-RESEARCH ARTICLE-

HOW DEMOCRATIC LEADERSHIP DRIVES DIGITAL ENTREPRENEURSHIP: A MODERATED MEDIATION APPROACH

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─**Abstract**─

Purpose – This study aims to critically examine the dominant assumption that democratic-style leadership adversely affects enterprise reform while exploring its relationship with digital entrepreneurship in technology-driven start-ups. Through a moderated mediation framework, the research further investigates the mediating role of strategic schema change and the moderating effect of the digital VUCA environment within the proposed model. Design/Methodology/Approach – This study employed a cross-sectional design, collecting data through structured questionnaires from a sample of 398 high- and middle-level managers working in five digital entrepreneurship parks in Shanghai, P.R. China. Hypotheses were tested using structural equation modelling (SEM) with AMOS 24.0. Findings – The findings confirmed the hypothesised moderated mediation model. Democratic leadership was found to have a positive influence on digital entrepreneurship in technology-driven start-ups. Additionally, strategic schema change mediated the relationship between democratic leadership and digital entrepreneurship. The moderating role of the digital VUCA environment in the link between strategic schema change and digital entrepreneurship was supported, with results indicating that higher VUCA conditions strengthened the indirect effect of democratic leadership on digital entrepreneurship. Overall, the study demonstrates that

democratic leaders foster digital entrepreneurship in technology-driven start-ups by leveraging strategic schema change, contingent upon a clear understanding of the VUCA environment. Originality/Value – This study seeks to challenge the prevailing bias that democratic leadership negatively affects enterprise reform and, based on this premise, elucidate the underlying procedural mechanisms that connect democratic leadership with digital entrepreneurship.

Keywords: Democratic Leadership; Moderated Mediation; Digital Entrepreneurship; Strategic Schema Change; VUCA Environment

INTRODUCTION

In 2021, the digital economy across 47 major global economies reached 38.1 trillion dollars, representing approximately 45% of their combined GDPs (CAICT, 2022). This underscores how the rapid advancement of digital technologies has disrupted traditional value-creation processes for enterprises, necessitating a shift from conventional business models to innovative digital approaches. For start-ups, aligning with the broader trend of digital transformation through digital entrepreneurship has become a crucial strategy for strengthening competitive advantage (Kraus et al., 2019). Digital entrepreneurship, as defined by Hull et al. (2007) and Kraus et al. (2019), refers to an innovative business model that leverages digital technologies, networks, and platforms to transform products, services, business operations, or technological processes—either partially or entirely—into digital formats. This transformation aims to generate additional value and enhance understanding of consumer needs. Over time, digital entrepreneurship has garnered significant attention in both academic and societal discourse (Hsieh & Wu, 2019; Kraus et al., 2019; Nambisan, 2017).

While existing research has examined the factors influencing digital entrepreneurship from various perspectives, including technology and resources (Dutot & Van Horne, 2015), digital knowledge (Li, 2023), organisational capabilities (Keller et al., 2022), technical personnel (Muafi et al., 2021), competitive pressure, and entrepreneurial traits (Abubakre et al., 2022), limited attention has been devoted to understanding the underlying mechanisms through which entrepreneurial leadership styles drive digital entrepreneurship. Specifically, how does a start-up's leadership style influence digital entrepreneurship?

According to the Upper Echelons Theory, the demographic characteristics, traits, experiences, and cognitive patterns of top managers significantly shape strategic decisions and organisational behaviours (Hambrick & Mason, 1984). Furthermore, leadership style theories suggest that leadership styles are shaped by leaders' personality traits and experiences (Iqbal et al., 2015), with variations in leadership approaches leading to differing strategic decisions that subsequently affect business model innovation (Mazzarella & Smith, 1989). Therefore, it is reasonable to posit that entrepreneurial leadership style is closely associated with digital entrepreneurship.

During the digital transformation and upgrading of start-ups, it is crucial for leaders to continuously acquire, filter, assimilate, and utilise valuable information and resources from the complex external environment (Eyal, 2012). This underscores the strong connection between a leader's cognitive and behavioural schema and the process of digital entrepreneurship (Lord & Hall, 2003; Mitchell et al., 2007). The cognitive structures and behavioural logic that guide a leader's strategic decision-making are collectively referred to as strategic schema (Nadkarni & Narayanan, 2007). Changes in strategic schema typically occur when leaders introduce new frameworks that reshape their cognitive processes, thereby generating novel cognitive structures and behavioural responses (Wrona et al., 2013). Strategic schema change encompasses information processing, learning, judgement, and problem-solving (Lei et al., 2022), ultimately exerting a sustained impact on the advancement of digital innovation in start-ups.

Furthermore, the concept of VUCA—an acronym representing Volatility, Uncertainty, Complexity, and Ambiguity—provides an accurate characterisation of the digital-era business environment (Petry, 2018; Troise et al., 2022). This dynamic environment inevitably shapes leaders' cognitive schemas and behavioural logics (Della Corte et al., 2019), influencing their decision-making processes. VUCA manifests in various competitive conditions, shifting customer demands (Petry, 2018), and the rapid iteration of digital technologies (Cousins, 2018). Consequently, leaders with different leadership styles within a digital VUCA environment develop distinctive approaches to decision-making.

Within the contextual landscape of this study, existing research indicates that leaders of contemporary Chinese enterprises, particularly those in digital start-ups, predominantly exhibit a democratic leadership style (Li & Miao, 2020; Zhu et al., 2015). This challenges the stereotypical perception of authoritarian leadership as a dominant trait in traditional Chinese enterprises (S. Zhang et al., 2021). Democratic leaders prioritise teamwork and empower employees to actively participate in decision-making, fostering agile, fair, and self-driven teams to achieve business objectives (Bhatti et al., 2012; Mansaray, 2019). The increasing volatility of the business environment has acted as a catalyst for this shift in leadership style (Hensellek, 2020).

In the digital era, leaders must cultivate agile teams capable of continuously adapting to dynamic environments and maintaining strong stakeholder networks. This requires leaders to demonstrate empathy, trust their employees (Young et al., 2017), promote self-motivation through decentralisation, and facilitate efficient team collaboration via information sharing (Parker & Grote, 2022). Furthermore, start-ups primarily recruit high-tech talent with strong learning abilities and innovative capacities to gain a competitive edge (Pan et al., 2022; Shkarlet et al., 2020). These employees are typically open to change, engage in transparent communication, challenge authority, and value a respectful work environment. Consequently, the adoption of a democratic leadership

style—characterised by a people-oriented and delegative approach—enables leaders to effectively influence and enhance team collaboration within such organisations (Klein, 2020). While research has explored factors influencing digital entrepreneurship (Muafi et al., 2021; Ziyae et al., 2014), the impact of democratic leadership remains underexamined.

This study addresses this gap by proposing a moderated mediation model, examining how democratic leadership affects digital entrepreneurship, with strategic schema change as a mediator and the VUCA environment as a moderator. Using primary data from Shanghai's digital start-ups, it offers theoretical and practical insights into leadership's role in digital entrepreneurship.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Digital Entrepreneurship

Drawing from various definitions proposed by scholars over different periods, this study conceptualises digital entrepreneurship as a transformative innovation in business models that creates value through the utilisation of digital technologies, networks, and platforms (Kraus et al., 2019; Le Dinh et al., 2018; Martins et al., 2015). It reflects the extent to which entrepreneurs adopt and integrate digital technologies and innovations into their business operations (Smith et al., 2017). Historically, digital entrepreneurship was largely confined to the consumer sector (Teece, 2023), as exemplified by Alibaba in online shopping, Grab in food delivery, and Uber in ride-hailing services. However, its scope has since expanded across multiple industries, including information and communication, healthcare (Bhavnani et al., 2016), education (Habibi & Zabardast, 2020), power, finance, energy, and manufacturing (Wen et al., 2022).

Digital entrepreneurship requires leaders to restructure their existing knowledge and cognitive frameworks to align with the demands of the digital landscape (Franco et al., 2021). This adaptation facilitates the seamless integration of digital technologies into business operations (Kraus et al., 2019), enabling enterprises to establish new core advantages and generate additional business value (Allen et al., 2019). As a result, digital entrepreneurship can be conceptualised as an outcome of strategic behavioural changes driven by shifts in entrepreneurs' perceptions (Martins et al., 2015; Nambisan, 2017). Scholars have explored various factors influencing digital entrepreneurship. Franco et al. (2021) highlighted the impact of digital skills and an entrepreneurial mindset, while (Ziyae et al., 2014) emphasised entrepreneurial traits in e-business development. Dutot and Van Horne (2015) stressed digital knowledge, experience, human capital, and strategic foresight, whereas (Spiegel et al., 2016) underscored social capital and network partnerships for success.

Democratic-Style Leadership

Leadership style encompasses the behaviours and attitudes exhibited by leaders in

directing and supervising their teams, shaped by their personality traits and experiences (Iqbal et al., 2015). Entrepreneurial leadership style is a critical determinant of start-ups' survival and success across various business activities (Burnes & Bargal, 2017), significantly influencing how entrepreneurs acquire, process, and analyse information both within and beyond the organisation. In the classification of leadership styles, (Goleman, 2021) identified six distinct types, with the autocratic and democratic styles frequently examined in comparative analyses. While transformational and transactional leadership styles have garnered increasing scholarly attention in the digital age, this study seeks to address an existing research gap by focusing specifically on the characteristics and implications of democratic leadership.

Democratic leaders typically demonstrate strong empathetic concern, promote an open and fault-tolerant corporate culture, prioritise a people-oriented and team-based approach, excel in communication, and are adept at fostering self-driven teams (Fredriksson & Wollscheid, 2007; Kotamena et al., 2020; Wilson, 2020). They emphasise collaboration over competition and place significant importance on employee satisfaction (Iqbal et al., 2015). While some scholars have raised concerns regarding its limitations—for example, (Chen et al., 2013) argued that democratic leaders, due to their inclusive nature, may struggle with decisive decision-making in the face of diverse subordinate perspectives—there is a growing body of research supporting its effectiveness.

Frankiewicz and Chamorro-Premuzic (2020) contended that the digital transformation of enterprises is driven primarily by talent rather than technology, making the formation of agile teams comprising skilled professionals and technical experts essential. In this competitive talent landscape, leadership plays a crucial role in uniting exceptional individuals within digital enterprises for effective collaboration. Consequently, democratic leadership, which fosters teamwork and mutual trust, emerges as particularly suitable in this context (Kotamena et al., 2020). Furthermore, Malik et al. (2024) argued that democratic leaders are well-positioned to leverage their strengths by cultivating a work environment characterised by equality, interactivity, teamwork, and empowerment (Sariwulan et al., 2021). Additionally, Abdullahi et al. (2020) suggested that democratic leadership can encourage employees' innovative behaviours. By promoting inclusivity and empathy, democratic leaders are better equipped to understand employees' ideas, provide them with the flexibility to experiment, and instil a sense of trust, thereby fostering innovation within the workplace.

Democratic-Style Leadership, Strategic Schema Change, and Digital Entrepreneurship

Democratic leaders typically prioritise efficient team collaboration and the stable development of the organisation as fundamental objectives of strategic behaviour (Kotamena et al., 2020). In technology-driven start-ups, these leaders often work with

highly skilled professionals who are deeply committed to innovation (Zaheer et al., 2022). To foster trust and cooperation while mitigating potential conflicts (George & Schillebeeckx, 2022), democratic leaders proactively adjust their cognitive frameworks and behavioural approaches to align with the developmental needs of their teams. Moreover, in start-up environments, collective team intelligence frequently drives continuous organisational advancements, necessitating the seamless integration of internal and external capabilities and resources (Cenamor et al., 2019). Consequently, democratic leaders engage in cognitive restructuring and strategic adaptations following brainstorming sessions to refine their decision-making processes. Additionally, as previously noted, democratic leaders demonstrate an enhanced ability to identify and capitalise on market opportunities (Anwar et al., 2018), while also actively reshaping existing strategic schemas by assimilating relevant information and resources that facilitate enterprise innovation (Markopoulos et al., 2020). Based on these insights, the following hypothesis is proposed:

H1: *Democratic-style leadership positively influences strategic schema change.*

From the perspective of strategic cognition Wrona et al. (2013), this study contends that strategic schema change is a continuous process in which entrepreneurs adapt their cognitive habits, knowledge structures, and behavioural logic. By assimilating diverse information and knowledge, entrepreneurs can modify their inherent strategic schemas, thereby generating novel strategic insights and facilitating resource reconfiguration, ultimately fostering the innovative development of business models (Martins et al., 2015; Phipps, 2012). Furthermore, the successful expansion of start-ups is contingent upon leaders' ability to identify and respond to changes within dynamic environments (Fauzi et al., 2022). Presently, China's digital economy is undergoing rapid growth, propelled by both government policies and substantial incentives for digital enterprises (W. Zhang et al., 2021). Aligning with digital entrepreneurship has thus become a strategic necessity. In this context, this study posits that start-up leaders reshape their strategic schemas by acquiring and integrating valuable information and resources within the digital landscape, enabling them to effectively engage in digital entrepreneurship. Based on these considerations, the following hypothesis is proposed:

H2: *Strategic schema change positively influences digital entrepreneurship.*

Building on the preceding discussion, this study posits that in contemporary China—where the number of digital enterprises exceeds 1.59 million (CEEA, 2023) and the digital industry continues to expand (Zhang & Wu, 2019)—democratic-style leadership is particularly conducive to fostering digital development in technology-driven start-ups for three key reasons. Firstly, democratic-style entrepreneurs are more effective in retaining talent and cultivating trust within the organisation due to their adaptive and altruistic approaches in interactions with subordinates (Iqbal et al., 2015). By offering

humanistic care and addressing employees' needs based on principled decision-making, these leaders create a harmonious work environment, enhance subordinate loyalty, and promote team flexibility (Mallén et al., 2015; Puni et al., 2014). This strategy mitigates talent attrition in China's highly competitive market while encouraging employees to actively acquire digital-related knowledge and share innovative ideas, thereby fostering digital innovation (Puni et al., 2014).

Secondly, democratic entrepreneurs demonstrate stability when responding to external changes and are more adept at adjusting organisational structures accordingly (Kayser & Melcher, 1973; Yazdani, 2010). Given that digital start-ups frequently encounter environmental turbulence and competitive threats (Yasir et al., 2017), democratic leaders maintain composure in the face of uncertainty and make rational decisions informed by the perspectives of their subordinates. Thirdly, democratic leaders tend to adopt an open mindset and exhibit a strong inclination towards entering new markets and engaging in innovative activities (Anwar et al., 2018). This receptiveness enables them to transcend existing cognitive frameworks and broaden their strategic outlook in the digital economy. Furthermore, it allows start-ups to establish extensive social networks, facilitating the exploration and utilisation of new information, resources, and digital opportunities (Puni et al., 2014). Based on this analysis, the following hypothesis is proposed:

H3: *Democratic-style leadership positively influences digital entrepreneurship.*

Mediating Role of Strategic Schema Change

Building on the perspective of leadership styles (Mazzarella & Smith, 1989), entrepreneurs with different leadership styles exhibit distinct strategic cognition and behavioural characteristics (Della Corte et al., 2019), which subsequently lead to variations in management behaviour and strategic outcomes (Della Corte et al., 2019; Malakyan, 2019; Martins et al., 2015). Digital entrepreneurship, as an innovative business model, can therefore be understood as a strategic outcome emerging from entrepreneurs' adaptation of their established strategic cognition. Accordingly, this study posits a mediating effect between leadership styles and digital entrepreneurship—whereby leaders modify their strategic cognition through their leadership style to shift their strategic direction and achieve digital entrepreneurship.

Drawing on the Upper Echelons Theory (Hambrick & Mason, 1984), leaders' strategic schemas shape their strategic behaviours, meaning that alterations in strategic schemas correspondingly lead to changes in strategic behaviour. Democratic leaders, characterised by a receptive and harmony-oriented leadership style (Iqbal et al., 2015), tend to focus on both internal and external organisational relationships while demonstrating a heightened sensitivity to industry trends and market opportunities (Anwar et al., 2018). This orientation enables them to acquire new information and

knowledge that facilitate digital transformation, prompting them to revise their inherent strategic schemas in pursuit of digital entrepreneurship. Based on the above discussion, the following hypothesis is proposed:

H4: *Strategic schema change plays a mediating role between democratic-style leadership and digital entrepreneurship.*

Moderating Role of VUCA Environment

VUCA—volatility, uncertainty, complexity, and ambiguity—characterises the dynamic business environment (Petry, 2018). These elements often coexist; for instance, new industries may be both volatile and ambiguous (Bennett & Lemoine, 2014). VUCA reflects market dynamics such as supply-demand relationships, competition, and technological advancements in the digital sector (Kaivo-oja & Lauraeus, 2018). As a key contingency factor, the external environment shapes enterprise strategies and outcomes (Fang & Zou, 2009; Petry, 2018; Pfeffer & Salancik, 2015). Gaur et al. (2011) argue that leaders' strategic schema change varies with VUCA levels, influencing their ability to utilise new knowledge and enact transformative strategies.

In low-VUCA settings, where consumer preferences are stable, competition is weak, and technological progress is slow, start-ups can sustain performance without altering strategic schemas, thus hindering digital entrepreneurship (Gaur et al., 2011). Conversely, high VUCA intensifies competition, expands consumer choices, and accelerates innovation (Prajogo, 2016). Start-ups in such environments must adapt by transforming strategic schemas, fostering digital entrepreneurship, and developing agile digital systems to capture market trends (Sadigov, 2022). Accordingly, we hypothesise:

H5a: *The positive relationship between strategic schema change and digital entrepreneurship will be stronger when VUCA is higher; such that the interaction between VUCA and strategic schema change has a positive association with digital entrepreneurship.*

In a low-VUCA environment, start-ups face reduced survival pressure and maintain stable relationships with stakeholders (Witschel et al., 2022). Limited access to heterogeneous external information prompts democratic leaders to prioritise stability, retaining existing strategic schemas and business models to minimise disruptions while preserving market share and stakeholder collaboration (Markopoulos & Vanharanta, 2014). Conversely, in a high-VUCA environment, fluctuating supply-demand dynamics heighten competitive threats, necessitating strategic innovation for survival. Enterprises with digital capabilities can better anticipate market shifts (Li et al., 2018). Democratic leaders, being fault-tolerant, receptive to new ideas, and proactive in innovation (Anwar et al., 2018), are well-positioned to capitalise on their teams' transformative drive. By integrating external knowledge and resources, they adapt strategic schemas and foster enterprise innovation, including digital entrepreneurship (Chitranshi, 2020). Based on

these discussions, we propose the following hypothesis.

H5b: *VUCA moderates the indirect effect of democratic-style leadership on digital entrepreneurship via strategic schema change; such that the indirect effect is stronger at a high level of VUCA than at a low level of VUCA.*

METHODOLOGY

Model and Endogeneity Bias

The theoretical model (Figure 1) was developed based on the research hypotheses. As shown in Figure 1, there are 5 sets of hypotheses, consisting of the direct effects of Democratic-style Leadership on Strategic Schema Change and Digital Entrepreneurship, the mediating effect of Strategic Schema Change, and the moderating effect of VUCA Environment. Moreover, according to Upper Echelons Theory (Hambrick & Mason, 1984), entrepreneurs' demographics (e.g., gender, age, education) influence their strategic behaviours. Additionally, firm type affects business strategy, as outlined in Organisational Life Cycle Theory (Smith & Miner, 1983). Thus, this study incorporates three control variables—gender, age, and firm type—representing both individual and organisational levels to account for their potential effects on digital entrepreneurship and strategic schema change. Including these variables helps mitigate endogeneity bias to some extent.
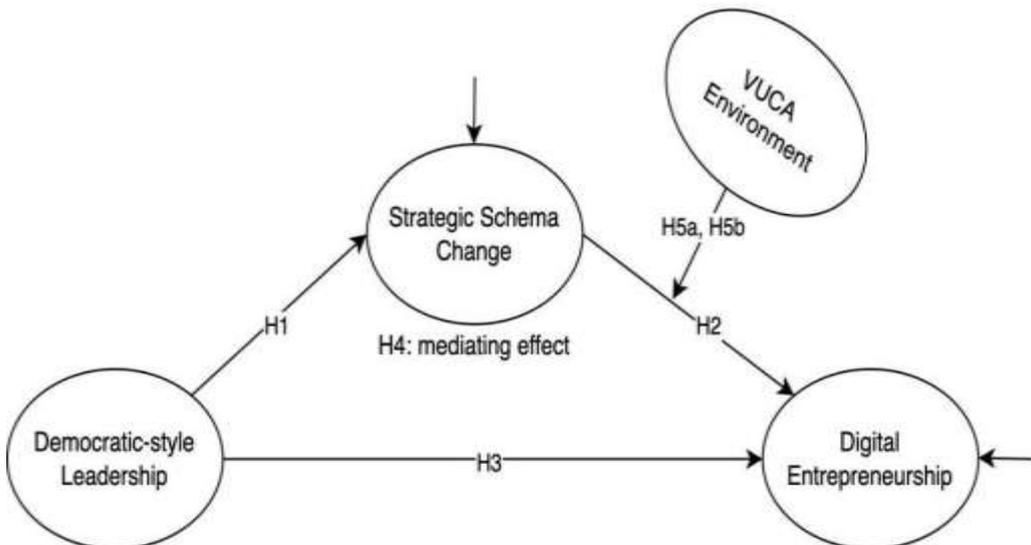

Figure 1: The Theoretical Model

Measurement

This study used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) for all measures, adapting reliable and valid scales from existing literature. Back-to-back translations between English and simplified Chinese ensured linguistic accuracy. Democratic-style leadership (DSL) was measured using a 4-item scale (Bhatti et al., 2012; Iqbal et al., 2015). Strategic schema change (SSC) was assessed with a 4-item scale (Fernández-Pérez et al., 2016). Digital entrepreneurship (DE) followed a 4-item scale (Karimi & Walter, 2021) based on (Hull et al., 2007) definition. The VUCA environment (VUCA) was measured using a 5-item scale (Fang & Zou, 2009), with higher scores indicating greater VUCA levels.

Data Collection and Pilot Test

Between August and September 2023, this study administered a questionnaire survey across five digital entrepreneurship parks in Shanghai: West Bund AI Valley, Shanghai Hodo Digital & Innovation Park, Shanghai U+ Digital & Innovation Park, Zhangjiang High-Tech Park, and Hai Ju Talent Base. A non-probability sampling approach was employed, targeting only participants who expressed interest in the study. To enhance the response rate, participants accessed the online questionnaire by scanning a WeChat QR code on-site. Prior to formal data collection, a pilot test was conducted with 100 high- and mid-level managers from 24 start-ups within the sample frame. Reliability testing using SPSS 27.0 led to the removal of measurement items with a Corrected Item-Total Correlation (CITC) value below 0.3 and a 'Cronbach's α if Item Deleted' exceeding the construct's Cronbach's α. Exploratory factor analysis (EFA) confirmed strong construct validity, yielding an ideal KMO value of 0.853 and a statistically significant Bartlett's test of sphericity (p = 0.000).

The final questionnaire comprised three sections—an introduction, demographic information, and a 14-item scale—and was distributed to 622 high-level (executives, department managers, and project leaders) and middle-level (group leaders) managers across 311 start-ups. To mitigate common method bias (CMB), two respondents—one high-level and one middle-level manager—were invited from each enterprise to complete the survey independently. After screening for unreasonable completion times and duplicate responses, a total of 398 valid questionnaires were retained, resulting in a valid response rate of 63.9%.

RESULTS

Descriptive Statistical Analysis

A descriptive analysis was performed using SPSS 27.0. Table 1 provides an overview of the descriptive statistics. Regarding gender distribution, male managers constituted a larger proportion than female managers, representing 54.3% of the total sample.

Table 1: Descriptive Statistics (n=398)

	Items	Frequency	Percentage (%)
Gender	Male	216	54.3
	Female	182	45.7
Age	≤30	19	4.8
	31-35	29	7.3
	36-40	84	21.1
	41-45	169	42.5
	46-50	52	13.1
	≥51	45	11.3
Firm Type	Sino-Foreign Joint Venture	78	19.6
	Private	169	42.5
	Joint-Stock	92	23.1
	Wholly Foreign-Owned	22	5.0
	State-Owned	39	9.8

The survey included managers from various age groups, with those aged 41–45 years (42.5%) and 36–40 years (21.1%) comprising the two largest cohorts. In terms of firm type, private enterprises accounted for the largest share (42.5%), consistent with the 2022 China Digital Economy Enterprise Development Report (CEEA, 2023), which indicated that private enterprises represented the highest proportion (49.3%) among China's Top 500 digital enterprises.

Measurement Model

The study's formal scale's construct validity was assessed using AMOS 24.0's confirmatory factor analysis (CFA). Table 2 shows that all measurement items' standardised factor loadings surpassed 0.600 (Hair et al., 2011), indicating robust relationships between measurement items and latent variables. Convergent validity was confirmed by each construct's AVE above 0.500 (Fornell & Larcker, 1981).

Table 2: Measurement Model Analysis (n=398)

Constructs	Measurement Items	Factor Loading (Std.)	Cronbach's α	CR	AVE
VUCA Environment (VUCA)	VUCA1: Actions of local and foreign competitors have been unpredictable.	0.690	0.791	0.766	0.624
	VUCA2: It is difficult to forecast where the technology will be in the next 5 years.	0.682			
	VUCA3: Market demand and consumer tastes have been unpredictable.	0.885			
Democratic Style Leadership (DSL)	LS1: Your leader seeks employees' input on upcoming plans and projects.	0.836	0.909	0.888	0.727
	LS2: Employees vote on all major decisions.	0.918			
	LS3: Employees have courage to share their mistakes with their leaders so that they can have better opinion from their leaders.	0.882			
	LS4: Your leader gives you autonomy to decide what needs to be done and how to do it.	0.749			

Strategic Schema Change (SSC)	SSC1: Your leader has a wide range of industry-related knowledge and information, and being able to organize and adjust them.	0.780	0.836	0.781	0.642
	SSC2: Your leader has the very strong organizational knowledge and information, and good at identifying and develop alternative methods to achieve performance targets	0.873			
	SSC3: The concepts your leader has learned about the industry are highly interrelated and he/she often improves them.	0.723			
Digital Entrepreneurship (DE)	DE1: Existing core and noncore products are both sold through digital media.	0.767	0.855	0.823	0.609
	DE2: We have a digital platform connecting to consumers.	0.881			
	DE3: We have developed digital platforms to launch direct digital marketing programs for businesses.	0.741			
	DE4: We have developed databases with consumer information and behaviour insights to help businesses target specific groups.	0.709			

Note: Threshold for factor loading (Std.): >0.5 new developed scale, >0.6 acceptable, >0.7 ideal and <0.95.
Threshold for Cronbach's α: >0.6 acceptable, >0.9 ideal and <0.95.
Threshold for CR: >0.7.
Threshold for AVE: >0.5.

Table 3 shows that the square roots of the AVE values for each construct, shown diagonally, above the suggested threshold of 0.7 and the correlation coefficients between constructs, proving discriminant validity (Fornell & Larcker, 1981).

Table 3: Pearson Correlations and Discriminant Validity (n=398)

	Mean	S.D.	VUCA	LS	SSC	DE
VUCA	11.583	2.534	0.790			
DSL	9.374	3.709	-0.044	0.853		
SSC	9.289	3.051	-0.088	0.268**	0.801	
DE	12.307	3.734	-0.196**	0.424**	0.620**	0.780

Note: *p<0.05 (2-tailed), **p<0.01 (2-tailed).
Diagonal values are square roots of average variance extracted (AVE), and the threshold is >0.7.
VUCA: VUCA Environment; DSL: Democratic-Style Leadership; SSC: Strategic Schema Change; DE: Digital Entrepreneurship.

Table 2 components were also assessed for reliability using SPSS 27.0. All constructs have Cronbach's α values above the recommended threshold of 0.700 (Ursachi et al., 2015) and a composite reliability (CR) value above 0.700 (Fornell & Larcker, 1981), confirming the reliability of the formal scale. Table 3 shows all constructs' mean, standard deviation, and correlation coefficients. Results show substantial correlations between key variables, ranging from -0.044 to 0.620. As these values are below 0.7 (Dormann et al., 2013), multicollinearity appears to be unimportant.

Common Method Bias Test

The study assessed common method bias (CMB) using two approaches. First, Harman's single-factor test in SPSS 27.0 showed that the first unrotated factor accounted for 37.270% of the variance, below the 40% threshold (Podsakoff et al., 2003), indicating minimal CMB. Second, AMOS 24.0 introduced a common method factor ('M') into the structural model. Model 1 ('Congeneric') fixed path coefficients at zero, while Model 2 ('Non-congeneric') used a common parameter ('a'). A comparison (Table 4) showed no significant model fit changes, confirming the absence of substantial CMB (Richardson et al., 2009).

Table 4: Common Method Bias Test (n=398)

Model	χ^2	df	χ^2/df	$\Delta\chi^2$	RMSEA	CFI	TLI	SRMR
Congeneric Model	174.270	71	2.455	-	0.061	0.966	0.956	0.041
Non-Congeneric Model	172.176	70	2.460	2.094	0.061	0.966	0.956	0.042

Path Analysis

The majority of existing studies have examined moderating, mediating, and moderated mediation effects using hierarchical regression analysis based on manifest variables or the PROCESS module (Cheung & Lau, 2017; Fang & Wen, 2018). However, a key limitation of this approach is its inability to account for measurement errors across all variables, which may result in an underestimation of moderating and mediating effects (Hayes et al., 2017; Ledgerwood & Shrout, 2011). To overcome this limitation, Structural Equation Modelling (SEM) provides a more robust analytical framework by incorporating latent variables, thereby effectively controlling for measurement error and yielding more accurate estimates of moderating and mediating effects (Cheung & Lau, 2017; Wen & Ye, 2014). Given that the present study employs a moderated mediation model based on latent variables, SEM using AMOS 24.0 represents the most appropriate approach for conducting path analysis.

Construction of Interaction Term, and Model Fit

Existing research suggests that when incorporating a moderating variable into a model, it is generally necessary to include an interaction term between the moderating variable and an explanatory variable to jointly predict the outcome variable (Rao Jada et al., 2019; Shankar & Jebarajakirthy, 2019). The potential interactions among explanatory variables require the inclusion of an interaction term to mitigate omitted variable bias and improve the accuracy of outcome predictions (Busenbark et al., 2022). Accordingly, the present study constructed the interaction term 'VS' by combining the moderating variable (the VUCA environment) and the mediating variable (strategic schema change, SSC) before conducting path analysis. The product indicator approach proposed by (Kenny & Judd, 1984) was employed.

Specifically, the measurement items for VUCA and SSC were ranked in descending order based on their standardised factor loadings (i.e., VUCA3, VUCA1, and VUCA2 with SSC2, SSC1, and SSC3). To minimise multicollinearity, all six measurement items were mean-centred using SPSS 27.0, following the recommendations of (Ahmed et al., 2017). The items were then paired and multiplied according to the "big match big, small match small" principle proposed by (Marsh et al., 2004) and (Wen et al., 2010). Consequently, three measurement indicators for the interaction term VS were derived: VS1, VS2, and VS3. At this stage, the complete model structure was successfully developed, as illustrated in Figure 2. The model fit indices were computed, yielding the following results: $\chi^2/df = 2.026$, GFI = 0.923, AGFI = 0.898, RMSEA = 0.051, NFI = 0.907, CFI = 0.950, and IFI = 0.951. These values indicate an overall good model fit, confirming that the constructed model adequately represents the data.

Hypotheses Testing

The hypotheses were tested in three steps: assessing direct effects (H1–H3) and moderation (H5a), evaluating mediation (H4), and examining moderated mediation (H5b). The standardised path model is shown in Figure 2.
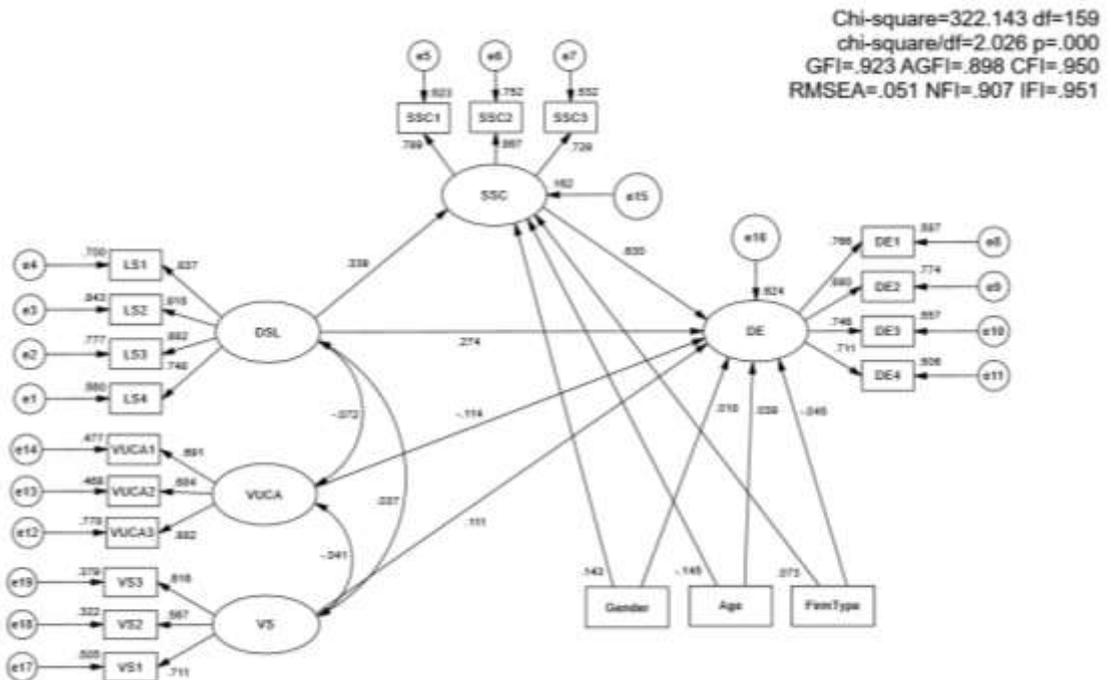

Figure 2: Standardized Model with Goodness-of-Fit

Table 5 indicates that DSL significantly influenced SSC ($\beta = 0.339$, p < 0.001) and DE ($\beta = 0.274$, p < 0.001). SSC also strongly affected DE ($\beta = 0.630$, p < 0.001), supporting H1, H2, and H3. Among control variables, gender ($\beta = 0.143$, p < 0.05) and age ($\beta = -0.145$, p < 0.05) had significant effects on SSC. Moreover, the interaction term VS,

representing the moderating effect of VUCA on the relationship between SSC and DE, was found to have a significantly positive impact on DE ($\beta = 0.111$, $p < 0.05$). In contrast, the direct effect of VUCA on DE was negative ($\beta = -0.114$, $p < 0.05$). However, these findings do not contradict the study's conclusion that VUCA strengthens the positive association between SSC and DE. This interpretation is supported by two key considerations. Firstly, as noted by (Wu, 2011; Goldsby et al., 2013), and (Jiang, 2022), a moderating effect is deemed significant when "the regression coefficient of the interaction term is significant." Secondly, Equation 1, derived from the standard linear regression model and frequently used in prior studies to compute moderating effects (Jiang, 2022), is applicable in this context.

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X + \hat{\beta}_2 Z + \hat{\beta}_3 XZ + \epsilon \qquad (1)$$

This study defines Y, X, Z, and XZ as representations of DE, SSC, VUCA, and the interaction term VS, respectively. The coefficients β_1, β_2, and β_3 correspond to the main effects of SSC on DE, VUCA on DE, and the interaction term VS on DE, respectively. In this context, the marginal effect of SSC on DE can be interpreted as a simple slope, derived by computing the first partial derivative. As demonstrated in Equation 2 and Table 5, both β_1 and β_3 were positive, indicating that the positive effect of SSC on DE strengthened as VUCA increased. These results provide empirical support for H5a.

$$\frac{\partial DE}{\partial SSC} = \hat{\beta}_1 + \hat{\beta}_3 VUCA \qquad (2)$$

Table 5: Results of Direct Effects and Moderating Effect

Paths	Std. Estimate (β)	S.E.	t-value	Results
H1: DSL→SSC	0.339***	0.069	5.967	Supported
H2: SSC→DE	0.630***	0.054	10.400	Supported
H3: DSL→DE	0.274***	0.051	5.793	Supported
H5a: VS→DE	0.111**	0.042	2.318	Supported

Note: **$p<0.05$, ***$p<0.001$.
DSL: Democratic-Style Leadership; SSC: Strategic Schema Change; DE: Digital Entrepreneurship; VS: The interaction between VUCA and SSC.

The study first assessed mediation before examining moderated mediation. Following Rijnhart et al. (2021), mediation occurs when a predictor significantly affects a mediator, which then influences the outcome. Table 5 shows DSL significantly impacted SSC ($\beta = 0.339$, $p < 0.001$), and SSC influenced DE ($\beta = 0.630$, $p < 0.001$), confirming mediation. Bootstrapping (2,000 resamples, 95% CI) further validated the mediator's effect. Table 6 confirms a significant indirect effect of DSL on DE via SSC ($\beta = 0.214$, $p < 0.001$), supporting H4. Based on Mueller and Hancock (2018), SSC partially mediated this relationship, with a direct effect of $\beta = 0.274$ ($p < 0.001$) and an indirect effect of $\beta = 0.214$ ($p < 0.001$).

Table 6: Results of Mediating Effect

Mediation Path (LS-SSC-DE)	Std. Estimate (β)	Bias-Corrected 95%CI		Results
		Lower	Upper	
H4: Indirect Effect	0.214***	0.135	0.302	Supported (Partial Mediation)

Note: Standardized estimating of 2,000 bootstrap samples. ***p<0.001.
DSL: Democratic-Style Leadership; SSC: Strategic Schema Change; DE: Digital Entrepreneurship.

Moderated Mediation

The final stage of hypothesis testing in this study involved assessing the effect of moderated mediation. As outlined by (Fairchild & MacKinnon, 2009), and (Jebarajakirthy & Das, 2021), moderated mediation occurs when an indirect effect within a mediation model varies across different levels of a moderating variable. This concept is generally categorised into first-stage and second-stage moderated mediation within the mediating paths (Edwards & Lambert, 2007) . In accordance with the study's model and hypothesis 5, the second-stage moderated mediation was evaluated using an approach widely adopted in previous research (Li & Lyu, 2021; Wang et al., 2016). Specifically, if the indirect effects of democratic-style leadership on digital entrepreneurship via strategic schema change differ significantly when VUCA is one standard deviation above (+1SD) and below (-1SD) its mean value, the presence of moderated mediation can be confirmed.

The discussion in the preceding section provided a comprehensive comparison of SEM with multiple regression analysis and the PROCESS module, highlighting its advantages in analysing mediating and moderating effects within latent variable models. Consequently, SEM was implemented in AMOS 24.0, and moderated mediation was tested using bias-corrected bootstrap analysis. By executing the syntax, the standardised simple slopes and corresponding 95% confidence intervals for the moderating effect of VUCA across high, mean, and low levels were obtained (Robinson et al., 2013). Additionally, the mediating effect of strategic schema change and its corresponding 95% confidence intervals were estimated at different levels of VUCA (+1SD and -1SD). The results of the second-stage moderated mediation analysis are presented in Table 7.

Table 7: Results of Moderated Mediation Analysis

Parameter	VUCA	Std. Estimate (β)	Bias-Corrected 95%CI		
			Lower	Upper	P
DLS→SSC→DE	High	0.248	0.157	0.356	0.001
	Mean	0.214	0.135	0.302	0.001
	Low	0.179	0.100	0.261	0.002
Difference (High-Low)		0.069	0.004	0.184	0.037

Note: Standardized estimating of 2,000 bootstrap samples. ***p<0.001, **p<0.05

As shown in Table 7, the indirect effects of democratic-style leadership on digital

entrepreneurship via strategic schema change were statistically significant and positive at both low ($\beta = 0.179$, $p < 0.01$) and high levels of VUCA ($\beta = 0.248$, $p < 0.001$). The lower and upper confidence interval values for these indirect effects did not include zero at either level of VUCA. Notably, the indirect effect of democratic-style leadership on digital entrepreneurship through strategic schema change differed significantly between low and high levels of VUCA ($\Delta\beta = 0.069$, $p < 0.05$), confirming the presence of a moderated mediation effect. Furthermore, the simple slope test illustrated in Figure 3 yielded consistent results, demonstrating a stronger indirect effect when VUCA is high and a weaker effect when VUCA is low. Therefore, hypothesis H5b was supported.
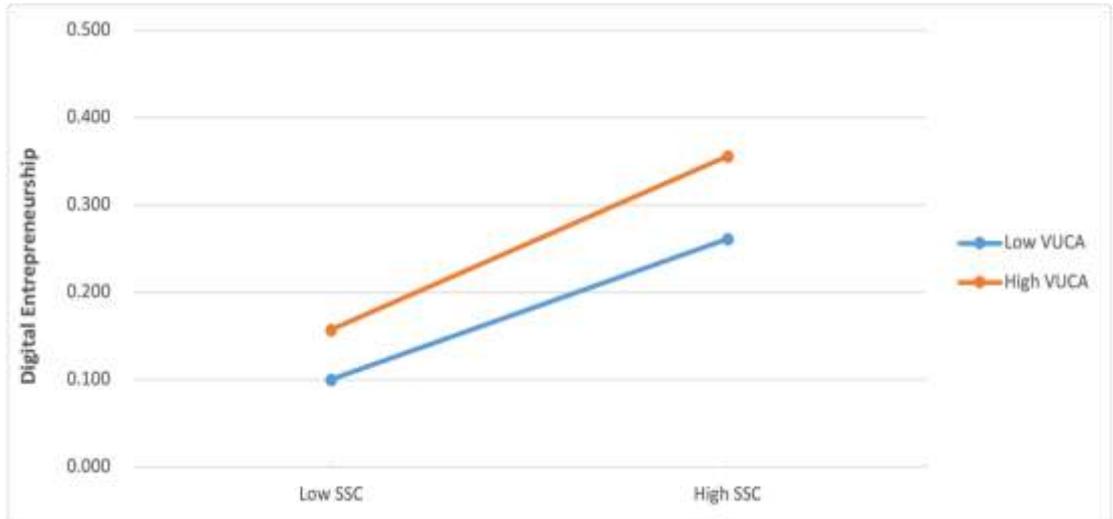

Figure 3: Simple Slope Test

DISCUSSION

This study proposed a moderated mediation model to explore the influence of democratic-style leadership on digital entrepreneurship, drawing upon the Upper Echelons Theory and Strategic Schema Theory. The hypotheses were categorised into three sets. The first set examined direct effects, demonstrating that democratic leadership in digital start-ups significantly influenced strategic schema change and digital entrepreneurship. These effects can largely be attributed to the characteristics of democratic leaders, such as inclusiveness, open-mindedness, a willingness to innovate, and concern for subordinates (Iqbal et al., 2015). As a result, such leaders are inclined to modify established strategic schemas in the digital economy era and attract digital talent to implement innovative digital business models (Anwar et al., 2018).

Furthermore, the findings provided empirical support for the significant impact of strategic schema change on digital entrepreneurship, aligning with the 'cognition-behaviour' perspective in the existing literature (Hambrick & Mason, 1984; Pei et al., 2020). In addition, this study validated the moderating role of VUCA by examining its

interaction with strategic schema change in the context of digital entrepreneurship. The results indicated that VUCA strengthened the positive association between strategic schema change and digital entrepreneurship. This finding suggests that in the digital VUCA era, despite facing various uncertainties, start-ups demonstrate a willingness to adapt their existing cognitive frameworks—such as acquiring digital knowledge, processing information effectively, and understanding digital market trends—in order to actively participate in the digital economy. This includes increasing investment in digital resources, technologies, and applications. The findings are consistent with the observed growth of digital enterprises in China (CEEA, 2023).

The second set of hypotheses focused on the mediating role of strategic schema change in the relationship between democratic-style leadership and digital entrepreneurship. Notably, the findings revealed that strategic schema change partially mediated this relationship. This suggests that democratic-style leaders not only exert a direct influence on digital entrepreneurship through their leadership approach but also shape cognitive processes by updating strategic schemas within the existing business model. Such cognitive refinement fosters innovative transformations in business models, ultimately facilitating successful digital entrepreneurship.

The third set of hypotheses examined the moderated mediation effect. The results indicated that the mediating role of strategic schema change varied significantly between low and high VUCA environments in the relationship between democratic-style leadership and digital entrepreneurship. In line with hypothesis H5b, the findings suggest that when democratic-style leaders perceive a high VUCA environment as aligned with their expectations and offering greater opportunities for external business growth, they are more inclined to innovate and adjust their strategic schemas. This adaptability enhances their capacity to implement digital entrepreneurship effectively.

THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretical Implications

This study makes three key theoretical contributions. First, it expands research on business model innovation in technology-driven start-ups by linking democratic entrepreneurial traits to digital entrepreneurship. It enriches leadership-innovation literature and challenges the notion that democratic leadership hinders enterprise reform. Second, it addresses Strategic Schema Theory's limitations by identifying strategic schema change as a mediator between entrepreneurial traits and business model innovation. Entrepreneurs' distinct schemas, shaped by external dynamics, enhance adaptability and innovation. Third, it introduces a moderated mediation model, showing that VUCA strengthens the mediating role of strategic schema change, offering deeper insights into strategic adaptation.

Practical Implications

Practically, these findings offer insights for technology-driven enterprises seeking business model innovation. First, fostering democratic leaders enhances digital-era innovation. Such leaders value team input, encourage participation, promote creativity, and emphasise teamwork. By building trust and granting autonomy, they enable flexible adaptation to digital environments. Their humanistic approach and open communication boost employee loyalty, inspiring innovation aligned with strategic goals. Additionally, their proactive nature drives them to challenge existing strategic schemas, serving as role models for continuous learning and knowledge sharing. Secondly, the moderating role of the VUCA environment in the digital industry provides crucial guidance for business leaders in digital strategy development. In a high VUCA digital economy, start-ups must avoid rigid strategic planning and instead adapt to external changes dynamically. Leaders should rapidly interpret environmental shifts and continuously reassess their strategic cognition to navigate uncertainty effectively. By aligning an enterprise's core capabilities with its developmental stage and industry characteristics, they can implement targeted digital transformations, ensuring ongoing iteration and optimisation of business strategies.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has several limitations. First, its cross-sectional design limits causal inferences between democratic leadership and digital entrepreneurship. A longitudinal approach could assess leadership's long-term impact. Second, it focuses only on democratic leadership, overlooking comparisons with other styles like autocratic leadership. Third, future studies could examine additional moderators and mediators, such as knowledge sharing and perceived responsibility. Lastly, as the study is based on China's digital economy, cultural differences may affect digital entrepreneurship, requiring validation in other national contexts.

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