (A), and their intersection (I) for each element, and then checking the condition where R = I to find the elements for the current level, and the process continues until every factor studied has been assigned a specific level. The steps of each iteration are as follows, and the final results are summarized in Table 6:

1. Determine the reachability and antecedent sets: For every factor in the 0-1 reachability matrix: Reachability set (R(i)): This set consists of the element itself and all other elements it can influence or "reach" (i.e., columns where the corresponding row has a '1'). Antecedent set (A(i)): This set consists of the element itself and all other elements that can influence it (i.e., rows where the corresponding column has a '1'). Intersection set (I(i)): This is the intersection of the reachability and antecedent sets (I(i) = R (i) ∩ A (i)).
2. Identify the element(s) of the top level: The elements that qualify for the highest level (Level I) are those in which the Reachability Set is identical to the Intersection Set (R(i) = I(i)). This condition means that the element can only reach those factors that also reach it (or itself). Crucially, this element cannot reach any element above its current level in the final hierarchy. These are the elements with the highest dependence power and are often considered the consequences or results in the system.
3. Extraction and Iteration: Once the top-level element(s) are identified, they are separated from the remaining elements. These extracted elements and their corresponding rows/columns are removed from the reachability matrix. The entire process (Steps 1 and 2) is repeated with the remaining submatrix to identify the elements for the next level (Level II).
4. Completion: This iterative process continues until each element in the system has been assigned a specific level. The final output is a clearly defined hierarchy that serves as the basis for drawing the final ISM directed graph.

Table 6. Identification of ISM levels.

Level	Factors	Interpretation
Level I	EM-RO (EM-Risk Taking Orientation), EM-CI (EM-Customer Intensity), EM-VC (EM-Value Creation).	Most dependent outcomes (marketing results & value creation)
Level II	EM-IO (EM-Innovation-Oriented), EM-RL (EM-Resource Leveraging).	High dependence, moderate drivers (innovation & relational learning)
Level III	EFF-PO (EFF-Partnership Orientation) EM-OF (EM-Opportunity-Focused).	Tactical entrepreneurial actions (performance orientation & opportunity focus)
Level VI	EM-PR (EM-Proactiveness).	Strategic marketing practices (proactive engagement & promotion)
Level V	EFF-MO (EFF-Means Orientation) EFF-LO (EFF- Loss Orientation) EFF-LC (EFF-Leveraging Contingencies) CAU (Causation)	Core strategic logics combining effectuation and causation
Level IV	EFF-CO (EFF-Control Orientation)	Fundamental driving factor influencing all others (root cause)

Table 6 shows that the ISM model structures the factors into six hierarchical levels, which can be consolidated into three main families that trace the causal chain from entrepreneurial logic to marketing outcomes. At the foundation (Level VI), the control orientation (EFF-CO) embodies the 'Pilot-in-the-Plane' principle, serving as the deepest driver underlying all orientations and indicating that an effective EM strategy relies on this core control logic. Level V includes key strategic orientations, means orientation (EFF-MO), affordable loss (EFF-LO), leverage contingencies (EFF-LC), and causation (CAU), illustrating the dual logic of flexible, adaptive, and goal-directed decision making. These strategic orientations translate into operational marketing practices at Level IV, where entrepreneurial proactiveness (EM-PR) converts intent into market action. Level III supports opportunity-oriented activities, including partnership orientation (EFF-PO) and opportunity-focused marketing (EM-OF), emphasizing alliances, network leverage, and market exploitation within manageable risks.

Advanced marketing capabilities emerge at Level II, Innovation orientation (EM-IO) and resource leveraging (EM-RL), enabling sustained innovation and efficient use of limited resources. Finally, Level I captures dependent outcomes: customer intensity (EM-CI), value creation (EM-VC), and risk-taking orientation (EM-RO), representing tangible results of a strategically grounded EM process. The risk taking here is an emerging outcome rather than an inherent trait.

Identification of Cause-Effect Chains

Identification According MICMAC Analysis

The MICMAC findings, specifically the classification of factors into drivers (zone I: EFF-CO, EFF-LC, CAU), intermediate drivers (EFF-PO, EFF-LO, EFF-MO) and key outcomes (EM-VC, EM-CI, EM-RO) Validate the four strategic causal-effect chains, as defined in Table 7.

Table 7. The identified causal-effect chain according to MICMAC.

Chain Name	Primary Driver Link (Level → Level)	End Point Rationale	MICMAC Evidence
Chain 1. Ultimate value amplification	EFF-CO (→ Indirect) EM-VC	EM-VC is the most essential dependent outcome, reflecting the founder's amplified belief.	IIG
Chain 2. Planned proactiveness path	CAU →EM-OF → EM-PR	EM-PR is a stable organizational milestone and a less dependent factor (zone IV).	DIG
Chain 3. Contingency-driven risk path	EFF-LC→EM-IO →EM-CI	EM-CI is a key-dependent result that directly encourages EM-RO.	DIG
Chain 4. Bootstrapping-to-risk path	EFF-CO →EFF-RO →EM-VC	EFF-LO directly enables EM-VC and successful value creation justifies EM-RO.	DIG

The analysis identifies four causal chains linking entrepreneurial logic to EM outcomes in early-stage startups:

- ***Chain 1 – Ultimate Value Amplifier:*** EFF-CO indirectly drives value creation (EM-VC), acting as the strongest indirect system driver (red link, Figure 6) and positioning cognitive control as a strategic catalyst that shapes subsequent effectual behaviors and marketing practices. Strong effectual control can offset resource constraints, enhancing early performance in Sfax startups.
- ***Chain 2 – Planned Proactivity:*** Causal reasoning (CAU) channels structured planning into organizational proactiveness (EM-PR), which precedes EM outcomes such as EM-VC and EM-CI. CAU also directly influences opportunity-focused marketing (EM-OF) and resource utilization (EM-RL), creating a predictable link between internal planning and market success.
- ***Chain 3 – Contingency-Driven Risk:*** EFF-LC drives innovation (EM-IO) and partnerships (EFF-PO), enabling rapid exploitation of unexpected opportunities. This strengthens EM-CI and reinforces risk taking (EM-RO), forming a self-reinforcing cycle of flexibility and responsiveness. Contingency-driven strategies accelerate innovation, build customer trust, and reduce uncertainty.
- ***Chain 4 - Bootstrapping to Risk:*** EFF-CO drives an affordable loss orientation (EFF-LO), supporting bounded experimentation and efficient EM-VC [4, 8]. Successful value creation enhances confidence and fosters EM-RO, directly or through EM-PR, demonstrating that affordable-loss strategies stabilize and enable early-stage ventures.

Identification According to the ISM Method

The ISM hierarchy identifies the key causal chains that link the foundational entrepreneurial factors (level IV) to ultimate outcomes (Levels I and II) for Sfax startups. By capturing direct influences across multiple levels, the chains reveal both sequential and accelerated strategic pathways, essential for understanding rapid decision making in resource-constrained seed and pre-seed phases. Three primary causal-effect chains are detailed in Table 8.

Table 8. The identified causal-effect chain according to ISM.

Chain Name	Causal Pathway (Direct ISM Links)	Rationale for Efficiency
Chain 5: Adaptive Resource-Based	EFF-CO (IV) → EFF-LO (V) → EM-RL (II) → All Level (I)	Entrepreneurs' control and affordable-loss logic enable adaptive resource use, supporting risk-taking while maintaining operational maketing efficiency (Customer Intensity and value creation).
Chain 6: Strategic Planning–Opportunity	EFF-CO (VI) → CAU (V) → EM-PR (VI) → EM-OF (III) → All Level (I)	Integrating causal planning with effectual opportunity focus enables proactive action and calculated risk-taking before formal market outcomes, translating strategy into results.
Chain 7: Partnership–Innovation	EFF-PO (V) → EM-IO (IV) → EM-CI (III) → All Level (I)	Partnerships drive innovation and customer engagement, accelerating market impact and reducing uncertainty through collaboration.

The three chains illustrate distinct pathways from the foundational mindset (EFF-CO, Level VII) to key behavioral outcomes (EM-RO, EM-CI, EM-VC):

- Chain 5 – Adaptive resource-based: EFF-CO and affordable loss (EFF-LO) foster a constraint-aware mindset supporting disciplined resource leveraging (EM-RL), converting scarcity into learning and confidence, ultimately enhancing EM-RO and sustainable value creation.
- Chain 6 – Strategic planning–opportunity: Causal reasoning (CAU) drives structured EM, with opportunity-focused marketing (EM-OF) translating planning into actionable market interventions, promoting EM-PR and evidence-based EM-RO. Integrating causation with opportunity recognition enables coherent, adaptive decision-making under uncertainty.
- Chain 7 – Partnership–innovation: Partnership orientation (EFF-PO) leverages external networks to drive innovation (EM-IO) and customer intensity (EM-CI), fostering collaborative learning, resource sharing, and informed risk-taking (EM-RO). Strategic collaboration creates a self-sustaining loop enhancing innovation, customer engagement, and EM effectiveness.

Aggregations to Causal-Effect Meta-Chains

From the seven causal effect chains (four from MICMAC, three from ISM), a synthesis produced three meta-chains by aggregating similar pathways and removing redundancies. The same six experts clustered the original chains based on variable interactions across hierarchical levels, yielding coherent meta-chains that capture the core strategic logics driving early-stage startup development in Sfax. The resulting meta-chains (Table 9) are: Meta-chain A, Effectual Strategic Logic and Value Creation, Meta-chain B, Combined Adaptive Effectual Reasoning and Causal Planning, and Meta-chain C, Partnership-Driven Innovation and Market Engagement.

- ***Meta-Chain A:*** Effectual Strategic Logic and Value Creation: EFF-CO and EFF-LO enable efficient resource use (EM-RL), driving value creation (EM-VC), and risk taking (EM-RO). For Sfax seed and pre-seed startups, this self-reinforcing loop links mindset to tangible outcomes, showing how operational efficiency supports calculated risk.
- ***Meta-Chain B:*** Combined Adaptive Effectual Reasoning and Causal Planning: EFF-CO (VI) and CAU (V) jointly drive proactiveness (EM-PR, VI) and opportunity-focused marketing (EM-OF, III), leading to risk taking (EM-RO, I). This meta-chain balances adaptive flexibility with strategic foresight, enabling proactive and calculated decision-making.
- ***Meta-Chain C:*** Partnership-Driven Innovation and Market Engagement: EFF-LC or EFF-PO stimulate innovation orientation (EM-IO) and customer intensity (EM-CI), culminating in risk taking (EM-RO). In Sfax startups, collaboration and networked learning accelerate innovation, enhance market responsiveness, and reduce uncertainty.

Table 9. Aggregating the original seven cause-effect chains to three meta-chains.

Chain Name	Source	Causal Pathway / Levels	Assigned Meta-Chain
Chain 1: Ultimate Value Amplification	MICMAC (IIG)	EFF-CO (→ Indirect) → EM-VC	Meta-Chain A
Chain 2: Planned Proactiveness Path	MICMAC (DIG)	CAU → EM-OF → EM-PR	Meta-Chain B
Chain 3: Contingency-Driven Risk Path	MICMAC (DIG)	EFF-LC → EM-IO → EM-CI / EM-RO	Meta-Chain C
Chain 4: Bootstrapping-to-Risk Path	MICMAC (DIG)	EFF-CO → EFF-RO → EM-VC/ EM-RO	Meta-Chain A
Chain 5: Adaptive Resource-Based	ISM	EFF-CO → EFF-LO → EM-RL → All Level	Meta-Chain A
Chain 6: Strategic Planning–Opportunity	ISM	EFF-CO (VI) → CAU (V) → EM-PR (VI) → EM-OF (III) → All Level (I)	Meta-Chain B
Chain 7: Partnership–Innovation	ISM	EFF-PO → EM-IO → EM-CI → All Level	Meta-Chain C

DISCUSSION

Findings Alignment with Existing Research

The integrated ISM–MICMAC analysis identified 13 key factors across effectuation, causation, and the seven dimensions of EM, structured into seven causal chains and consolidated into three metachains, capturing hybrid decision-making in early-stage Sfax startups.

Meta-Chain A: Effectual Strategic Logic and Value Creation

Meta-Chain A represents seed and pre-seed ventures under resource constraints. EFF-CO and EFF-LO guide entrepreneurs to focus on controllable factors and limit downside exposure (Sarasvathy, 2021; Sarasvathy, 2008; Read *et al.*, 2009). This logic translates into resource leveraging (EM-RL), generating incremental value (EM-VC) through low-cost experimentation, bricolage, and creative recombination of resources (Baker et al. 2005; Reymen et al. 2015; Ghorbel, et al. 2017; Bao et al. 2024; Costa, 2025). The value created reinforces the risk-taking orientation (EM-RO), forming a self-reinforcing loop. In particular, affordable loss plays a more central role in Sfax than in Western ecosystems (Yu et al. 2018), showing context-specific intensities of effectuation.

Meta-Chain B: Combined Adaptive Effectual Reasoning and Causal Planning

MetaChain B highlights hybrid reasoning, where EFF-CO and CAU drive proactiveness (EM-PR) and opportunity focus (EM-OF) (Read *et al.,* 2009; Reymen *et al.* 2015; Reyes-Mercado and Verma, 2020; Ruiz-Jiménez *et al.* 2021). Effectuation enables rapid adaptation, while causation ensures coherent planning. This dual logic fosters calibrated risk taking (EM-RO), blending real-time experimentation with systematic evaluation (Galkina and Jack, 2021; Zhou and Liao, 2021). Unlike classical effectuation models, Sfax startups adopt causal planning early, likely due to incubator influence, emphasizing structured opportunity mapping even under high uncertainty.

Meta-Chain C: Partnership-Driven Innovation and Market Engagement

Meta-Chain C focuses on relational mechanisms. EFF-LC and EFF-PO leverage contingencies and partnerships to drive innovation orientation (EM-IO) and customer intensity (EM-CI) (Sarasvathy, 2001; Galkina and Jack, 2021). Collaborative networks provide knowledge, reduce uncertainty, and improve market responsiveness. Risk taking emerges from distributed confidence within partnerships rather than internal control. In economy, a resource-scarce Sfax, partnerships are structurally essential, replacing missing infrastructure and enabling startups to innovate and grow under severe constraints.

CONTRIBUTION AND IMPLICATIONS

This study applies the integrated ISM–MICMAC approach to examine interactions between effectuation, causation, and EM dimensions in early-stage Sfax startups. Analysis of three meta-chains illustrates how entrepreneurs balance adaptive improvisation with structured decision-making. Meta-Chain A emphasizes effectual control and affordable loss in translating founder beliefs into measurable outcomes. Meta-Chain B shows how combining effectual reasoning with causal planning promotes opportunity-focused marketing, proactiveness, and risk taking. Meta-Chain C highlights partnerships and contingency leverage, accelerating innovation and customer engagement, underscoring the importance of relational capital.

The findings reveal that effectual and causal logics operate simultaneously, particularly in Meta-Chain B, forming a synergistic rather than sequential relationship. Compared to previous studies, the research shows a stronger reliance on external networks for capability building in emerging ecosystems like Sfax. Methodologically, it contributes by systematically mapping entrepreneurial logics to EM dimensions using causal-effect chains and hierarchical meta-chains.

Thirteen key factors were structured into seven causal effect chains, identifying effectual control, causal planning, and leverage of contingency leverage as primary drivers, and value creation, proactiveness, and customer intensity as main outcomes. The framework provides actionable guidance to founders, incubators, and educators on how to leverage effectual and causal reasoning, resource use, and network collaboration to improve early-stage growth and resilience.

The study advances theory in three ways: effectual logic dominates early stages even alongside causal reasoning; effectual and causal logics operate concurrently, combining adaptive experimentation with strategic planning; and partnerships compensate for institutional gaps, highlighting the role of relational capital in driving innovation, customer intensity and risk-taking.

Practical implications include prioritizing disciplined effectual experimentation, iterative market testing, and lightweight planning, in conjunction with actively cultivating partnerships and engaging customers. Incubators can support cognitive hybridization, networking, and access to intelligence and micro-funding, while policymakers can enable growth through simplified regulations, seed funding aligned with affordable loss, stronger university-industry links, and regional partnership platforms.

In general, early stage success in Tunisia relies on the synergy of adaptive effective logic, targeted causal planning, and innovation enabled by partnerships, improving resilience, accelerating market participation, and allowing resource-constrained startups to grow while managing uncertainty in a structured, yet flexible manner.

CONCLUSIONS

This paper investigates the structural relationships among the five principles of effectuation, causation logic, and the seven dimensions of EM, drawing on the expertise of an academic and expert panel in Sfax, Tunisia. Using a combined ISM–MICMAC methodology, the study identifies the hierarchy of influence and dependence between entrepreneurial logics and EM dimensions, uncovering key strategic levers within early-stage ventures.

Analysis of seven causal-effect chains enabled the identification of three overarching meta-chains. The first, effectual strategic logic and value creation, integrates ultimate value amplification, risk-based bootstrapping, and adaptive resource-based chains, emphasizing the role of effectual reasoning, resource leveraging, and affordable-loss thinking. This meta-chain demonstrates how startups generate tangible value and undertake calculated risks within resource-constrained environments. The second, combined effectuation–causation path, consolidates planned proactiveness and strategic planning chains, reflecting a hybrid logic that merges effectual flexibility with causal foresight. It shows how structured goal setting and opportunity recognition can coexist with adaptive improvisation, guiding startups toward predictable, yet adaptable outcomes. This balanced logic is particularly relevant for navigating uncertainty and fostering innovation in dynamic environments. The third, innovation and market participation, merges risks and partnership–innovation chains, underscoring the importance of collaboration and relational capital. Entrepreneurs leverage partnerships to accelerate innovation, strengthen customer engagement, and link internal capabilities with market responsiveness.

Collectively, these three meta-chains provide a structured framework for translating entrepreneurial logics into actionable marketing strategies. They offer practical guidance for startup founders, incubator managers, and educators by fostering balance between experimentation, structured planning, and collaboration. This framework supports opportunity recognition, operational resilience, and risk management growth, key enablers of startup sustainability in emerging ecosystems such as Sfax.

From a theoretical point of view, this research advances the understanding of how cognitive entrepreneurial logics interact with EM dimensions, offering an empirically grounded framework for analyzing hybrid strategies and refining models of EM models. Practically, it equips stakeholders with diagnostic tools to assess startup development, enabling more targeted support and improved alignment between entrepreneurial behavior and market outcomes.

However, several limitations must be acknowledged. The empirical scope of the study was restricted to experts in the Sfax startup ecosystem, which may limit the generalizability of the results to other regions or countries. Additionally, the reliance on expert judgments drawn exclusively from trainers and academics, rather than from practitioners directly involved in venture creation or investment, may introduce bias in the interpretations. The methodological approach, which is qualitative and interpretive in nature, is effective for revealing structural relationships, but does not capture temporal dynamics, quantify the strength of interactions, or allow testing of causal or predictive effects. As a result, the explanatory power of the identified meta-chains remains limited, particularly when used to inform policy formulation or managerial decision making. Furthermore, the exploratory and expert-based nature of the study limits external validity, as no direct firm-level measurements of cognitive logic or EM practices were carried out.

Future research could address these limitations by expanding the data collection strategy and adopting other heterogeneous groups of informants, including entrepreneurs at different stages of venture development, incubator managers, investors, and public sec-tor actors, to improve the validity and triangulation of expert input. Large-scale survey designs targeting early-stage companies, complemented by structured in-depth interviews, would allow systematic testing of the proposed causal framework. Longitudinal or mixed-method research designs would further strengthen the evidence base, allowing scholars to examine the temporal evolution of effectual–causal logics and validate the stability of interfactor relationships. The application of structural equation modeling, such as in (Asad *et al.* 2025 Andelo *et al.* 2025) and/or regression analysis, such as in (Johnson and Hörisch, 2021; Long *et al.* 2021), could further enhance the robustness and generalizability of the founded three metachains. Integrating

quantitative indicators, such as survival rates, revenue trajectory, or innovation outputs, would allow empirical testing of the predictive validity of the structural model and assessing its practical relevance.

Furthermore, comparative analyzes between regions and countries would improve our understanding of transferability and the influence of contextual factors. Future research should emerge directly from the study findings by exploring the strategic importance of metachain drivers, particularly affordable loss and partnerships, in shaping early-stage growth trajectories. Comparison data sets between regions and international would provide stronger external validation of the proposed structures. Investigating the moderating roles of digital technologies and AI in entrepreneurial decision making could also provide novel insights into how startups navigate uncertainty in the era of digital entrepreneurship.

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Informed Consent: Informed consent was obtained from all participants' experts, who were informed of the academic purpose and voluntary nature of the study. Responses were kept strictly confidential, without disclosure of information that could identify them
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Author's Contribution: Both authors contributed to the conception and design of the study
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