Big Data Analysis of Entrepreneurial Intention and Success: The Role of Individual and Social Network Factors with Education and Experience as Moderators — Evidence from GEM APS Survey

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ARTICLE INFO	ABSTRACT
	Entrepreneurship has become a key driver of economic growth and employment in developed and developing economies. However, it depends on socio-economic status, educational level, experience-based learning, and the quality of institutional backup. Although policymakers and scholars have continued to analyze this terrain, there remains considerable uncertainty about determinants interrelates to either nurture or hinder entrepreneurial mobilization. To bridge these gaps, the current study aims to contribute a systematic examination of entrepreneurial activity by investigating big-data analytic techniques. Using the Global Entrepreneurship Monitor (GEM) Analysis of the Pulse Survey (APS) data on Bahrain, the study formulates eight hypotheses. The systematic analysis process involves variable selection, data cleaning, and preparation using statistical and computational methods like correlation analysis, Chi-Square tests, ANOVA, and logistic regression with p-value testing. SPSS was used to run the statistical tests in the study. Python scikit-learn library was used to build machine-learning models. Among the analytic suite, there were logistic regression, decision-tree, and random-forest classifiers. Empirical evidence on the multifaceted drivers is evident from findings, highlighting personal characteristics, social networks, and contextual moderators. The study contributes to entrepreneurship theory and policy development, offering insights for fostering entrepreneurial ecosystems in Bahrain. **Keywords:** Big Data , Analysis, Entrepreneurship, Individual, Social, Network, Factor.

Introduction

Entrepreneurship is widely recognized as a key driver of economic growth, innovation, and societal development. Entrepreneurship is also commonly accepted as a pillar of economic growth, novelty, and employment, which is very important, especially in emerging economies, where diversification and growing sustainability are key issues. However, there is no uniform entrepreneurial activity; personal ambitions, social forces, institutional structure, and the overall economic situation shape the activity. The dynamics are crucial in the identification of barriers, entrepreneurial intentions, and the creation of ecosystems that enable these intentions to form and to remain sustainable. This paper thus addresses the complex motivators of entrepreneurship and how individual, social, and environmental aspects can be related to entrepreneurial performance.[5]

Entrepreneurial ecosystems still face the long-standing challenges that limit the realization of nascent ideas into sustainable and long-term business opportunities. Some of the factors that tend to hinder the growth of entrepreneurial activities, particularly in developing economies, are limited access to

finances, a lack of entrepreneurial education, and weak institutional backing for entrepreneurial ventures. It is necessary to mitigate these hindrances, bearing in mind that the element of entrepreneurship plays a critical role in enhancing competitiveness, fostering innovation, and reducing unemployment. The necessity of the study, which aims to clarify the interaction of individual factors, social relationships, and contextual variables to create entrepreneurial intentions and behavior, fulfills a gap in the theoretical research and policy-making processes.

A large amount of literature has proven the importance of previous experience, the influence of education, and social capital in entrepreneurial behavior (Shane and Venkataraman, 2000; Acs, Autio, and Szerb, 2014; Nabi et al., 2017). This literature has discussed the impact of personal factors—such as self-efficacy, motivation, and risk-taking—and network and social factors—such as peer influence and access to entrepreneurial role models—on entrepreneurial intention and success. However, most prior studies have relied on traditional statistical approaches and have not fully leveraged the power of big data analytics and machine learning to explore these relationships at scale.

Entrepreneurship is always an essential driver of innovation, competitiveness, and sustainable economic development, especially in those areas that are aimed at diversification and resilience (Bosma et al., 2020; Nabi et al., 2021). Although it is the most critically important, structural barriers often prevent entrepreneurial activity; they may be the lack of access to finance, insufficient institutional support, or the absence of entrepreneurial education and experience (Gioni et al., 2020; Fuster et al., 2021). According to the recent scholarship, there is an increasing need to investigate the combined influence of individual, social, and contextual components on entrepreneurial intentions and outcomes (Cardella et al., 2022; Guerrero et al., 2023). Nevertheless, the majority of the literature available remains based on standard statistical structures and is generally inclined to separate out the mediating variables like education level and work experience, therefore providing incomplete information on their inter- action processes. To address this gap, the current research will utilize big-data methods of analytics to evaluate the impacts of individual and social factors on entrepreneurial intention and success. In addition, it builds upon the current body of knowledge by examining the intermediary positions of education and experience within a single research framework, thus providing an overall view that provides more profound theoretical and policy implications.

Literature Review

Entrepreneurship and Economic Growth

Entrepreneurship has long been recognized as a central driver of economic growth, innovation, and job creation. Entrepreneurs contribute by introducing new products, services, and processes, stimulating competition, and generating employment opportunities (Acs et al., 2004). In many economies, entrepreneurship not only promotes efficiency but also enhances social development through opportunity creation, knowledge diffusion and job formation (Adretsch, Keilbach and Lehmann, 2006; Global Entrepreneurship Monitor, 2021; Mahn and Poblete, 2023)

The Global Entrepreneurship Monitor (GEM) emphasizes that higher rates of entrepreneurial activity are often linked with stronger economic dynamism, particularly in emerging markets (GEM Global Report, 2023/24). Understanding the determinants of entrepreneurial activity is therefore crucial, as fostering entrepreneurship contributes directly to both economic performance and societal resilience.

Entrepreneurial Intention and Success: Theoretical Foundations

Entrepreneurial intention is widely studied as a precursor to entrepreneurial behavior. The most influential framework is Ajzen's Theory of Planned Behavior (TPB), which explains intention as a function of attitudes toward entrepreneurship, subjective norms, and perceived behavioral control (Ajzen, 1991). Numerous studies have applied TPB in entrepreneurship, confirming that self-efficacy, social support, and perceived feasibility strongly predict entrepreneurial action (Liñán & Chen, 2009).

While intention is the starting point, entrepreneurial success is the eventual outcome, shaped by both internal and external factors. The construct of success has been defined in the scope of a multiplicity of theoretical perspectives: the Psychological Traits Theory has stated that the intrinsic dispositions or inherent risk-taking propensity, emotional stability, and persistence of effort are some of the foundational antecedents (Salmony & Kanbach, 2022); the Human Capital Theory has forecasted that formal education, knowledge accumulation, and cumulative learning of experience are some of the catalysts (Boldureanu et al., 2020); and the Social Capital Theory has articulated that the web The combination of these paradigms pro- vides a holistic- multidimensional concept of entrepreneurial success hence recognizing the fact that the results are a product of the complex interaction of individual, social and situational factors.

Entrepreneurial Success

There is no final concept of entrepreneurial success that is context-independent and multi- faceted as it remains a conceptual construct that is subject to different interpretations across disciplines. According to Wach and other authors (2020), these definitions usually cover both financial and non-financial performance, which makes the concept subjective in its nature. This complexity is even more pronounced in the context of emerging economies, especially in the Gulf Cooperation Council (GCC) region, and the localized frameworks that are based on research are just in their infancy.

Lukes and Laguna (2010) define success as the achievement of results which are valuable to the individual and psychological fulfillment is as important as financial gains. Chaves- Maza and Fedriani (2022) also argue that, though success is a subjective construct, it should also have quantifiable aspects, such as survival, profitability, and aspirational levels, to allow it to be strictly analyzed. Furthermore, the Global Entrepreneurship Monitor (GEM) is even wider in such a view by highlighting the role of education levels, policy systems, and institutional facilitating structures (GEM, 2023/2024).

Based on this, the research takes a dominant position in organizational performance measures, which are survival, profitability, employee development, and return on investment as defined by Dej (n.d.) and Littunen and Tohmo (2003). However, it also does not ignore the inseparable importance of intrinsic motivations in determining the performance of entrepreneurs.

Individual Factors

It is a fact that personal traits have a long-term effect on the performance of entrepreneurs. Interestingly, personality traits, such as the need to achieve (McClelland, 1961; Gomezelj and Kusce, 2013), locus of control (Arkorful and Hilton, 2021), risk taking propensity (Correa et al., 2022; Parveen et al., 2020), self-efficacy (Schunk and DiBenedetto, 2021; Renko et al., 2020), are fundamental predictors of entrepreneurial intention and later

In addition, such affective traits as optimism, resilience, and adaptability also contribute to persistence and more effective reactions to uncertainty (Santoro et al., 2020; Cabrera and Mauricio, 2017). The foregoing empirical data are aligned with the Psychological Traits Theory that states that intrinsic traits, such as innovativeness and risk tolerance, are the invaluable assets in overcoming the entrepreneurial difficulties and driving positive outcomes (Lindblom et al., 2020; Salmony and Kanbach, 2022).

Network and Social Factors

Social networks also incorporate entrepreneurial success, as resources, information and emotional support are provided to the entrepreneur. The bigger networks increase access to financial resources, knowledge, and markets (Semrau & Werner, 2014; Farooq et al., 2018). Strong ties, in their turn, provide with mentorship, encouragement, and trust (Langford et al., 1997; Sahban et al., 2014). The resources of support may be divided into emotional, tangible, informational, and companionship ones (Edelman et al., 2016; Kelly et al., 2019). The concept of social capital, which refers to the worth of ties, reputation, and trust in the community, lies at the heart of entrepreneurship (Santarelli and Tran, 2013;

Shao and Sun, 2021). This correspondence to the Social Capital Theory highlights the significance of the quality of net- works in the entrepreneurial behavior and performance (Mishra, 2020).

Experience Factors

Experience also leads to better performance and the intention to start an entrepreneurship because people gain skills, confidence, and industry-specific knowledge (Neves and Brito, 2020; Abbasianchavari and Moritz, 2021). Managerial and problem-solving skills (van Scotter and Garg, 2019) are provided by their professional experience, and opportunity recognition and competitiveness (Peng et al., 2020) are made possible by their industry-specific skills. In addition, experience in entrepreneurship in itself attenuates uncertainty, enhances decision-making and builds resilience (Unger, 2006; Wang and Chugh, 2014). Even the social capital is also enlarged through experience through developing networks with mentors, investors and customers (Baker and Dutton, 2006; McAdam et al., 2006). This point of view is consistent with the Human Capital Theory, according to which experience is accumulated knowledge and skills that are required to perform as an entrepreneur (Boldureanu et al., 2020).

Education Factors

Education plays a central role in shaping entrepreneurial intentions through providing individuals with the necessary knowledge, analytical skills and confidence. Liñán et al. (2011) and Cui & Bell (2022) show that education fosters entrepreneurial mindset, while higher edu- cation enhances creativity, opportunity recognition, and adaptability (Ferreira et al., 2017; Boldureanu et al., 2020). Business-specific education provides crucial competencies in finance, marketing, and management (Bauman & Lucy, 2021; Njoroge & Gathungu, 2013), while also building networks that support new ventures (Xu & Jiang, 2024). Furthermore, education strengthens self-efficacy, which directly influences entrepreneurial choice (Lestari & Setiawan, 2021). These dynamics are also supported by Human Capital Theory, emphasizing education as a key source of entrepreneurial capacity.

Research Gap

The literature has specified that individual characteristics, social environment, experience, and education are clear indicators of entrepreneurship. However, most of the studies themselves are rather conventional and use statistics to examine the mediators, including school and experience, separately; thus, the findings are to some extent divided. Even though the GEM APS data is abundant and many studies utilize it, limited literature uses big-data or machine-learning methods to investigate the large-scale dynamics of these entrepreneurial forces. The lack of connection with that renders it difficult to see how the different elements interact to drive motives and outcomes. As a remedy to that, we are using fancy pants analytics in looking at the individual and the social together and we are also experimenting on whether education and experience are the mediators in a one-factor, one-piece. Through it do not only augment theory, but we also inform policymakers on the knowledge that may lead to better entrepreneurial ecosystems.

Research Framework and Hypotheses

Research Framework

The research framework in Figure 1 represents the input of individual and network /social factors as independent variables (IVs), education and experience as mediating variables (MVs), entrepreneurial intention as the intervening variable, and entrepreneurial success as the dependent variable (DV).

The model illustrates how individual characteristics—such as self-efficacy, risk-taking, and motivation—and social resources—including networks, relationships, and support systems— directly influence both entrepreneurial intention and entrepreneurial success. At the same time, experience (professional background, industry expertise, or prior entrepreneurial expo- sure) and education (knowledge, skills, and entrepreneurial training) are positioned as media- tors, reinforcing or shaping these relationships.

Entrepreneurial intention functions as a bridge variable, capturing how these antecedent factors translate into actual entrepreneurial behavior and outcomes.
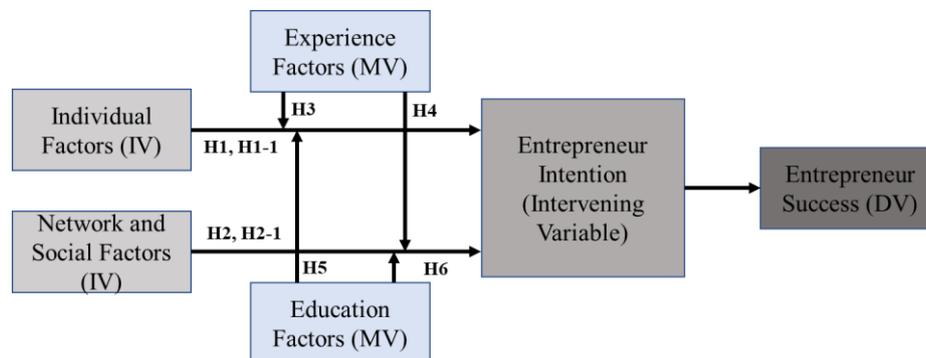

Fig. 1. A figure caption is always placed below the illustration. Short captions are centered, while long ones are justified. The macro button chooses the correct format automatically.

Hypotheses Development

Based on the framework, the following hypotheses are proposed:

- H1: Individual factors have a significant effect on entrepreneurial intention.
- H1-1: Individual factors have a significant effect on entrepreneurial success.
- H2: Network and social factors have a significant effect on entrepreneurial intention.
- H2-2: Network and social factors have a significant effect on entrepreneurial success.
- H3: Experience mediates the relationship between individual factors and entrepreneurial intention.
- H4: Experience mediates the relationship between network and social factors and entrepreneurial intention.
- H5: Education mediates the relationship between individual factors and entrepreneurial intention.
- H6 Education mediates the relationship between network and social factors and entrepreneurial intention.

Conceptual Justification

The hypotheses are grounded in established theoretical perspectives. Psychological Traits Theory explains the role of individual characteristics—such as locus of control, risk-taking, and resilience—in shaping entrepreneurial outcomes (Salmony & Kanbach, 2022). Social Capital Theory emphasizes the importance of networks, relationships, and social reputation in supporting entrepreneurial activity (Mishra, 2020; Santarelli & Tran, 2013). Meanwhile, Hu- man Capital Theory highlights the value of education and experience in developing knowledge, skills, and strategic decision-making capacity (Boldureanu et al., 2020).

The model is the continuation of earlier studies by testing factors together, and also introduces the concept of big data analysis and machine learning to test nonlinearities and complex interactions that the old models might not capture. Compared to the previous literature that focuses on education, experience, the present study incorporates both as media-tors, and thus gives a more comprehensive perspective of the combined effects of human and social capital in creating entrepreneurial intention, and entrepreneurial success.

Research Framework and Hypotheses

This research involves the use of secondary sources in the form of Global Entrepreneurship Monitor (GEM) Adult Population Survey (APS). The dataset gives a cross-sectional picture of the entrepreneurial activity as the APS is organized on an annual basis over a certain time period. It is hence appropriate to

both descriptive analysis which is used to summarize the patterns of entrepreneurship and causal analysis which is used to examine the directional relationship among the independent variables, mediating variables and de- pendent variables.

The study employs a range of statistical techniques as its primary analysis tools. Chi-Square tests, correlation analysis, and ANOVA are applied to examine associations and group differences, while logistic regression is utilized to test the hypotheses and identify significant mediating effects. Together, these methods provide a robust framework for uncovering the relationships among.

Data Source: GEM APS

The study utilizes data from the Global Entrepreneurship Monitor (GEM) Adult Population Survey (APS), recognized as the largest and most comprehensive dataset on entrepreneurship worldwide. Conducted annually in over 100 countries, the APS captures a representative sample of approximately 2,000 adults per country. The survey collects detailed information

on entrepreneurial activities, including nascent and new business creation, established owner- ship, and business discontinuation. It also provides measures of entrepreneurial perceptions, such as opportunity recognition, perceived capabilities, fear of failure, and entrepreneurial intentions, along with aspirations relating to innovation, job creation, and internationalization. For this research, the APS data made publicly available for Bahrain in September 2025 is employed. The dataset provides a snapshot of entrepreneurial dynamics within the country while contributing to globally comparable measures such as the Total Early-Stage Entrepreneurial Activity (TEA) index. Despite its comprehensive scope, the GEM APS presents two limitations: (i) some relevant factors identified in the literature are not fully represented in the survey, and (ii) several variables suffer from high levels of missing data, creating challenges for big data analyses. These limitations necessitate both selective use of variables and careful handling of missingness, as detailed in Section 4.3.

Variable Selection

Variable selection was guided by theoretical relevance and alignment with prior studies. Con- structs identified in the literature—such as individual factors, network and social factors, education, experience, entrepreneurial intention, and entrepreneurial success—were mapped onto corresponding GEM APS variables. This mapping ensured conceptual consistency be- tween established measures and the GEM survey questions.

Data Cleaning and Preparation

A structured approach was applied to ensure the dataset was reliable for statistical and ma- chine learning analyses:

- Variables with >50% missingness were excluded, as such extensive gaps compare- mise reliability.

- Variables with ≤5% missingness were imputed using mode substitution, preserving original distributions.

- Variables with 5–50% missingness were imputed using advanced neural network– based imputation techniques, enabling the retention of valuable information while minimizing bias.

In addition, GEM-provided sampling weights were applied to ensure national representativeness. Numerical variables were normalized where appropriate, and categorical variables were encoded for use in logistic regression and machine learning models. Variable selection was guided by theoretical relevance and alignment with prior studies. Constructs identified in the literature—such as individual factors, network and social factors, education, experience, entrepreneurial intention, and entrepreneurial success—were mapped onto corresponding GEM APS variables. This mapping ensured conceptual consistency between established measures and the GEM survey questions.

Research Article

Category	Reference	Indicator	Label	Label Description	% Of Missing data
Financial Perspective	Amit & Lev 1996; Bamford et al. 2004; Duchesneau & Gartner 1990; Fisher et al. 2014; Hormiga & Batista-Canino 2009; Kaplan & Norton 1992; Laguna et al. 2012; Oyeku et al. 2014; Sexton 1988; Usoff et al. 2002; Venkataraman & Ramanujam 1986;	Achieve or Exceed Positive Return on Investment (ROI) that Set Out in the Initial Business Plan	supay2	Q1E3. Did the founders of this business receive any wages, profits or payments in kind from this business before January 1, 2017?	99.57
			suwage	Q1E1. Has the new business paid any salaries, wages, or payments in kind, including your own, for more than three months?	90.26
			GEMHHINC	GEMHHINC. GEM income recoded into thirds	0
			suwageyr	Q1E2. What was the first year the founders of the business received wages, profits, or payments in kind from this business?	96.71
Customer Perspective	Duchesneau & Gartner 1990; Fisher et al. 2014; Hofer & Sandberg 1987; Hormiga & Batista-Canino 2009; Ittner & Larcker 1998; Kaplan & Norton 1992; Laguna et al. 2012; Oyeku et al. 2014; Usoff et al. 2002;	High Level of Customer Satisfaction by Reducing the Number of Complaint	sucstexp	Q1G3C. Will you have any customers in the following locations? Outside your country?	90.27
			suexport	Q1G4. What percentage of your annual sales revenues will usually come from customers living outside your country?	97.96
			sucstnat	Q1G3B. Will you have any customers in the following locations? Elsewhere in your country?	90.27
			sucstloc	Q1G3A. Will you have any customers in the following locations? In the area where you live?	90.27
	Baumol 1986; Bruderl &	Achieve or Exceed the Sale	suyr5job	Q1H2. Not counting owners, how many	90.27

Internal Business Perspective	Preisendorder 1998; Duchesneau & Gartner 1990; Fisher et al. 2014; Kaplan & Norton 1992; Man et al. 2002; McGee et al. 1995; Oyeku et al. 2014; Venkataraman & Ramanujam 1986;	Growth Rate that Set Out in the Initial Business Plan		people will be working for this business five years from now?	
			sunowjob	Q1H1. Not counting the owners, how many people are currently working for this business?	96.58
			sunewprod	Q1G5. Are any of your products or services new to people in the area where you live, or new to people in your country, or new to the world?	90.27
			sunewproc	Q1G6. Are any of the technologies or procedures used for your products or services new to people in the area where you live, or new to people in your country, or new to the world?	90.27
Lifestyle Perspective	Ardichvili et al. 2003; Fisher et al. 2014; Huberman & Miles 2002; Marshall & Rossman 2006; Saunders et al. 2007; Yin 2003;	Obtain Other's Approval, Admiration, and Recognition	susdg_pri	Q1SDG3. You prioritize the social and/or environmental impact of your business above profitability or growth	90.57
			sumotiv4	Q1K9. Please tell me the extent to which the following statements reflect the reasons you are trying to start a business. To earn a living because jobs are scarce.	90.27
			susdg_soc	Q1SDG1. When making decisions about the future of your business, you always consider social implications such as access to education, health, safety, inclusive work, housing, transportation, quality of life at work, etc.	90.57

			sumotiv1	Q1K3. Please tell me the extent to which the following statements reflect the reasons you are trying to start a business. To make a difference in the world.	90.27

Table 1. Success Variables and Measurement Mapping

Category	Reference	Indicator	Label	Label Description	% Of Missing data
Financial Perspective	Liñán, F., & Chen, Y. W. (2009)	Nascent Entrepreneurial Intention	bstart	Q1A1. Are you, alone or with others, currently trying to start a new business, including any self-employment or selling any goods or services to others?	0
	Douglas, E. J., & Shepherd, D. A. (2002)	Intrapreneurial Activity	bjobst	Q1A2. Are you, alone or with	0

				others, currently trying to start a new business or a new venture for your employer as part of your main employment?	
	Reynolds, P., Bosma, N., Autio, E., Hunt, S., De Bono, N., Servais, I., ... & Chin, N. (2005).	Startup Action Engagement	suacts	Q1B. Over the past twelve months have you done anything to help start this new business?	81.85
	Sequeira, J. M., Mueller, S. L., & McGee, J. E. (2007).	Future Startup Expectation	futsup	Q3A. Are you, alone or with others, expecting to start a new business,	0

				including any type of self-employment, within the next three years?	
Blanchflower, D. G., Oswald, A. J., & Stutzer, A. (2001).	Self-Employment Preference	occuself	Q5E3. Self-employed	0	
Liñán, F., & Chen, Y. W. (2009)	Recoded Future Startup Expectation	FUTSUPyy	Expects to startup in the next 3 years	0	
Van Stel, A., Carree, M., & Thurik, R. (2005)	Startup Formalization Intent	SUB	Reports new startup effort (independent or job)	0	
Reynolds, P. D., Bosma, N., Autio, E., Hunt, S., De Bono, N., Servais, I., ... & Chin, N. (2005)	Current Entrepreneurial Activity	EXIT_ENT	Discontinued a business in the past 12 months (includes businesses that were continued)	1.38	

Research Article

	Hessels, J., Grilo, I., Thurik, R., & van der Zwan, P. (2011)	Business Exit / Discontinuation	DISCENT	Q3B. Have you, in the past 12 months, sold, shut down, discontinued or quit a business you owned and managed, any form of self-employment, or selling goods or services to anyone?	0
Attitude Toward Start-up (Personal Attitude, PA)	Liñán, F., & Chen, Y. W. (2009)	Self-appraisal of fairness and opportunity	**equal-incL**	Qi5. In my country, most people would prefer that everyone had a similar standard of living.	45.35

Definition: Positive/negative personal evaluation about being an entrepreneur.		Self-directed vision = motivational orientation	**vision**	Qi14. Every decision you make is part of your long-term career plan.	51.47
		Trait that reinforces positive entrepreneurial attitude	**creativ**	Qi13. Other people think you are highly innovative.	51.47
		Capability perception (PBC-related)	**SU_NEWPROC**	SU: Are any of the technologies or procedures used for your products or services new to people in the area where you live, or new to people in your country, or new to	0

					the world?
3. Subjective Norm (SN)	Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000)	Direct SN measure	**futsup**	Q3A. Are you, alone or with others, expecting to start a new business, including any type of self-employment, within the next three years?	0
Definition: Perceived social pressure from important others (family, friends, society).		Cultural SN	**nbstatusL**	Qi7. In my country, those successful at starting a new business have a high level of status and respect.	37.23
		Societal influence through media	**nbmediaL**	Qi8. In my country, you	38.79

				will of-ten see stories in the public media and?/or inter-net about suc-cessful new busi-nesses.	
		Social norms re-garding purpose-driven business	**nbso-centL**	Qi10. In my coun-try, you will of-ten see busi-nesses that pri-marily aim to solve social prob-lems.	47.81
4. Entre-preneurial Intention (EI) and Desire to Start a Business	Thompson, E. R. (2009)	Direct EI measure	**bstart**	Q1A1. Are you, alone or with others, cur-rently trying to start a new busi-ness, includ-ing any self-	0

				employ-ment or sell-ing any goods or ser-vices to oth-ers?	
These vari-ables cap-ture the cognitive commit-ment to starting a business in the future, aligning with your definitions.		Behavior driven by intention	**suacts**	Q1B. Over the past twelve months have you done any-thing to help start this new busi-ness?	81.85
		Career-oriented in-tention	**bjobst**	Q1A2. Are you, alone or with others, cur-rently trying to start a new busi-ness or a new ven-ture for your em-ployer as part of your main	0

			em-ploy-ment?	
	Formalization intent – concrete intention	**SUB**	Reports new start-up effort (independent or job)	0
	Strong intention translated to early action	**EXIT_ENT**	Discontinued a business in the past 12 months (includes businesses that were continued)	1.38

Table 2. Intention Variables and Measurement Mapping

Analytical Techniques

To test the proposed hypotheses, the study employs a set of established statistical techniques: In this study, the primary statistical method used was logistic regression, which was used to test the hypotheses of the study. The model was coded in Python with the help of the scikit- learn library, which was used to estimate binary entrepreneurial intention and success out- comes. Individual characteristics, social influences, and contextual factors were included as predictor variables, and education and experience were considered to be mediating variables. To ensure robustness and reliability of the results, accuracy, F1 score, and the use of p-value were used to measure the effectiveness of the model.

These methods collectively allow for the systematic testing of hypotheses concerning the direct and mediating effects of individual, social, educational, and experiential factors on entrepreneurial out-comes.

Results

Descriptive Statistics

The analysis is based on the Global Entrepreneurship Monitor (GEM) Adult Population Sur- vey (APS) 2021, which contains 154,397 individual responses across 47 countries. The dataset is extensive, comprising 465 variables that capture demographic details, entrepreneurial attitudes, intentions, activities, and outcomes. Data types are diverse, including numeric (169 variables) and categorical (296 variables) indicators, reflecting the survey's multi- dimensional scope.

Respondents are distributed across regions and income classifications as defined by the World Bank (WBINC), ensuring coverage of both developed and developing economies. Gender distribution is balanced, with men and women represented almost equally, consistent with GEM's aim of national representativeness. The survey also includes household and business-related measures, such as income levels (GEMHHINC), entrepreneurial perceptions (suskillL, opportL, fearfailL), and network characteristics (knowentR, BUSANGyy).

A key challenge is the high rate of missing values across several variables, particularly perception and attitudinal measures, with some exceeding 50%. In line with best practice, variables with excessive missingness (>50%) were excluded, while others were imputed using a combination of simple methods (e.g., mode replacement for <5% missing) and advanced neural network–based imputation for moderate missingness (5–50%).

Overall, the dataset provides a rich, multi-country perspective on entrepreneurship, but its size and complexity necessitate careful preparation and robust analytical methods. These descriptive insights frame the subsequent correlation and regression analyses that test the study's hypotheses on the roles of individual, social, experiential, and educational factors in entrepreneurial intention and success.

Table 3. Overview of GEM APS 2021 Dataset and Variables

Category	Details
Dataset & Year	3 Global Entrepreneurship Monitor (GEM) APS, 2021
Sample Size & Cover- age	4 154,397 responses from 47 countries (developed & developing economies)
Variables	5 465 total (169 numeric, 296 categorical)
Key Characteristics	6 Balanced gender distribution; includes demographics, income, per- ceptions, networks
Data Preparation & Cleaning	7 Variables >50% missing excluded; <5% imputed with mode; 5– 50% with neural networks

Correlation Analysis

H1 – Individual factors → Entrepreneurial Intention

Correlation results show moderate positive associations between key individual factors (e.g., perceived capabilities suskillL, opportunity perception opportL, job status bjobst) and entrepreneurial intention (bstart, SUB). For example, suskillL correlated strongly with bstart (r = 0.24) and SUB (r = 0.25). Conversely, fear of failure (fearfailL) showed a negative rela- tionship with entrepreneurial intention measures, consistent with prior research. These results suggest that self-belief and opportunity recognition are important drivers of entrepreneurial intention, while fear acts as a deterrent.

H1-1 – Individual factors → Entrepreneurial Success

The correlation matrix shows weak but notable associations between individual factors and entrepreneurial success (GEMHHINC as proxy). For instance, proact (proactiveness) and nbsocentL (social

orientation) correlated positively with GEMHHINC (r = 0.016 and r = 0.048, respectively), while fear-failL had a slight negative correlation (r = −0.005). These suggest that proactivity and social orientation may support entrepreneurial success, whereas fear of failure has a small suppressing effect.

H3 – Experience mediates individual factors → Entrepreneurial Intention

The correlation matrix incorporating mediators (e.g., occuself, suskillL) indicates stronger relationships between individual factors and entrepreneurial intention outcomes. Notably, suskillL maintained a positive correlation with bstart (r = 0.24) and SUB (r = 0.25), while occuself was negatively correlated with intention (r = −0.26 with SUB). This highlights the relevance of prior occupational or entrepreneurial experience in shaping how self-perceptions translate into intentions.

H5 – Education mediates individual factors → Entrepreneurial Intention

When educational mediators (GEMEDUC, UNEDUC) were introduced, correlation pat- terns with entrepreneurial intentions were weak. While some modest associations were observed (e.g., opportL with bstart r = 0.17), education variables themselves did not exhibit strong direct correlations with entrepreneurial intention outcomes. This preliminary result suggests that the mediating role of education may be limited.

H2 – Network factors → Entrepreneurial Intention

The correlation matrix shows that network and social factors are positively associated with entrepreneurial intentions. For instance, knowentR (knowing an entrepreneur) correlated with bstart (r = 0.23) and SUB (r = 0.24), while BUSANGyy (business networks) correlated more modestly with bstart (r = 0.12). These findings indicate that exposure to entrepreneurial peers and business networks enhances entrepreneurial intention, though the strength of associations varies by factor.

H2-1 – Network factors → Entrepreneurial Success

The correlation analysis highlights positive associations between network factors and entrepreneurial success. Specifically, knowentR (knowing another entrepreneur) correlated with GEMHHINC at r = 0.10, while BUSANGyy (business network engagement) correlated at r =

0.07. Although modest, these positive correlations indicate that exposure to entrepreneurial networks is linked to higher income levels among entrepreneurs.

H4 – Experience mediates network/social factors → Entrepreneurial Intention

Hypothesis	Pathway	Key Variables	Correlation Findings	Interpretation
H1	Individual factors → Entrepreneurial Intention	suskillL, opportL, bjobst, fearfailL → bstart, SUB	suskillL–bstart (r = 0.24), suskillL–SUB (r= 0.25); fearfailL nega- tive	Self-belief & opportunity recognition drive intentions; fear deters
H1-1	Individual factors → Entrepreneurial Success	proact, nbsocentL, fearfailL → GEMHHINC	proact (r = 0.016), nbsocentL (r = 0.048), fearfailL (r = −0.005)	Proactivity & social orienta- tion aid success; fear slightly suppresses

H2	Network factors → Entrepreneurial Intention	knowentR, BUSANGyy → bstart, SUB	knowentR–bstart (r = 0.23), knowentR–SUB (r = 0.24); BUSANGyy–bstart (r = 0.12)	Entrepreneurial peers & net- works boost in- tention
H2-1	Network factors → Entrepreneurial Success	knowentR, BUSANGyy → GEMHHINC	knowentR (r = 0.10), BUSANGyy (r = 0.07)	Networks mod- estly linked to higher entrepre- neurial in- come
H3	Experience medi- ates individual factors → Entre- pre- neurial Intention	occuself, suskillL → bstart, SUB	suskillL–bstart (r = 0.24), suskillL–SUB (r= 0.25); occuself–SUB (r = −0.26)	Skills enhance inten- tion; prior occupa- tional experience dampens
H4	Experience medi- ates net- work/social factors → En- tre- preneurial Intention	occuself, suskillL → bstart, SUB	suskillL–bstart (r = 0.24), suskillL–SUB (r = 0.25); occuself–SUB (r = −0.26)	Skills amplify net- works' effect; self- employment experi- ence re- duces inten- tion
H5	Education me- diates individ- ual factors → Entrepre- neurial Inten- tion	GEMEDUC, UNEDUC → bstart, SUB	opportL–bstart (r = 0.17); GEMEDUC & UNEDUC weak/insignificant	Education plays lim- ited mediat- ing role
H6	Education me- diates net- work/social fac- tors → Entrepre- neurial Inten- tion	GEMEDUC, UNEDUC → SUB	UNEDUC–SUB (r = 0.04); GEMEDUC near- zero/negative	Education pro- vides little me- diation be- tween networks & in-

Table 4. Correlation Results for Hypothesized Pathways of Entrepreneurial Intention and Success

When mediators (experience variables occuself and suskillL) were included, correlations with entre- preneurial intentions strengthened. suskillL showed strong positive correlations with bstart (r = 0.24) and SUB (r = 0.25), while occuself was negatively correlated with intentions (r = −0.26 with SUB). This suggests that while experience in self-employment may discourage intentions, perceived skills amplify the positive impact of networks on intention.

H6 – Education mediates network/social factors → Entrepreneurial Intention

Introducing education variables (GEMEDUC, UNEDUC) produced weak and inconsistent correlations with intention outcomes. For example, UNEDUC had a small positive correlation with SUB (r = 0.04), while GEMEDUC showed near-zero or negative values. Overall, correlations indicate that education provides little mediating effect between networks and entrepreneurial intention.Hypothesis Testing with Statistical Models

Table 5. Summary of Hypotheses Testing: Logistic Regression, χ²/ANOVA, and Machine Learning Results

Hypothesis	Pathway	Key Findings (Logistic Regression, χ²/ANOVA, ML)	Support Status
H1	Individual factors → Entrepreneurial Intention	suskillL (coef = 0.45, p < 0.001), opportL (coef = 0.20, p < 0.001) ↑ intention; fearfailL & occuself ↓ intention. χ² signifi- cant: opportL (χ² = 7075, p < 0.001), suskillL (χ² = 11133, p < 0.001).	Supported
H1-1	Individual factors → Entrepreneurial Success	Logistic regression: weak predictive power (Accuracy = 0.54, F1 = 0.37). χ² signifi- cant: nbsocentL (χ² = 1641, p < 0.001), fearfailL (χ² = 1480, p < 0.001). ML confirmed weak results.	Partially supported
H3	Experience mediates individual factors → Entrepreneurial Intention	suskillL positive (coef = 0.44, p < 0.001); occuself negative (coef = − 0.88, p < 0.001). χ² significant (occuself χ² = 2169, p < 0.001). Accuracy = 0.68, F1 = 0.28.	Partially supported
H5	Education mediates individual factors → Entrepreneurial Intention	No significant coefficients (p = 1.0). χ² significant but weak (e.g., GEMEDUC χ² = 3101, UNEDUC χ² = 938). Accuracy = 0.62, F1 = 0.24.	Not sup- ported
H2	Network factors → Entrepreneurial Intention	knowentR (coef = 0.40, p < 0.001), BUSANGyy (coef = 0.76, p < 0.001). χ² significant: knowentR × SUB (χ² = 9889), BUSANGyy × bstart (χ² = 4194). ML Ac- curacy = 0.60, F1 = 0.24.	Supported
H2-1	Network factors → Entrepreneurial Success	Logistic regression: higher predic- tive power (Accuracy = 0.61, F1 = 0.38). χ² significant: knowentR (χ² = 2664), BUSANGyy (χ² = 1002).	Supported

		ML confirmed results.	
H4	Experience mediates network/social factors → Entrepreneurial Intention	knowentR, BUSANGyy, suskillL strongly positive (p < 0.001); occuself negative (coef = −0.82). χ^2 strong (e.g., SUB × occuself = 13050). ML Accuracy = 0.63, F1 = 0.27.	Partially supported
H6	Education mediates network/social factors → Entrepreneurial Intention	Logistic regression null (p = 1.0). χ^2 weak (e.g., GEMEDUC χ^2 = 3100, UNEDUC χ^2 = 938). ML weak (Accuracy = 0.65, F1 = 0.24).	Not sup- ported

H1 – Individual factors → Entrepreneurial Intention

- Logistic regression, conducted in Python (scikit-learn), confirmed that individual factors significantly predicted entrepreneurial intention. Variables such as suskillL (coef = 0.45, p < 0.001) and opportL (coef = 0.20, p < 0.001) increased the likeli- hood of entrepreneurial intention, while fearfailL and occuself reduced it.
- Chi-Square/ANOVA tests further supported these results, showing highly signifi- cant associations between intention outcomes (SUB, FUTSUPyy, bstart) and pre- dictors like opportL (χ^2 = 7075, p < 0.001) and suskillL (χ^2 = 11133, p < 0.001).
- Overall, H1 is supported: individual factors have a significant effect on entrepreneurial intention.

H1-1 – Individual factors → Entrepreneurial Success

- Logistic regression showed individual factors had weak but significant predictive power for entrepreneurial success. The model achieved an overall accuracy of 54% and F1 = 0.37, with moderate precision for the lower-income group (0.73) but poor recall for high-income entrepreneurs.
- Chi-Square/ANOVA tests confirmed significant associations between individual predictors and GEMHHINC: nbsocentL (χ^2 = 1641, p < 0.001), fearfailL (χ^2 = 1480, p < 0.001), nbgoodcL (χ^2 = 903, p < 0.001), and proact (χ^2 = 812, p < 0.001).
- ML evaluation returned similar results (Accuracy = 0.54, F1 = 0.37), confirming weak predictive strength.
- H1-1 is only partially supported: while some individual factors show significant ef- fects, their overall predictive power for entrepreneurial success is limited.

H3 – Experience mediates individual factors → Entrepreneurial Intention

- Regression with mediators showed experience-related factors moderated the strength of relationships. For example, suskillL remained highly significant for bstart (coef = 0.44, p < 0.001) and SUB (coef = 0.37, p < 0.001). At the same time, occuself (occupational self-employment experience) was negatively significant across outcomes (e.g., coef = −0.88 for SUB, p < 0.001).

- Chi-Square/ANOVA confirmed significant associations between mediators and intention outcomes (e.g., occuself χ^2 = 2169, p < 0.001 with EXIT_ENT).
- Model evaluation showed modest predictive accuracy (mean Accuracy = 0.68, F1 = 0.28), indicating the mediating role of experience improves explanatory power but not predictive performance.
- H3 is partially supported: experience influences the pathways from individual fac- tors to entrepreneurial intention, with some variables (e.g., occuself) acting negatively.
  H5 – Education mediates individual factors → Entrepreneurial Intention
- Regression with education mediators (GEMEDUC, UNEDUC) showed no significant coefficients; all p-values = 1.0, with pseudo-R^2 values negative or near zero, suggesting no explanatory contribution.
- Chi-Square/ANOVA did find significant associations between education and some outcomes (e.g., GEMEDUC with FUTSUPyy: χ^2 = 3101, p < 0.001; UNEDUC with SUB: χ^2 = 938, p < 0.001). However, effect sizes were small (<0.09).
- Predictive model results also remained weak (mean Accuracy = 0.62, F1 = 0.24), similar to baseline.
- H5 is not supported: education does not appear to mediate the relationship between individual factors and entrepreneurial intention in a meaningful way.

    H2 – Network factors → Entrepreneurial Intention

- Logistic regression results showed knowentR (coef = 0.40, p < 0.001) and BUSANGyy (coef = 0.76, p < 0.001) significantly increased the probability of entrepreneurial intention.
- Chi-Square tests confirmed significant associations across outcomes (e.g., SUB × knowentR: χ^2 = 9889, p < 0.001; bstart × BUSANGyy: χ^2 = 4194, p < 0.001).
- ML models achieved average Accuracy = 0.60 and F1 = 0.24, indicating limited predictive performance.
- H2 is supported: network and social factors significantly affect entrepreneurial intention.

    H2-1 – Network factors → Entrepreneurial Success

- Logistic regression results showed that knowentR and BUSANGyy significantly predicted entrepreneurial success. The model achieved higher performance than in- dividual factors alone (Accuracy = 0.61, F1 = 0.38).
- Chi-Square/ANOVA confirmed strong associations: knowentR (χ^2 = 2664, p < 0.001) and BUSANGyy (χ^2 = 1002, p < 0.001), with effect sizes slightly stronger than individual factors.
- ML evaluation produced consistent results (Accuracy = 0.61, F1 = 0.38), indicating modest but reliable predictive power.
- H2-1 is supported: network and social factors show a stronger and more consistent effect on entrepreneurial success than individual-level predictors.

    H4 – Experience mediates network/social factors → Entrepreneurial Intention

- Regression with mediators showed that knowentR, BUSANGyy, and suskillL remained strongly positive (all p < 0.001), while occuself was consistently negative (coef = −0.82 for SUB, p < 0.001).
- Chi-Square/ANOVA revealed strong significance for mediation effects (e.g., SUB
- × occuself: χ^2 = 13050, p < 0.001; FUTSUPyy × suskillL: χ^2 = 13206, p < 0.001).
- ML performance improved slightly compared to H2 (mean Accuracy = 0.63, F1 = 0.27), suggesting mediators enhanced explanatory power.
- H4 is partially supported: experience modifies the network–intention relationship, with perceived skills strengthening and self-employment history weakening intention.

    H6 – Education mediates network/social factors → Entrepreneurial Intention

- Logistic regression with education mediators returned null coefficients (p = 1.0), with pseudo-R^2 negative or near zero, suggesting no explanatory contribution.

- Chi-Square/ANOVA showed some significant links (e.g., GEMEDUC × FUTSUPyy: χ^2 = 3100, p < 0.001; UNEDUC × SUB: χ^2 = 938, p < 0.001), but effect sizes were small (<0.09).
- ML performance remained weak (mean Accuracy = 0.65, F1 = 0.24).
- H6 is not supported: education does not appear to mediate the relationship between network factors and entrepreneurial intention in a meaningful way

Discussion

This study provides insightful evidence when it is viewed through the lenses of Psychological Traits Theory, Social Capital Theory and Human Capital Theory.

At First, the results partially support Psychological Traits Theory. Opportunity recognition (opporL) and perceived capabilities are linked with entrepreneurial intention, which is consistent with initial research highlighting self-efficacy and opportunity recognition as core drivers of entrepreneurial behavior (Nabi et al., 2017; Travis and Craig, 2022). Simultaneously, fear of failure (fearfailL) is consistently reducing both success and intention, reflecting the

work of Cacciottind Hayton (2019), who stress its restraining effects. Proactivity and social orientation showed only weak effects on entrepreneurial success, which aligns with Rauch and Frese (2020). They found that psychological attributes are more predictable in terms of intention than sustained outcomes. The findings enlighten that traits are essential to spark entrepreneurial entry, but insufficient for establishing and ensuring long-term success.

Secondly, this study presents evidence on Human Capital Theory. According to it, Experience is taken as a more potent mediator than education, along with perceived skills and capable intentions. While self-employment experience sometimes discourages them, as it reflects the "scar tissue" effect (Politis, 2005).

This complex role shows that Experience contributes to learning but may also transmit discouragement when negatively perceived. At variance with formal education (GEMEDUC, UNEDUC), which had insignificant mediating effects, diverging from traditional Human Capital assumptions (Unger et al, 2011) but consistently with newer studies (Cardella et al, 2022; Guerrero et al, 2023), argues that classroom based education often fails to capture ap- plied entrepreneurial learning.

Thirdly, the empirical findings are strong evidence of the Social Capital Theory. The net- works that perpetually split the intention and success of the entrepreneur include knowentR and BUSANGyy. Hence, corroborate the theoretical assumptions of Davidsson and Honig (2003) and Crowley and Barlow (2022), according to which networks are essential resources providing information, legitimacy, and opportunity. Moreover, mediation analysis shows that perceived competencies enhance the advantages that are brought about by these networks, which emphasizes the interactive aspect of human and social capital (Nahapiet and Ghoshal, 1998). These results support the perspective that entrepreneurship is embedded within social ecosystem rather than pursued in isolation.

Considering the evidence suggests that psychological traits can be viewed as the antecedent of entrepreneurial intention. Social capital is a factor that cannot be neglected when it comes to success maintenance. Human capital has its impact circumscribed and mostly occurs through experiential learning instead of formal academic achievement.

Contributions of the Study

Theoretical Contributions

This research would add to an entrepreneurship theory by increasing the use of three primary perspectives. The Psychological Traits Theory is supported, and the evidence provided across countries shows that both self-efficacy and recognition of opportunities are known to generate entrepreneurial intention. Still, traits show only weak performance in terms of long-term success. The Human Capital Theory is subtle because the results differentiate between the weak impacts of formal education and stronger but complicated impacts of experience, hence justifying the idea that learning driven by practice is superior to academic qualifications. The Social Capital Theory is enhanced because networks were demonstrated to be reliable predictors of intention and success at all times, which underscores the importance of social embeddedness in entrepreneurship.

Practical Contributions

The findings suggest to policymakers the need to shift their paradigm based on the belief that higher education is the only trigger of entrepreneurship, to focus on ensuring that their eco- systems are robust and encourage mentorship, networking, and experiential training. Entrepreneurial resilience should also be enhanced with specific interventions that address psycho- logical barriers, including the widespread fear of failure. To the practitioners and teachers, the research highlights the need to have critical applied curricula that simulate real business situations and cultivate meaningful relationships. These programs can not only be used to start ventures, but also to sustain the ventures.

Methodological Contributions

By leveraging the opportunities of the Global Entrepreneurship Monitor Augmented Panel Survey data and combining machine-learning algorithms with traditional statistical models, this study clarifies all the opportunities and limitations of large-scale survey data in assessing the entrepreneurship theories in the heterogeneous cultural and economic contexts empirically. The approach outlined in this paper is a repeatable model when future studies on cross- national entrepreneurship are under taken.

Conclusion and Future Research

The advantage of the GEM AOS 2021 dataset was employed for this study. Over 154,000 respondents across 47 countries were covered through the study to investigate how entrepreneurial intention and success were shaped through social, individual, experiential, and educational factors. The results suggested that intention was steered strongly through psychological traits, particularly perceived skills, and opportunity recognition, while, on the other hand, fear of failure consistently daunted the entrepreneurial behavior.

Social Capital made its appearance as the strongest foreteller of intention and success, emphasizing the importance of net- works and peer effects. The contribution of "Experience was adequate in a binary way, amplifying the outcomes when positive, except that intentions were discouraged when it was linked to past failures. However, education revealed negligible effects, showing that practice- based learning is more predominant than formal schooling. Psychological Traits and Social Capital are backed by these findings, while offering limited and critical insights into the Hu- man Capital Theory.

This study, based on the strategic exploitation of Global Entrepreneurship Monitor Augment- ed Panel Survey data and integrating machine-learning with traditional statistical tools, ex- plains the opportunities and limitations of large-scale survey data in empirically testing the theory of entrepreneurship in a diverse cultural and economic context. The approach outlined in this paper is a repeatable model when future studies on cross-national entrepreneurship are undertaken.

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