

Journal of Innovation & Knowledge



https://www.journals.elsevier.com/journal-of-innovation-and-knowledge

The causal exploration of digital entrepreneurial psychological capital configurations based on fsQCA



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ARTICLE INFO

Article History: Received 20 January 2022 Accepted 25 December 2022 Available online 2 January 2023

Keywords: Digital entrepreneurship Psychological capital Self-regulation Entrepreneurial learning Family support Entrepreneurial environment

JEL code: 0310

ABSTRACT

The COVID-19 brings about a great quantity of digital entrepreneurs in China. In the fierce competition, positive psychological capital can better help them adjust emotions, cognition and behavior. However, little is known of how to improve the digital entrepreneurial psychological capital (DEPC). To fill this gap, this paper explored the configurations to promote DEPC. Based on the key psychological resources theory, a configurational framework which encompasses the antecedent conditions of self-regulation, entrepreneurial learning, family support and entrepreneurial environment is proposed. Using fuzzy-set qualitative comparative analysis (fsQCA) to analyze the survey data of 238 digital entrepreneurs in China, specifically, there are 4 recipes for resulting in high DEPC and 5 for not-high DEPC. The results reveal that the changes of DEPC are mainly caused by the synergy of multi-factors. In order to enhance DEPC, digital entrepreneurs should seek support from family members actively; build self-regulated entrepreneurial learning (SREL) capabilities or entrepreneurial experience learning capabilities; and adjust promoting regulatory focus to a lower level or accumulate the experience of digital entrepreneurship in a good entrepreneurial environment. Overall, this work highlights the approaches to high DEPC. Theoretically, it contributes to the literature on positive organizational behavior by confirming the configurational roles of DEPC; practically, it provides beneficial implications for the development of DEPC, which helps digital entrepreneurs face the crisis better in VUCA environment

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Introduction

Since the COVID-19 pandemic began, a large number of digital entrepreneurs have emerged in China. According to *Global digital economy white book 2021*¹, the scale of Chinese digital economy approaches 5.4 trillion USD in 2020, ranking second in the world and the growth rate reaching to 9.6%. In 2022, the "14th five year" digital economy development plan is issued by the State Council, which is emphasized the importance of digital entrepreneurship. Besides, there is also a worldwide increase in government policies advancing the development of digital entrepreneurship activities (Ammirato et al., 2019a; Acs et al., 2017). However, the recorded failure rate of among digital companies and entrepreneurs is still high (Ammirato et al., 2019b). As Luthans et al. (2020) argued, psychological capital (PsyCap) can effectively resist the double attack from COVID-19 pandemic and entrepreneurial pressure. Relevant researches show that

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PsyCap can also help entrepreneurs improve entrepreneurial performance (Grözinger *et al.*, 2022; Hmieleski, 2008; Esfandabadi *et al.*, 2019), and predict entrepreneurial success (Baluku *et al.*, 2016). Hence, it is significant to pay attention to the PsyCap of digital entrepreneurs and investigate how to improve it.

In order to find the influence path of PsyCap, the antecedent conditions are needed to be scoped. There are few studies on testing the antecedent conditions of PsyCap, because the shortage of the systematic methods restrains its development (Avey et al., 2011). At present, personal characteristics (Brandt et al., 2011), entrepreneurial learning (Hasan et al., 2019; Suksod et al., 2019), family support (Kwok et al., 2015) and so on are known to be the antecedents of PsyCap. Existing studies mainly employ conventional statistical methods, focusing on the net effect or two-way interactions of outcome conditions (Douglas et al., 2020). Few articles cut into the research of PsyCap from the perspective of multiple conditions, which leads to few studies on the configurational framework of PsyCap. PsyCap is a state-like variable which is affected by many conditions, and different combinations of conditions may lead to the same outcome. Therefore, to deepen the understanding of digital entrepreneurial psychological capital (DEPC), it is necessary to analyze its synergistic effect from an integrative view.

https://doi.org/10.1016/j.jik.2022.100291

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¹ Sources: China Academy of Information and Communications Technology Institute (CAICT)

Based on the key psychological resources theory (Hobfoll, 2002), four factors (namely self-regulation, entrepreneurial learning, family support and entrepreneurial environment) which significantly related to PsyCap are selected to clarify the logical relationships between them, and construct a configurational framework through the configurational theorizing approach proposed by Furnari *et al.* (2021). It is focused on identifying the antecedent conditions which affect DEPC, and figuring out the configurations of promoting or inhibiting the PsyCap level for digital entrepreneurs by using the fuzzy set qualitative analysis (fsQCA).

The remainder of this work is constructed as follow. Section 2 explains the relevant theories of PsyCap, then scopes and links the various conditions that impact DEPC to build framework. Section 3 illustrates fsQCA method, data collection and processing. Section 4 presents and interprets the empirical results. Section 5 contains discussions and conclusions, limitations, and directions for future research. Theoretically, this study further explores the configurational framework of PsyCap, which expanded new core and marginal conditions and discovered the condition combination of promoting and inhibiting DEPC. It also provides a new theoretical direction for psychological capital intervention (PCI). Practically, it plays a guiding role in improving the PsyCap of digital entrepreneurs and helping them find ways to intervene their own PsyCap. It will effectively alleviate the entrepreneurial pressure and promote the possibility of entrepreneurial success.

Theoretical background

The key psychological resources theory is the basis of PsyCap. This theory holds that psychological resources are the key resources which help people achieve career success (Hobfoll, 2002). Base on this theory, Luthans *et al.* (2007) defined PsyCap as positive psychological resources of individuals, which consists of self-efficacy, hope, resilience and optimism. The formation of PsyCap is produced by the complex mechanism of individual characteristics, behavior, environment, and so on (Hmieleski *et al.*, 2015; Basinska & Rozkwitalska, 2022). Thus, from these aspects, self-regulation, entrepreneurial learning, family support and entrepreneurial environment are chosen to construct the framework on the ground of the key psychological resources theory.

Currently, the definition of digital entrepreneurship is not unified yet. Different from traditional entrepreneurship, digital entrepreneurship weakens the boundary between entrepreneurial process and result through digital technology (Steininger, 2019), and reduces the estimated location of the venture. It is not a subcategory of entrepreneurship (Sahut et al., 2021), but the reconciliation between traditional entrepreneurship and new ways in the digital age (Le Dinh et al., 2018). Some scholars consider that using digital technologies (e.g. cloud computing, big data and artificial intelligence) to explore entrepreneurial opportunities is digital entrepreneurship (Nambisan, 2017; Giones & Brem, 2017; Delacroix et al., 2019; TöRHöNen, 2021). Other scholars deem that digital entrepreneurship is the creation and development of digital technologies for profits (Ngoasong, 2018; Tumbas et al., 2018). Overall, this work holds that digital entrepreneurship refers to entrepreneurs develop or use digital technologies, products, services or digital platforms to identify and develop entrepreneurial opportunities for the purpose of making profits or realizing self-worth.

Combined with apposite literatures, this paper defines that the digital entrepreneurial psychological capital (DEPC) refers to the superposition of psychological factors which can actively affect entrepreneurial cognition and effectively intervene in self-decision-making in the process of digital entrepreneurial activities.

In order to build the overarching framework of DEPC scientifically, this paper follows the configurational theorizing process (Furnari *et al.*, 2021). It is composed by three stages: finding the key conditions

through the pertinent literature (scoping); paying attention to the internal connection between conditions (linking); labeling the configurations to evoke their orchestrating themes (naming). This section identifies the key conditions through literature review and discusses the correlations between them. In the chapter 4, it will be continued to follow the naming stages according to the empirical results.

Self-regulation

Self-regulation is a developable personal characteristic (Garud & Giuliani, 2013; Shane, 2012; Shepherd et al., 2013), which reflects the different attitudes of entrepreneurs when facing the opportunities and the risks. Self-regulation improves the pressure resistance of entrepreneurs at the beginning of a business (Baron et al., 2016), the high level of self-regulation helps them achieve goals by changing attitudes, which allows them to easily succeed in any field of activity and feel more confident in difficult situations. However, excessive self-regulation will make entrepreneurs overconfident, which will lead to entrepreneurial failure (Artinger & Powell, 2015). PsyCap is a state-like entity which can be affected by personality trait and cognitive ability (Monnot, 2017), and the relevant studies verify that selfregulation positively affects PsyCap within limits (Galina et al., 2021; Luthans et al., 2021). Digital entrepreneurs are at the high risk of being eliminated and changes in government digital policy, so it is particularly important to have a good self-regulation system to help them recover from malignant events. Therefore, this paper assumes self-regulation as a key condition of DEPC configurational framework.

Entrepreneurial learning

Entrepreneurial learning is a positive behavior for entrepreneurs to improve their personal capabilities, which can promote entrepreneurs' self-confidence and sense of achievement (Rae & Carswell, 2001; Minniti & Bygrave, 2001). Currently, lean startup approaches (LSAs) are proposed to support digital entrepreneurs facing business model innovation (Ghezzi & Cavallo, 2020). LSAs are a kind of validated learning processes use to test out and validate their business model, which help digital entrepreneurs explore entrepreneurial opportunities or find potential customers (Ghezzi, 2019; Ghezzi, 2020). Relevant empirical researches show that, there is a significant positive correlation between entrepreneurial learning and PsyCap (Hasan, 2019; Sarasvathy, 2004), and PsyCap predicts the entrepreneurial success through the intensity of entrepreneurial learning directly or indirectly (Juhdi et al., 2015). Since digital entrepreneurship is borderless and highly innovative (Tumbas et al., 2018; Nambisan, 2017), it reflects that digital entrepreneurs need to adapt to such an unpredictable environment through entrepreneurial learning. Knowledge collection can improve entrepreneurs' senses of self-efficacy (Rae & Carswell, 2001), and the high learning intensity leads to the formation of positive PsyCap (Cope, 2003), while digital entrepreneurs need to keep learning and mastering digital knowledge, technologies, and LSAs so as to improve the level of PsyCap. Thus, this study considers that entrepreneurial learning is one of the antecedents affecting DEPC.

Family Support

Family is the primary source of support in the case of difficulties in entrepreneurship and provides various supports for the successes (Powell & Eddleston, 2013). A good family environment can provide the multi-dimensional supports for digital entrepreneurs, such as social capital and social networks of parents or partners (Edelman *et al.*, 2016). It is found that the combination of family support with the applications of digital technologies in developing countries is

conducive to the individual entrepreneurship (Soluk *et al.*, 2021). In contrary, a terrible family environment will limit the development of entrepreneurial PsyCap. According to Gao *et al.* (2021), the three dimensions of family support, including family financial support, family emotional support and family social network support, have a significant positive impact on entrepreneurial PsyCap. To sum up, the family support of digital entrepreneurs will have a certain impact on their own psychological capital. Hence, this work believes that family support is also one of the key conditions of DEPC.

Entrepreneurial Environment

Volatility, Uncertainty, Complexity and Ambiguity (VUCA) now defines the competitive environment of the digital economy (Cousins, 2018). In the competition pattern characterized by digital technological progress and digitization, VUCA environment makes entrepreneurs need to predict or respond quickly and effectively to external changes to achieve the purpose of survival and successful competition (Troise et al., 2022). Moreover, the pandemic further aggravates VUCA environment. At the same time, it also accelerates the digital transformation of consumer habits and entrepreneurs. It means that digital entrepreneurs are also in VUCA environment. Psy-Cap can effectively deal with the pressure, anxiety, depression and suicide brought by the epidemic and VUCA environment (Luthans et al., 2020). Therefore, we should pay attention to the formation and promotion of DEPC in VUCA environment. Individual psychology and its surrounding environment are independent entities, but they can interact with each other (Bandura, 2007). Relevant studies have also shown that PsyCap has a significant influence on the relationship between the external environment and individual attitudes and behaviors (Alexander & Onwuegbuzie, 2007; Beins, 2019). Thus, this paper believes that the entrepreneurial environment will have an impact on the DEPC.

Framework

By scoping the above four key conditions, the existing researches mainly explain single "net-effects model" through symmetric methods which highlights the dominant relationship found (Douglas, 2020). However, the symmetry method cannot reveal the influence of multiple factors on DEPC. In configurational theorizing process, scholars need to gain some awareness of the coherence or orchestrating themes that underlie the combinations of attributes (Miller, 2018). After scoping the key conditions of DEPC, this paper establishes a configurational framework by exploring their logical relationship, as shown in the Figure 1. Thus, the next section will clarify the logical relationship between the conditions, to make the overall framework more scientific and rigorous. Among them, self-regulation and entrepreneurial learning are internal factors, and family support and entrepreneurial environment are external factors.

Correlations between internal factors

In research on self-regulation and learning, self-regulated learning (SRL) theory proposes to interpret learning as a dynamic self-regulation process that depends on planning, monitoring and self- reflection (Schunk, 2001; Zimmerman, 2000). As Rae & Carswell (2001) argued. SRL can effectively improve self-efficacy. Winkler & Fust (2021) based on SRL theory, build self-regulated entrepreneurial learning (SREL) model, which shows how entrepreneurs should systematically develop entrepreneurial expertise to improve the probability of entrepreneurial success. It is composed of countless SRL small cycles, and the basic principles guided by entrepreneurial practice are embedded in it. In addition, SREL can also be applied to environments with high uncertainty, destructive changes and new situations, which are inherent in the digital entrepreneurial environment. Relevant empirical study shows that there is a significant correlation between PsyCap and self-regulated learning (Sava et al., 2020). Therefore, the first hypothesis is proposed:

Hypothesis 1. There is a configuration which self-regulation condition and entrepreneurial learning condition present both, leads to the presence of high DEPC.

Correlations between external factors

The macro entrepreneurial environment has a substantial impact on micro environment (Statman, 2007). According to Chen et al. (2014), the sales and workforce growth rates of enterprises with family control will significantly reduce in a less favorable regulatory environment. However, perceived family support can reduce individuals the amount of conflict felt brought by the external environment (Dianne et al., 2021). Relevant research also shows that persons with negative perceptions of their family environments lead to a lower level of perceived support in the social environment (Brian & Lewis, 1994). In other words, when exploring from micro environment to macro environment, individual cognition and behavior will also be affected by their families to a certain degree. For instance, Allen (2001) finds that individuals with family support can adapt to the working environment better; and Markoski (2014) deems that family businesses can respond to environmental challenges more quickly. Therefore, this paper believes that family support can help digital entrepreneurs quickly adapt to the environment.



Correlations between internal and external factors

The formation of self-regulation is not only related to individual own congenital conditions, but also related to family environment (Grolnick *et al.*, 2013). Family support can help improve the difficulties in self-regulation during their growth (Bundy-Myrow, 2005). Sanders *et al.* (2019) proposed that actively promoting parent-child relationship can improve the self-regulation of both parents and children.

Family environment has an impact on entrepreneurial learning (Clinton *et al.*, 2021). According to Bloemen-Bekx (2019), parents' entrepreneurial experience will have a positive impact on their children's entrepreneurial learning and entrepreneurial intention. Some entrepreneurs are willing to learning from family members (Zamani, 2018), and advice from family members is particularly critical for young entrepreneurs (Edelman *et al.*, 2016). Combined with subsection 2.5.2, it shows that family support condition is correlated with other three conditions respectively, however, there is little literature on the correlations between the above three logical chains and Psy-Cap. Thus, in this paper, the following hypothesis is proposed:

Hypothesis 2. There is at least one configuration contains family support condition, which is sufficient for the presence of high DEPC.

Self-regulation is related to various environments, such as learning environment (Canter, 2019; Yusufu *et al.*, 2021) and individual environment (Dwivedi *et al.*, 2018). According to Chang *et al.* (2010), the poor environment will destroy the self-regulation system and cause individual changes. From a psychological perspective, the environmental structural context affects human action through self-regulation (Luthans *et al.*, 2000). The overuse of digital environment is related to the neural and psychological underpinnings of the self-regulation failures (Caudle & Dartmouth, 2012). Combined with Section 2.1, this paper considers that individuals need more self-regulation to achieve entrepreneurship in a bad environment, while high level of self-regulation is easier to drive entrepreneurs to be overconfident and make improper decisions in a good entrepreneurial environment. Therefore, this paper proposes the following hypothesis:

Hypothesis 3. There is a configuration causes high DEPC, which the entrepreneurial environment condition and self-regulation condition cannot present at the same time.

Entrepreneurial environment is one of the important factors which affecting entrepreneurial learning (Man, 2006; Petkova, 2009). Due to the environment may not be conducive to entrepreneurial learning, the hostility of the environment will be reduced accordingly through participatory learning (Lévesque *et al.*, 2009). In an innovation-based digital era, it is necessary to have the well-trained entrepreneurial technical expertise to deal with a rapidly changing global economic environment (Essia, 2012). This work considers that entrepreneurial learning can help digital entrepreneurs quickly adapt to the new environment and a good entrepreneurial environment is beneficial for entrepreneurial learning. According to Choi *et al.* (2020), the correlations among PsyCap, informal learning and person-environment are significant. Thus, the following hypothesis is proposed:

Hypothesis 4. The presence of entrepreneurial learning condition and entrepreneurial environmental condition brings about the presence of high DEPC.

Methodology

Method

theory, the different combinations of conditions may produce the same results, thereby revealing asymmetries and multiple pathways that are otherwise hidden in the data (Misangyi *et al.*, 2017). The combinations of these conditions are named as configurations. In the configuration perspective, the whole is not equal to the sum of parts, and the conditions are highly dependent.

Data and measurement

Based on the definition of digital entrepreneurs (Delacroix et al., 2019), this study selects digital entrepreneurs who start a business on the digital platform which using big data, cloud computing and artificial intelligence as the research objects (i.e. Tiktok, Kwai and Bilibili). In order to screen out the digital entrepreneurs from the platform users, their accounts are initially analyzed by observing the associated online stores with the account. If there is no online store on the platform, the cross platform online stores or the established companies have been checked by analyzing the user's video data. Because these conditions are difficult to observe objectively, the questionnaire method is selected to collect data. Through the "Questionnaire Star" website links, there are 345 questionnaires were distributed and 238 valid questionnaires were eventually returned. According to the IP from backstage, the subjects come from 28 regions (including multiple provinces, Hong Kong and Macao), the effective samples collected break the impact of regional digital differences to a certain extent. The items are set as Likert five level scales, ranging from "Strongly disagree" (1) to "Strongly agree" (5). Before the formal survey, 42 samples are collected for pre survey, after deleting items the consistency level is higher than 0.70.

Digital entrepreneurial psychological capital (DEPC)

DEPC was measured using the PCQ-24 scale established by Luthans *et al.* (2007), which encompasses self-efficacy, hope, optimistic and resilience. The items are adjusted and deleted in the context of digital entrepreneurship. Finally, 8 items are chosen, e.g. "In the process of digital entrepreneurship, you believe you can set good goals" and "Encounter setbacks in digital entrepreneurship (such as cyber violence or malicious comments), it's hard for you to recover from it and move on", etc. The Cronbach's α for the DEPC scale is 0.71. Usually, Cronbach's α is required to be higher than 0.75, while the value above 0.7 is also acceptable (Hair *et al.*, 2010). One of the possible circumstances that lead to the Cronbach's α lower than 0.75 is the insufficient samples. In the follow-up study, we will further increase the data sample size.

Entrepreneur self-regulation (ESR)

Self-regulation comprises two dimensions: promoting regulatory focus and defensive regulatory focus. As Lanaj *et al.* (2012) indicate, promoting regulatory focus can promote the individual self-efficacy and thus affects the level of psychological capital. Individuals with defensive regulatory focus are more likely to focus on information related to failure and loss (Higgins & Tykocinski, 1992), the failure will make them depressed more easily. Therefore, in this work, it is believed that only promoting regulatory focus has influence on DEPC. There are 6 items in the RFQ scale is selected which compiled by Higgins (2001) to measure the promoting regulatory focus, a sample item is "Whether you often complete exciting tasks, even if the tasks are very arduous". And the Cronbach's α value for ESR scale is 0.83.

Digital entrepreneurship learning (DEL)

Based on the dynamic perspective, entrepreneurial learning includes three dimensions: cognitive learning, practical learning and empirical learning (Man, 2006; Rae and Carswell, 2001). In VUCA environment, digital entrepreneurship needs to improve self-awareness of new digital technologies and apply knowledge in continuous practice, so this work refers to Man (2006) on the cognitive learning

Entrepreneurship has entered a new era, which needs to combine new elements to solve the complex problems (Douglas, 2020). Fuzzy set qualitative analysis (fsQCA) is well-suited to the dealing with the complexity of entrepreneurial phenomena. Based on complexity dimension and practical learning dimension measurement. Because digital entrepreneurs may not have experiences, and the trial-anderror process of transforming experience into knowledge may not be suitable for digital entrepreneurship with the changeable situations, the experience learning dimension is not included in the DEL scale. By the adjustment and deletion in the digital entrepreneurship scenarios, 6 questions are reserved, such as "You often communicate with other digital entrepreneurs" and "You pay close attention to the behavior of benchmark digital entrepreneurs", etc. The Cronbach's α for the DEL scale is 0.80.

Entrepreneurial family support (EFS)

Entrepreneurial family support (EFS) is different from general family support in measurement. According to Powell and Eddleston (2013), there are 4 items to measure EFS. It is created for the purpose of addressing experiences of family support in the entrepreneurial setting. By the adjustment in digital entrepreneurship context, the items are including: "When you feel depressed in digital entrepreneurship, your family will try to understand you" and "Your family often contributes to your digital entrepreneurship without expecting return", etc. The Cronbach's α for EFS scale is 0.87.

Digital entrepreneurial environment (DEE)

The Chinese government has strong regulation and control over the market, and the policies, market and cultural environment have an important impact on VUCA environment. Therefore, this study will investigate DEE from these aspects. Based on the GEM model (Cheraghi *et al.*, 2019), 5 items is determined, such as "The local government attaches great importance to digital entrepreneurship and has issued a variety of measures to promote digital entrepreneurship", "If you carry out digital entrepreneurship, the local market can provide you with good technical support" and "Local culture encourages earn your own living and personal initiative", etc. The Cronbach's α for DEE scale is 0.76.

Digital entrepreneurship experience(DEXP)

The measurement of DEXP chooses the duration of digital entrepreneurship to evaluate the entrepreneurial experiences. In the qualitative comparative analysis, researchers need to add important control variables to the auxiliary analysis (Dwivedi *et al.*, 2018), such as company size, education level, gender and entrepreneurial work experience. Through the review and analysis of the literature, it is necessary to add the entrepreneurial experience into the research framework.

Calibration

According to the User Operation Manual of Fuzzy Set/Qualitative Comparative Analysis written by Ragin (2008), more than 95% of the cases in the case set are fully in point and less than 5% are fully out point. The mean value is selected as the crossover point. We assign a value of 0 when the duration of entrepreneurship is less than 1 year; 0.25 for 1-2 years; 0.5 for 2-3 years; 0.75 for 3-4 years; 1 for more than 4 years. Table 1 presents the descriptive statistics for the

Table 1

Variables	Fuzzy set calibrations			Descriptive statistics			
	Fully out	crossover	Fully in	Mean	SD	Min	Max
DEPC	20	27.28	31	27.3	3.270	16	36
ESR	16	20.26	24	20.26	2.489	13	26
DEL	14	21.14	25	21.14	3.187	10	27
EFS	8	15.44	19	15.44	3.088	5	20
DEE	10	19.30	24	19.30	3.822	7	25
DEXP	0	0.46	1	0.46	0.274	0	1

Table 2

Single conditional necessity analysis based on "DE	PC"
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Conditions tested	High DEPC		Not-high	DEPC
	Consistency	Coverage	Consistency	Coverage
ESR	0.690404	0.785615	0.628491	0.501831
\sim ESR	0.562205	0.683204	0.731506	0.623772
DEL	0.796868	0.808253	0.688813	0.490246
\sim DEL	0.497425	0.694935	0.730589	0.716211
EFS	0.822537	0.801617	0.706542	0.483172
\sim EFS	0.469684	0.695206	0.709904	0.737327
DEE	0.810453	0.803160	0.703180	0.488982
\sim DEE	0.484341	0.699288	0.716935	0.726335
DEXP	0.656799	0.801012	0.624007	0.534008
\sim DEXP	0.617903	0.700778	0.767475	0.610768

Note: the symbol \sim denotes the absence of the condition.

underlying measures and the calibration thresholds for the institutional conditions and outcome.

Analytical technique

Necessity analysis

The purpose of the single condition necessity analysis is to explore the relationships between a single condition and the result in the set and prevent the lack of necessary conditions in the analysis results (Dul, 2016). By using the "Necessary conditions" function, Table 2 is obtained with "high DEPC" and "not-high DEPC" as the results respectively.

It is found that the coverage value for all tested conditions is less than 1, indicating that self-regulation, entrepreneurship learning, family support, digital entrepreneurship environment and digital entrepreneurship experience are the antecedents of DEPC. However, since none of the consistency factors is up to 0.9, there is no necessary condition for DEPC (Schneider & Wagemann, 2010).

Sufficiency analysis

According to Fiss (2011), the raw consistency threshold is established at 0.8 to conduct the sufficiency analysis. When the study case covers a wide range of rows, or the raw consistency of rows are higher than 0.8, it indicates that there is a strong subset relationship between each configuration and the results. The analysis results of the truth table may have no reduced solution. When this happens, the rows in the truth table can be further filtered by setting the PRI value, cutoff value or selecting the natural break (Greckhamer *et al.*, 2018; Morten *et al.*, 2012). In the calculation with high DEPC as the result, the natural break of PRI consistency coefficient is obvious and thus the natural break is chosen as 0.748. Because of the large-scale sample and following prior studies (Ragin, 2008), the case frequency threshold is set to 2.

When the existence or absence of conditions has no inevitable impact on the results, the intermediate solutions and complex solutions of the truth table are exactly the same (Ragin, 2008). In the single conditional necessity analysis of this study, the existence and lack of antecedent conditions have no inevitable impact on DEPC. Therefore, this paper only reports the intermediate and parsimonious solutions (Table 3 to 6). The core conditions presents in both solutions, whereas peripheral conditions are stripped Considering the principle of causal asymmetry, the configurations sufficient for high DEPC are not the opposite of those for not-high DEPC, the sufficiency of conditions for not-high DEPC is explored based on prior practice (Misangyi *et al.*, 2017; Ragin, 2008).

After the standardized analysis of truth table through fsQCA3.1b, the parsimonious solutions and intermediate solutions with "DEPC" as the result can be obtained (Table 3 and Table 4). It illustrates that the core conditions are DEL, EFS and DEE.

Table 3

Parsimonious solu	itions with	"DEPC"	as the result	

Model: DEPC = f(ESR, DEL, EFS, DEE, DEXP) Algorithm: Quine-McCluskey							
— PARSIMONIOUS SOLUTION — frequency cutoff: 2 consistency cutoff: 0.943348							
-	Raw coverage	Unique coverage	Consistency				
DEL	0.796868	0.0417557	0.808253				
EFS	0.822537	0.0372516	0.801617				
DEE 0.810453 0.0355354 0.80316							
solution coverage 0.947948							
solution consistency	0.777375						

Table 4

Intermediate solutions with "DEPC" as the result

Model: DEPC = f(ESR, DEL, EFS, DEE, DEXP) Algorithm: Quine-McCluskey								
— INTERMEDIATE SOL	— INTERMEDIATE SOLUTION —							
frequency cutoff: 2								
consistency cutoff: 0.9-	43348							
	Raw coverage	Unique coverage	Consistency					
EFS	0.822537	0.0658517	0.801617					
~ESR*DEE	0.512226	0.0220936	0.872381					
ESR*DEL	0.606892	0.0201628	0.885273					
DEL*DEXP	0.572429	0.00922334	0.878332					
DEE*DEXP	0.576863	0.00793648	0.880498					
solution coverage	0.925068							
solution consistency	0.770487							

Table 5

Parsimonious solutions with "~DEPC" as the result

Model: ~DEPC = f(ESR, DEL, EFS, DEE, DEXP) Algorithm: Quine-McCluskey								
- PARSIMONIOUS SO	— PARSIMONIOUS SOLUTION —							
frequency cutoff: 2								
consistency cutoff: 0.8	03299							
	Raw coverage	Unique coverage	Consistency					
\sim DEL* \sim DEE	0.601386	0.0342364	0.825339					
\sim DEL* \sim EFS	0.58712	0.0682688	0.824674					
\sim EFS* \sim DEE* \sim DEXP	0.502649	0.00978178	0.85687					
\sim ESR* \sim DEE* \sim DEXP	0.495619	0.00876302	0.852585					
\sim ESR* \sim EFS* \sim DEE	0.49572	0.0199714	0.86612					
solution coverage	0.752496							
solution consistency	0.762283							

Table 7

Configurations sufficient for high DEPC

Table 6

ntermediate solutions with " \sim DEPC" as the result	

Model: ~DEPC = f(ESR, DEL, EFS, DEE, DEXP) Algorithm: Quine-McCluskey							
- INTERMEDIATE SOLUTION frequency cutoff: 2 consistency cutoff: 0.803299							
	Raw coverage	Unique coverage	Consistency				
\sim DEL* \sim DEE	0.601386	0.071937	0.825339				
\sim ESR* \sim DEL* \sim EFS	0.483289	0.0163029	0.854749				
~DEL*~EFS*DEXP	0.372835	0.0121254	0.802413				
ESR*~EFS*~DEE*~DEXP	0.328714	0.00967979	0.82718				
\sim ESR*EFS* \sim DEE* \sim DEXP	0.329632	0.00927234	0.806734				
~ESR*~EFS*~DEE*DEXP	0.340636	0.0214997	0.854987				
solution coverage	0.744039						
solution consistency	0.763647						

The parsimonious and intermediate solutions with " \sim DEPC" as the result can be obtained through "standard analysis", as shown in Table 5 and Table 6.

Results

Configurations sufficient for high DEPC

There are 4 main configurations presented in Table 7, which consistently links to the presence of high DEPC. The overall consistency is 0.77, higher than 0.75; the consistency of each configuration is greater than 0.8, indicating that the level of consistency is qualified (Fiss, 2011; Schneider and Wagemann, 2012).

In configuration D1, EFS as a single core condition presents, the presence or absence of other conditions are irrelevant. The unique coverage of D1 reaches to 6.59%. Family support makes digital entrepreneurs more confident to deal with the challenged tasks and more optimistic about the future. Since the working environment of digital entrepreneurs is relatively closed and the social network is relatively simple, the care and understanding from family members will relieve the physical and the mental stresses for digital entrepreneurs. This result is consistent with the researches of Kwok *et al.* (2015) and Gao *et al.* (2021). Thus, in the cases of high family support, digital entrepreneurs easily obtain their required sources and cultivate high level of DEPC. We call this group of conditions the family-support path.

Configuration D2 indicates that ESR as a peripheral condition absents and DEE as a core condition presents can develop high DEPC. The unique coverage of this configuration reaches to 2.21%. When the digital entrepreneurial environment is good, the individual self-regulation is like a "magnifying glass", which magnifies the characteristics

Condition/Result			High DEPC		
	D1	D2	D3 D3a	D3b	D4
ESR		⊳	•		
DEL			•	•	
EFS	•				
DEE		•			•
DEXP				•	•
Consistency	0.801617	0.872381	0.885273	0.878332	0.880498
Raw coverage	0.822537	0.512226	0.606892	0.572429	0.576863
Unique coverage	0.0658517	0.0220936	0.0201628	0.00922334	0.00793648
Overall consistency	0.770487				
Overall coverage	0.925068				

Note: Full black circles denote the presence of conditions, and crossed open circles denote their absence; large circles denote core conditions; small circles denote peripheral conditions; and blank spaces denote conditions that are irrelevant to the outcome.

Table 8

Configurations sufficient for not-high DEPC

Condition/Result	dition/Result Not-high DEPC					
	ND1	ND2 ND2a	ND2b	ND3	ND4	ND5
ESR				•	♥	<
DEL	♦	♦	♥			
EFS		♥	♥	♦	•	♦
DEE	♦			♦	♦	♦
DEXP			•	♦	♦	•
Consistency	0.825339	0.854749	0.802413	0.82718	0.806734	0.854987
Raw coverage	0.601386	0.483289	0.372835	0.328714	0.329632	0.340636
Unique coverage	0.071937	0.0163029	0.0121254	0.00967979	0.00927234	0.0214997
Overall consistency	0.763647					
Overall coverage	0.744039					

Note: Full black circles denote the presence of conditions, and crossed open circles denote their absence; large circles denote core conditions; small circles denote peripheral conditions; and blank spaces denote conditions that are irrelevant to the outcome.

of individual regulatory focus. Since the resources in the environment are adequate and easy to obtain, the promoting regulatory focus will benefit entrepreneurs making more radical decisions. We refer to this mechanism as the environment-dominate path, with the absence of self-regulation conditions, digital entrepreneurs are easier to foster a high level of psychological capital in a good entrepreneurial environment.

The core condition of both D3a and D3b is DEL. In configuration D3a, ESR as a peripheral condition presents, with the unique coverage of 2%. Based on SREL model (Winkler and Fust, 2021), this configuration shows that digital entrepreneurs will consciously carry out entrepreneurial learning and maintain a high degree of self-discipline, thereby it helps entrepreneurs develop the learning strategies systematically. Digital entrepreneurship is usually closely connected with new technologies, configuration D3a reflects digital entrepreneurs to keep the active learning and accept the new technologies to adapt to the constantly updated digital environment, enhance their confidence and determination to deal with technological innovation, and accept new things, thus improving the level of DEPC. Compared with D3a, DEXP as a peripheral condition presents in configuration D3b. The unique coverage is up to 0.9%. This configuration illustrates that the entrepreneurs with experiences will be more confident in decision-making and calm down in case of difficulties compared to the inexperienced digital entrepreneurs, thus promoting their DEPC level. We call D3 the learning-promoted path, D3a the self-regulatedlearning path and D3b the experience-learning path.

In configuration D4, DEE as a core condition presents and DEXP as a peripheral condition presents. The unique coverage is only 0.7%. This result illustrates that when the digital entrepreneurial environment is good, digital entrepreneurs with entrepreneurial experience are more likely to obtain resources and the hope of entrepreneurial success compared to those inexperienced digital entrepreneurs. Thus, this group of conditions for high DEPC is called the accumulate-steadily path. In summary, these results support **H1**, **H2** and **H3**, not **H4**.

Configurations sufficient for not-high DEPC

The not-high DEPC configuration analysis is exhibited in Table 8. There are 5 main configurations consistently link to not-high DEPC, each configuration has two or more core conditions missing. The overall consistency is 0.76 and the consistency of each configuration is greater than 0.8, reached the standard (Fiss, 2011; Schneider and Wagemann, 2012).

Configuration ND1 shows that the improvement of DEPC is inhibited with the absence of DEL and DEE. The unique coverage value is 7%. The poor digital entrepreneurial environment leads to the lack of entrepreneurial resources, allowing entrepreneurs feeling hopeless. The lack of entrepreneurial learning makes it difficult for entrepreneurs to establish self-confidence. Entrepreneurs in the resource deficient environment cannot obtain the required knowledge through learning, resulting in the lack of resilience. This group of conditions for not-high DEPC is called the learning-environmentinsufficient path.

In configuration ND2, the configurations ND2a and ND2b are both lack of two core conditions: DEL and EFS. In configuration ND2a, ESR as a peripheral condition absents. The unique coverage value is 1.6%. For digital entrepreneurs, EFS is the core condition for maintaining the high DEPC. Without the family support, entrepreneurs will feel helpless. The lack of emotional communication will also affect the physical and mental health of entrepreneurs and they are more likely to be trapped in difficulties. The lack of the self-regulated-learning path will let them fail to complete the endogenous cycle of "setting goals-regulating behavior-self-reflection" and learn from it facing the negative events or emergencies. Moreover, digital entrepreneurs will also easily fall into pessimistic in emergencies. Compared with ND2a, DEXP as a peripheral condition presents in configuration ND2b, with the unique coverage of 1.2%. In this configuration, the process of transforming entrepreneurial experience into knowledge is hindered by the lack of SREL, restricting the formation of DEPC. Therefore, we called ND2 the family-learning-insufficient path, ND2a the familyself-regulated-learning-insufficient path and ND2b the family-experience learning-restrictive path.

In configuration ND3, ND4 and ND5, there are 3 core conditions are absence. In configuration ND3, EFS, DEE and DEXP as core conditions absent, and ESR as a peripheral condition presents. The unique coverage value is up to 0.97%. Based on the social cognitive theory, self-regulation helps entrepreneurs improve their sense of self-efficacy. Without the family emotional support, their psychological situation will be difficult to remain stable. Moreover, self-regulation is the individual characteristic of entrepreneurs, which often leads to the obstruction of regulation under the action of the external environment. Thus, when these three conditions are missing, the self-regulation effect is hindered and lead to not-high DEPC. This group of conditions is called the self-regulation-restrictive path. Configuration ND4 consists of EFS as a peripheral condition presents, and ESR, DEE and DEXP as core conditions absent. The unique coverage of ND4 is 0.93%. According to configuration D1, family support is a core conditions which resulting in high DEPC. However, without self-regulation condition, entrepreneurs tend to be emotional and the effectiveness of family emotional support will be reduced. Moreover, the lack of entrepreneurial environment makes it difficult for families to give social resources. When families give economic support to digital entrepreneurs who lack the entrepreneurial experiences, it is hard to improve entrepreneurs' self-confidence. Therefore, configuration ND4 is called the family-support-restrictive path. Configuration ND5 is composed of the presence of DEXP, and the absence of ESR, EFS and DEE. The interpretation of this configuration is the least, only

2.1%. The experiences can help entrepreneurs improve their sense of self-efficacy and the lack of self-regulation will reduce it. Without the family support, the entrepreneurial experience of digital entrepreneurs is difficult to produce a marked effect. So ND5 is called the entrepreneurial-experience-restrictive path.

Sensitivity analysis

In this study, 2 methods are used for the sensitivity analysis, namely, the improving the consistency level method and the adjusting the calibration point method.

Firstly, this study raised the consistency level of the truth table with "DGPC" and " \sim DGPC" as the results from 0.8 to 0.81 and recalculated them respectively. It can be found that the adjusted configuration number does not change. The overall consistency of high psychological capital is still 0.77 and the overall consistency of nonhigh psychological capital is still 0.76. The result of configuration is the same as that before the adjustment and there is no substantial change. It shows that the conclusion is robust (Schneider and Wagemann, 2012).

Secondly, the essence of adjusting the calibration point method is the application of the sensitivity analysis in qualitative analysis of fuzzy sets (Fiss, 2011). The method of adjusting calibration points is used to adjust the intersection points in the calibration points within the value range of + / - 25%. In this paper, the amplitude of + 5% and - 5% are selected respectively to adjust the intersection points of conditional variables for recalibration. After recalculation, it is found that only minor changes have taken place in relevant data, which has no impact on the composition and the overall interpretation of the configuration, showing that the conclusion is robust.

Discussion and conclusion

Prior studies mainly consider the net effect of entrepreneurial activities on PsyCap (Hasan *et al.*, 2019; Brandt *et al.*, 2011; Hmieleski *et al.*, 2015; Kwok *et al.*, 2015), neglecting the configurational effect of multiple factors. However, the formation of PsyCap is produced by the complex mechanism regarding the individual characteristics, behavior and environment (Hmieleski *et al.*, 2015; Basinska & Rozk-witalska, 2022). Besides, in the traditional regression research, some variables are proved to be related to PsyCap but cannot clarify the "causal" logical relationship. To fill these gaps, we develop an integrative framework based on the key psychological resources theory, which is composed of individual characteristics, behavior, internal and external environment as interdependent configurations.

The results of this work indicate that DEPC is mainly caused by the synergy of multi-factors. In this work, a variety of configurations constituting high DEPC and non-high DEPC are obtained by the method of fsQCA to explain the complexity of the interaction between conditions. The joint effects of multiple conditions play a more comprehensive understanding of DEPC and helps digital entrepreneurs promote DEPC. As the only single conditional core configuration D1 in the solutions, EFS is particularly a key to high DEPC. In the sufficient analysis for not-high DEPC, 5 solutions are the lack of core conditions of EFS. Configuration ND4 indicates that the effect of EFS is obstructed only when ESR, DEE and DEXP as the core conditions all absent. The features of digital entrepreneurship are high digital (Nambisan, 2017), high innovation (Tumbas et al., 2018) and high value (Farani et al., 2017), which requires digital entrepreneurs to continuously improve their knowledge through learning. Combined configuration D3a and ND2a, it illustrates that SREL and DEPC change in the same direction; configuration D3b and ND2b shows that DEXP cannot be directly transformed into experience learning and it is not a key factor for DEPC. Configurations D2 and D4 are both with DEE as the core condition present, and ND1, ND3, ND4 and ND5 are all as core condition absent. Configuration D2 and D4

cause the same results even if the peripheral conditions are different. Combined with the configurations related to DEE, the uncertainty of DEE has an impact on the psychological status of entrepreneurs. Overall, EFS, DEL and DEE are significant to high DEPC, and the configurational results are asymmetrical.

This study contributes to the literature in three ways. First, it contributes insight into PsyCap of Chinese digital entrepreneurs, and helps them consciously cultivate it by exploring interdependence of entrepreneurs' characteristics, behavior, family and environment. According to the relevant traits of Chinese digital markets, this conclusion can be popularized and applied in similar developing countries. Because PsyCap is state-like, it can be exploited through PCI (Luthans *et al.*, 2010). This study provides a new theoretical basis for PCI, so as to better help digital entrepreneurs intervene in PsyCap. At present, the digital technology of "Taobao Village²" has helped many digital entrepreneurs improve their communication abilities, enhance their entrepreneurial awareness, and improve their psychological states. Based on this, related digital technologies can be further developed to create the PIC modules for promoting DEPC, and make these modules popularize among the digital entrepreneurs.

Second, an integrative framework is proposed for analyzing the PsyCap of digital entrepreneurs. The previous studies mainly focus on the net-effect of causality between the relevant factors and PsyCap (Brandt et al., 2011; Hmieleski et al., 2015; Hasan et al., 2019), while this study combines the characteristics, behavior and internal and external environment of digital entrepreneurs into an analytical framework based on a configurational perspective. This framework is helpful for clarifying the causal complexity between the individual level and environment in the context of digital entrepreneurship. As The COVID-19 further aggravates the VUCA environment, physical entrepreneurships are also transforming to digital in order to win survival opportunities and get rid of business difficulties (e.g. Lin Qingxuan Biotechnology Co., Ltd, LQX). When facing crisis, LQX chose to improve organizational resilience and arouse employees' self-confidence in the process of digital transformation. In this work, the framework can guide entrepreneurs who want to make digital transformation and potential digital entrepreneurs how to hold their positive psychological states in digital entrepreneurship, so as to better complete digital transformation.

Third, this study contributes to the key psychological resources theory by expanding its application in situations of causal complexity. Although some studies have proved the logical relationship between ESR, DEL, EFS and DEE (Winkler & Fust, 2021; Dianne *et al.*, 2021; Sanders *et al.*, 2019; Bloemen-Bekx, 2019), there is little literature shows their joint effects on DEPC. Because it is difficult for a single factor to explain complex entrepreneurial and psychological phenomena, this study uses fsQCA method to expand the application of PsyCap in the field of digital entrepreneurship to analyze the complex relationship between multiple conditions and DEPC.

Besides, this paper gives three main recommendations for digital entrepreneurs to promote DEPC. First, digital entrepreneurs should seek support from family members actively, especially in developing countries. Because resources in developing countries are restricted, family support can help them better obtain entrepreneurial resources. This makes them more resilient when facing difficulties, so as to promote DEPC. Second, digital entrepreneurs should build self-regulated entrepreneurial learning capabilities or entrepreneurial experience learning capabilities. These two learning abilities can help digital entrepreneurs better adapt to VUCA environment, cultivate self-confidence and improve DEPC. Third, digital entrepreneurs should adjust promoting regulatory focus to a lower level or accumulate the experience of digital entrepreneurship in a good

² Taobao Village, refers to the villages where the number of active online stores under Alibaba Digital Enterprises has reached more than 10% of the local households and the annual e-commerce transaction has reached more than 10 million yuan.

entrepreneurial environment. Even when the resources are adequate, excessive self-regulation bring about overconfident, and leads to entrepreneurial failure. It is not beneficial for the formation of DEPC.

Nevertheless, there are two major limitations in this study that could be addressed in future research. First, the sample size still needs to be increased. In the process of data collection, the number of digital entrepreneurs that can be identified by manual is limited. Future research should try machine learning to identify digital entrepreneurs, so as to expand the sample size. Second, this study focuses on the quantitative research through fsOCA. Future studies can complement this study with case analysis, introducing qualitative comparative analysis to explore the PsyCap of digital entrepreneur more comprehensively. Due to space constraints, we will continue to conduct comparative analysis on the enterprise size, gender, educational level and entrepreneurial experience of digital entrepreneurs in the follow-up research, to throw new light on the differences between different factors.

Conflict of interest

We declare that we do not have any commercial or associative interest that represents a conflict of interest in connection with the work submitted.

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