

Why co-working spaces in an analogical environment exhibit different recovery abilities under the COVID-19 shock? Evidence from China



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ABSTRACT

Although co-working spaces have attracted significant attention as a type of platform organisation in the sharing economy, little is known about why some spaces faced with an analogical environment demonstrate obvious differences in recovery abilities after sudden shocks, such as the one caused by the COVID-19 pandemic. To understand this novel phenomenon, we collected data from the Chengdu high-tech zone and employed grounded theory and fuzzy set qualitative comparative analysis (fsQCA) to identify the possible causal configurations for high levels of resilience in small and medium-sized platform organisations. Our findings reveal that (1) there are five antecedent configurations that multi-morphologically lead to the same outcome; (2) compared with other antecedent conditions, networking ability and diverse value co-creation with customers play more important roles in the formation of a high level of co-working spaces' resilience; (3) under certain circumstances, a substitutional relationship exists between industrial experience and communication ability; and (4) when the endogenous factors of organisations (e.g. their abilities and resources) coincide with complex external environments, organisational resilience is expressed. In this manner, our study contributes to the organisational resilience literature and research on co-working spaces. Some practical suggestions for the sustainable development of co-working spaces are also provided.

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Introduction

Faced with a volatile, uncertain, complex, and ambiguous (VUCA) environment, scholars have paid more attention to organisational resilience, which highlights the ability to adapt to external disturbances and restore vitality after crises (Kunz & Sonnenholzner, 2023; Yuan et al., 2022). Current literature focuses on large-scale enterprises (Hillmann, 2021; Rodríguez-Sánchez et al., 2021), and several antecedent conditions that are important for organisational resilience, such as organising and adjusting, a feedback loop from prior experiences, organisational learning, available resources, and operational flexibility (Hillmann, 2021; Kahn et al., 2018; Williams et al., 2017). We observe that there has been relatively lesser research on the resilience of small and medium-sized enterprises (SMEs), especially small and medium-sized platform organisations, such as co-working spaces, which is a recent phenomenon.

As entrepreneurial platforms combining both online and offline sections, co-working spaces not only provide physical spaces for

users, but also create opportunities for participants, including the government, third-party service organisations, and start-ups, to cooperate (Clifton et al., 2022; Tiwasing, 2021). In China, co-working spaces have expanded significantly annually, growing on average by 90 % since 2015 (Iimedia, 2021). One Chinese co-working space brand, Ucommune, successfully listed its IPO on the NASDAQ in 2020. Recently, scholars conducted research pertaining to co-working spaces (Kojo & Nenonen, 2016; Shearmur, 2021). Some studies emphasise that co-working spaces offer shared office facilities and entrepreneurial services, and hold various activities to establish contacts with venture capital institutions, which promotes knowledge transfer as well as innovation activities (Chen et al., 2021; Wijngaarden et al., 2020). As a place of social interactions, a co-working space is regarded as a 'micro-cluster' for freelancers and start-ups to integrate resources, playing important roles in community construction and the development of local economy (Bergman & McMullen, 2021; Fiorentino, 2019).

However, the COVID-19 pandemic, has caused significant losses to SMEs. The regulatory measures taken by local governments differ according to the epidemic situation in their particular areas. While many co-working spaces have declared bankruptcy and are not immune to the challenges caused by this pandemic, some co-working

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spaces in analogous environments (e.g. similar natural surroundings, government regulations, supportive policies provided by the local government, economic development level, industrial competition, and entrepreneurial culture) appear to have handle the shock better. Therefore, the following questions arise: *What factors influence the resilience of small and medium-sized platform organisations like co-working spaces? Why do co-working spaces in a similar environment, even in the same region, exhibit different recovery abilities when experiencing tremendous shocks?*

Since there are relatively few studies on the resilience of small and medium-sized platform organisations, this study first employs grounded theory to identify antecedent conditions and then presents propositions. Subsequently, we utilise fuzzy set qualitative comparative analysis (fsQCA) to test the combined effects of the antecedent conditions. Our findings suggest that (1) for platforms with high degrees of cooperation with participants, the networking ability of their founders positively contributes to achieving resilience in co-working spaces; (2) for platforms with high degrees of cooperation with participants, their founders' communication abilities and adaptive agility positively contribute to building resilient co-working spaces; and (3) for platforms with non-high degrees of cooperation with participants, their founders' networking abilities and adaptive agility positively contribute to building resilient co-working spaces.

This study makes four theoretical contributions. First, it enriches the emerging literature on organisational resilience by specifying how the resilience of small and medium-sized platform organisations can be cultivated. Relevant studies on organisational resilience have so far primarily focused on large-scale enterprises (Iftikhar et al., 2021; Khurana et al., 2022; Linnenluecke, 2017; Yuan et al., 2022). Therefore, our findings, based on the platform context, offer new insights into organisational resilience. Second, by identifying several equivalent multidimensional paths, this study significantly expands the contributions of previous literature on the net effect of organisational resilience (Duchek, 2020; Tasic et al., 2019; Yang et al., 2022). Theoretically, this helps to unpack the underlying mechanism of resilience. Third, we redefine organisational resilience by integrating the perspectives of ability and process proposed in prior studies (Iftikhar et al., 2021; Kahn et al., 2018; Williams et al., 2017). Unlike other traits (e.g. dynamic capability and absorptive capacity), organisational resilience depends significantly on the triggers of the external environment, which by nature is uncertain. This provides new insights into the nature of organisational resilience. Fourth, unlike existing research (Shearmur, 2021; Tiwari, 2023; Wijngaarden et al., 2020), by concentrating on certain less visible factors affecting co-working spaces, rather than on the tangible resources (e.g. physical spaces and office equipment), this study contributes to co-working space research, identifying the underlying factors leading to their strong recovery abilities.

The remainder of this paper is organised as follows. Section 2 discusses the relevant literature and presents propositions based on the analysis results of grounded theory and previous studies. The research methodology is outlined in Section 3, and Section 4 reports the results. Section 5 presents the contributions of this study. The final section presents the conclusions and some suggestions for future research.

Theoretical foundation and possible configurations

Organisational resilience

Resilience is the ability of systems or individuals to recover from shocks and disturbance (Martin, 2012; Reggiani, 2013). This concept was initially applied to physics and then introduced to ecology by Holling (1973) in the 1960s. Researchers have different understandings of organisational resilience. For example, Shook et al. (2003) regard it as a type of organisational ability. They argue that this ability

reflects whether organisations can forecast, and adjust for potential factors that may influence core business profitability. Annarelli and Nonino (2016) proposed that resilience demonstrates an organisation's capability to deal with disruptions through the strategic awareness and operational management of shocks. Despite the lack of consensus on the definition of this term, most scholars agree to define and assess it from the perspective of a capability (Kahn et al., 2018; McDonald, 2017).

Organisational resilience emphasises an organisation's ability to resume its functions and develop in the face of uncertainty and emergency. Relevant studies on organisations' ability to resume critical functions focus on two themes: one, the capability to re-attain the original state, and two, the capability of surpassing that original state. The former focuses on limiting regression and protecting an organisation's basic functions (Sahebjamnia et al., 2018). The latter focuses on creating more opportunities for expansion (Rehak, 2020). Based on prior research (Kotsopoulos et al., 2022; Sahebjamnia et al., 2018; Yuan et al., 2022), this study considers organisational resilience as the ability of organisations to change their operational modes to better adapt to a new environment and maintain sustainable development when faced external shocks.

In recent years, the rise of the sharing economy has increased scholars' interest in the resilience of platform organisations (Khurana et al., 2022; Kotsopoulos et al., 2022; Yuan et al., 2022). For example, Yuan et al. (2022) conducted a case study exploring the resilience mechanism employed by platform-based ventures during the COVID-19 pandemic. This three-stage model includes anticipating changes, leveraging shared resources, and capitalising on 'winners-take-all' opportunities. Kotsopoulos et al. (2022) revealed that knowledge-intensive enterprises play a pivotal role in fostering resilience within platform ecosystems and influence the emotional reactions of system members such as feelings of worry, hope, and optimism about the future. In addition, several antecedent conditions that are important in the formation of resilience in large-scale enterprises are considered: organising and adjusting, responding to major disturbances, a feedback loop from prior experiences, organisational learning, available resources, relational networks, communication abilities, and operational flexibility (Do et al., 2022; Hillmann, 2021; Kahn et al., 2018; Williams et al., 2017).

Selection of antecedent conditions and related propositions

Presently, co-working spaces are new types of platform organisations, and there is a dearth of studies exploring the resilience of small and medium-sized platform organisations. As recommended by Park et al. (2020a), we first conduct a grounded theory analysis to provide qualitative insights into antecedent conditions.

In China, co-working spaces are scattered across numerous cities, among which Chengdu and several other cities with significant development potential stand out. The expansion of Chengdu's central area and supportive policies by the local government have enhanced the demand for comprehensive commercial and office services. According to the *Chengdu Co-working Space Industry Annual Report* (Chengdu Science & Technology Bureau, 2019), the number of average weekly visitors per store to Chengdu's Officezip space is three times that in Beijing, which is the city in China with the largest number of co-working space brands and office cubicles. Additionally, the average number of weekly activities hosted per space in Chengdu is approximately 30 % higher than that in Beijing. The data indicates active office and social activities in Chengdu. Compared to other regions in Chengdu, the high-tech zone has the largest number of co-working spaces (Chengdu Science & Technology Bureau, 2019). China's Ministry of Science and Technology included this high-tech zone in the first batch of national high-tech industrial development zones in 1991. Supportive policies from the central and local government, as well as the aggregation of multifarious resources (e.g. resources

from electronic information, air transportation, and biology industries) in this zone, attract numerous SMEs and entrepreneurial teams. Several co-working spaces are optimistic about the prospects offered by this zone and are eager to locate themselves here. By the end of 2019, there were more than 56 co-working spaces in the Chengdu high-tech zone (Chengdu Science & Technology Bureau, 2019).

At the end of January 2020, co-working spaces were forced to close, owing to the COVID-19 pandemic. As a result of quick preparation and extensive support from the local government and some financial institutions, over 18,000 employees of SMEs in the Chengdu high-tech zone were able to return to their offices in co-working spaces by 26 February 2020. By April of the same year, over 85 % of the co-working spaces' activities in this zone had recovered to their pre-pandemic level.

The regulatory measures taken by local governments differed according to the epidemic situation in their particular regions. In this study, we selected six representative co-working spaces located in Chengdu high-tech zone, which were recommended by the Chengdu Science and Technology Bureau, based on their resumption of work. Our data were collected throughout July 2020. During that period, we interviewed the co-founders or senior managers of the sample spaces, who were selected based on their knowledge of the co-working space. Each interview lasted for approximately one hour. The interviews were conducted in two stages. Stage 1 focused on Ucommune (Chengdu Intime), Officezip, and Work+, with questions on their recovery processes and the core factors of their resumption. Stage 2 focused on MyDreamPlus, Tectent Space, and Foun Town with the aim of further examining the aspects identified in Stage 1. In total, approximately 33 h (2.7 GB) of interview data were collected for our codification process, along with 42 pieces of relevant secondary materials from websites, WeChat public accounts, mobile phone applications, and newspapers.

NVivo11.0 software was used to analyse the collected data. Multiple members of our group, who collected the data, participated in the codification process, and translated the material into English. The definitions of the first, second, and aggregate themes were based on grounded theory data analysis. We developed a codification scheme independently and discussed our ideas to reach a consensus. The codification process ended when new categories and themes could not be abstracted. The initial codification yielded 132 categories, and subsequent recodification eliminated several similar categories. By identifying the relationships and patterns among the 36 first-order categories, 13 second-order themes were defined and further abstracted into five aggregate themes. The codification structure is shown in Fig. 1 and representative quotes are provided in Appendix A.

The antecedent conditions considered in this study, based on relevant literature and our qualitative analysis results, including industrial experience, communication ability, networking ability, adaptive agility, and diverse value co-creation with customers (Babu et al., 2020; Duchek, 2020; Iftikhar et al., 2021; Tasic et al., 2019).

Industrial experience

Industrial experience refers to entrepreneurs' relevant experience held before starting a business, which familiarities them with certain invisible rules and information existing within each industry (Hajizadeh & Zali, 2016). Organisational resilience appears to be closely connected to industrial experience (e.g. knowledge of former crises) (Borekci et al., 2021; Duchek, 2020). In emergencies, organisations need to decide and act quickly. Knowledge derived from industrial experience is important for developing multiple ideas, collecting information, and formulating suitable solutions (Goncalves et al., 2019). Therefore, industrial experience is an essential source of information for organisations. Scholars also highlight another reason why prior industrial experience is useful for improving the recovery capabilities of organisations: founders are influenced by their prior

experience and may take steps that are highly suited the external environment (Isensee et al., 2023). Bento et al. (2021) and Hillmann (2021) proposed that resilience could be developed and enhanced through time and experience. Researchers have also suggested that platform founders shape their ability to anticipate sustainable business opportunities by drawing on and learning from past experiences (Do et al., 2022; Isensee et al., 2023; Karunarathne & Gress, 2022). By leveraging previous experiences and the knowledge gained from them, organisations demonstrate the capacity to effectively navigate challenging situations. Thus, founders' industrial experience has a clear impact on the sustainable development of organisations.

Communication ability. Communication ability allows one to gain support by persuading others and conducting effective communication (Gesell et al., 2018). Dealing with the consequences of environmental shocks requires considerable interaction among multiple actors. These interactions may involve information transfers, resource exchanges, and cross-border collaborations. Through these interactions, effective communication is important to persuade others and, improve the likelihood of securing recognition and support. Audretsch and Belitski (2021) highlight the significance of adopting effective communication strategies with external partners, as this can mitigate the adverse impact of an uncertain environment and overcome resource constraints. Knowledge sharing through diverse communication channels between among partners and competitors enhances their ability to respond promptly to unforeseen changes (Rangel-Pérez et al., 2022). Communication fosters the development of shared meanings, attitudes, and opportunities to address specific needs, thereby influencing preparedness and recovery efforts (Karman, 2020; Yang et al., 2022). For example, a founder's ability to persuade investors to provide financial support after a crisis strengthens the organisation's position (Foroudi et al., 2020). Furthermore, in China, the government holds significant control over project approval and scarce resources. Organisations must obtain permission from the local government before they are allowed to resume work under the pandemic shock. As such, we consider this type of ability to be associated with organisational resilience.

Networking ability

Networking ability refers to the ability to identify the values, shape the structures, utilise the relationships, and guide the changes of networks (Vrontis et al., 2020). It is widely acknowledged that network members can provide feedback on diverse aspects, such as business ideas, task-related help, and assistance for sustainable issues (Radman et al., 2023; Rese et al., 2022). In particular, when the external environment is volatile, utilising network relationships is useful for organisations. Utilising such relationships to communicate and learn from other actors can improve the diverse abilities of organisations (Parker, 2010). Additionally, formal and informal relationships exist within networks. Developing and maintaining high-quality network relationships, characterised by mutual trust, usually involves a series of resource exchanges, which may enhance an organisation's crisis response abilities (Liu et al., 2020). Jia et al. (2020) assert that networks and resources accessible to firms through their connections contribute to the resilience of organisations. In the context of a disaster, established networks can facilitate co-learning between organisations and grant access to additional resources, thereby enhancing their capabilities to respond effectively (Karman, 2020; Khurana et al., 2022). The presence of a broad stakeholder network provides organisations with various resources, improves their learning activities, and maximises the benefits of resilience (Santoro, 2020). Indeed, organisational networks play a crucial role in supporting resilience by enabling resources utilizations, which ensures the continuity of operations even during challenging times (Kunz & Sonnenholzner, 2023).

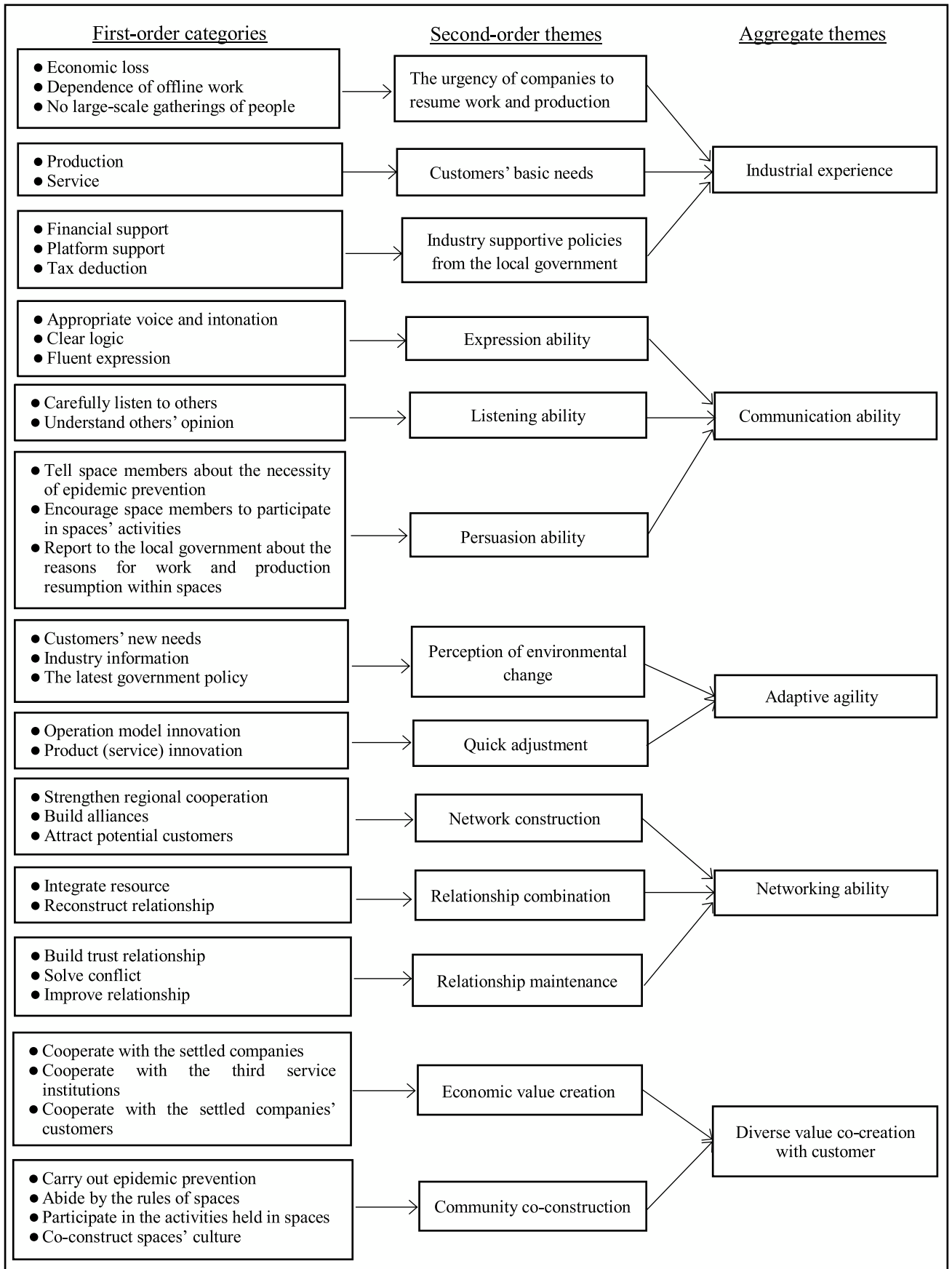


Fig. 1. Codification structure.

Adaptive agility

Adaptive agility refers to the set of abilities of business participants that allow them to anticipate developments in competition, perceive emerging opportunities, and take innovation risks (Bundy et al., 2017). As resilience requires adjustment and innovation, there is considerable consensus on the necessity of adaptive agility while facing external disturbances (Conz & Magnani, 2020).

The founders and managers of organisations usually act as leaders and are responsible for critical tasks, such as identifying business opportunities, conducting learning activities, and guiding innovation activities (Teece, 2014). Leaders of resilient organisations usually possess similar characteristics. Specifically, they can quickly formulate responses and, adaptively adjust and readjust to dynamic changes (Bundy et al., 2017). Furthermore, organisational resilience is demonstrated by an organisation's ability to evolve its business model to anticipate and capitalise on sustainability opportunities, enabling it to adapt to sudden shocks (Isensee et al., 2023). The COVID-19 pandemic impacted on organisations' activities, prompting some businesses to diversify their products or services and exhibit greater openness to innovation (Burgel et al., 2023). Resilient companies with strong innovation capabilities rely less on external networks to demonstrate their sustainability. Empirical data from researchers also indicate that resilient organisations implementing changes in response to COVID-19 not only adapt to challenges, but also flexibly reconfigure their resources (Hu et al., 2020). For example, leveraging digital platforms provides organisations with opportunities to explore new channels and effectively navigate challenging situations (Isensee et al., 2023). Thus, we consider that adaptive agility helps organisations achieve a high level of resilience.

Diverse value co-creation with customers

Co-creation is considered as a process wherein suppliers and customers conduct reciprocal exchanges (Frow & Payne, 2011). Researchers have found that sharing is the start of co-creation (Sala et al., 2023). After customers evaluate their experience and generate new value requirements, they share information and knowledge with firms that, in turn, have opportunities to create new value through organisational learning (Yu et al., 2021). Value co-creation promotes resource integration, which is a valuable strategy for addressing problems by pooling the resources of customers and suppliers, thereby enabling the diagnosis and reorganisation of problem-solving processes (Baier-Fuentes et al., 2023; Méndez-Suárez & Monfort, 2020).

Co-working spaces are widely recognised as vibrant and motivating environments that bring together professionals from diverse backgrounds and, foster knowledge sharing and co-creation (Tiwari, 2023). Platforms grant new forms of interaction and communication to firms, facilitate information flows, and provide immediate access to valuable external knowledge, such as insight and feedback from customers (Martin-Rojas et al., 2023). These communities and networks within platforms promote co-production, facilitating a deeper understanding of the connections between different organisations. In turbulent times, co-working spaces and organisations need to create value to increase their odds of survival. Diverse value co-creation with customers refers to co-working spaces that participate in the incubation of businesses with their customers, either through direct investment or assistance in obtaining support from local governments. The combination of promising entrepreneurial projects (provided by customers) and substantial support (provided by co-working spaces) can increase the probability of successfully incubating a business (Wright et al., 2022). This type of value co-creation provides co-working spaces and users with opportunities to continuously innovate and maintain sustainable development.

The combined effects of antecedent conditions

Previous research and the data collected from our interview also suggest the combined effects of conditions. During our interview, the

founder of ShenJing Space told us, 'Due to the cost constraints, we did not focus on providing new services. Frankly speaking, I did not possess the industrial experience and communication skills. However, we paid considerable attention to nurturing entrepreneurial projects with our customers, and we tried to use partner networks to support these entrepreneurial teams. Everyone helped each other so as to cope with the impact of the pandemic'. Indeed, value co-creation is important for both co-working spaces and entrepreneurial teams (Clifton et al., 2022; Tiwari, 2023). Network effects are also amplified as more participants join and contribute to platforms, resulting in benefits for all involved (Rese et al., 2022; Sala et al., 2023). Through the sharing of network resources, collaborative processes have been established to address challenges in turbulent environments. Additionally, Mr Huang, the founder of Ubespace, shared their survival strategy: 'In my opinion, although we lacked industrial experience and networking ability, we mainly depended on communicating with multiple participants, quickly meeting customers' needs, and fostering diverse relationships through co-creation activities. We actively communicated with stakeholders, such as the local government and investors, and obtained support from them at the beginning of the recovery phase. The nested relationships with our partners provided us with various resources and helped us nurture numerous start-ups'.

During our interview, the founders of some spaces also mentioned that they could survive the impact of COVID-19 owing to other abilities and resources, rather than relying on value co-creation. The founder of Miss Startup told us, 'Before setting up this co-working space, I have maintained cooperative relationships through industrial associations. Our space focused significantly on providing new services to customers. We quickly identified their new demands, and built cooperative relationships with live broadcasting room merchants by providing locations to film in. Through coordinating resources from our cooperative networks and continuously innovating our services, we were able to resume operation as early as April 2020'.

Based on the above, we present three propositions:

Proposition 1: For platforms with a high degree of cooperation with participants, the networking ability of their founders positively contributes to achieving the resilience of co-working spaces.

Proposition 2: For platforms with a high degree of cooperation with participants, founders' communication abilities and adaptive agility have positive effects on achieving the resilience of co-working spaces.

Proposition 3: For platforms with a non-high degree of cooperation with participants, founders' networking abilities and adaptive agility have positive effects on achieving the resilience of co-working spaces.

The conceptual framework is presented in Fig. 2.

Methodology

Social science research has increasingly employed qualitative comparative analysis (QCA), based on Boolean algebra and fuzzy set theory (Greckhamer et al., 2018; Virginia & Lorenzo, 2016). Given the complexity of real-life phenomena, results are usually the combinations of different conditions. QCA allows researchers to detect underlying causal conditions that may contribute to outcomes. As a subset of the QCA method, fsQCA is a more accurate and rigorous assessment than other subsets of QCA because it can use continuous and interval scale variables. This configurational approach captures both the diversity and heterogeneity of samples, enabling comparisons across cases. The FsQCA software (version 3.0) was used in our analysis, considering the two main indicators of coverage and consistency.

Sample and data collection

In this study, we selected 36 co-working spaces located in Chengdu high-tech zone. These spaces, with similar ownership, firm

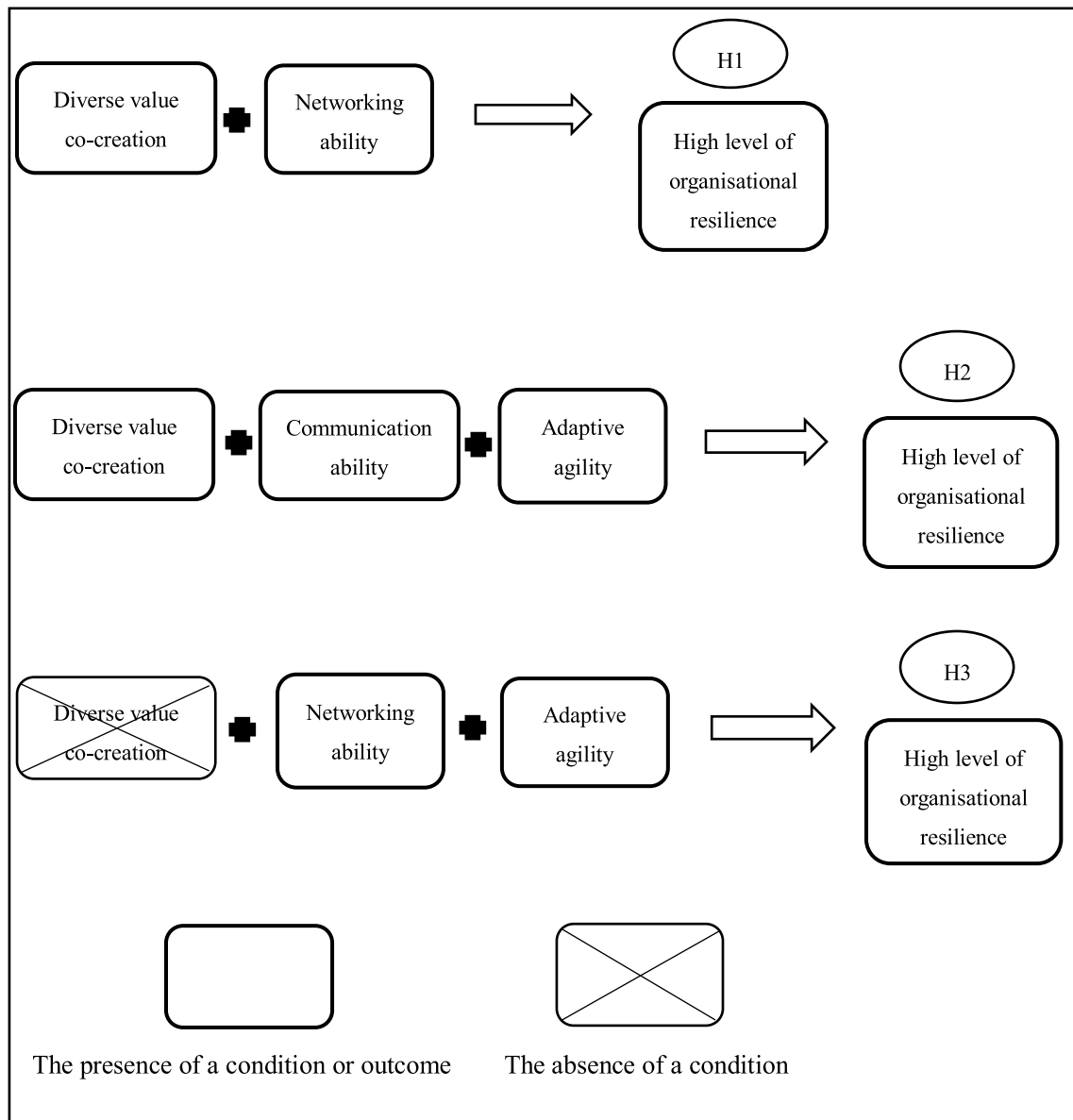


Fig. 2. Conceptual framework.

size, organisational structure, and experience in managing changes, were recommended by the Chengdu Science and Technology Bureau. More specifically, (1) all the sample spaces had similar areas (approximately 800–1000 m²s) and were private platform organisations without a state-owned background, surviving by their marketisation; (2) these spaces had operated for no more than eight years with similar organisational structures; (3) the local government provided a series of support policies since 2015, and the spaces were faced with a similar favoured external environment before the COVID-19.

Data collection was conducted in November 2020. During that period, we interviewed the co-founders or senior managers of the sample spaces who were selected based on their knowledge of the co-working space. Each interview lasted for approximately one and a half hours. The basic information of the selected co-working spaces and respondents is presented in Appendix B. Secondary data were collected from official websites, WeChat public accounts, mobile phone applications and newspapers. The use of multiple sources improves the overall understanding of recovery processes in co-working spaces. Approximately 53 h (4.6 GB) of interview data were collected, along with 84 pieces of relevant secondary materials.

Measurement

This study explored the causal configurations of five antecedent conditions related to organisational resilience. As shown in Table 1, the interviews required participants to assess five antecedent conditions and one outcome through 5-point Likert scales. Several follow-up questions asked the interviewees to expand their answers, allowing them to provide more information and generate a greater degree of flexibility in their responses.

Calibration

As per Ragin's suggestion, the data was calibrated into values ranging from 0 to 1 (Ragin, 2009). This process requires threshold values, including full membership, full non-membership, and maximum ambiguity. Based on previous studies (Kraus et al., 2018; Ragin, 2009), the value for full membership was set to five, the value for full non-membership was set to one and the crossover point was set to 3.

Table 1
Interview questions.

Conditions and outcome	Scales	Initial questions	Follow-up questions
Industrial experience (IE)	1: Very little 5: Very rich	Do you have any industrial experience? What industries did you work in before entering co-working space industry?	Could you please tell me more about the reasons for that? Why did you not choose other ratings?
Communication ability (CA)	1: Very weak 5: Very strong	How about your ability to persuade others to support your work resumption and reach a consensus after your communication?	Could you please give me some examples of this?
Networking ability (NA)	1: Very weak 5: Very strong	How about your ability to build and maintain networks with other participants, and utilize resources from these network relationships during the pandemic?	
Adaptive agility (AA)	1: Very weak 5: Very strong	How about your ability to anticipate industrial competition, perceive business opportunities, and conduct innovation on services or operational modes during the pandemic?	
Diverse value co-creation with customers (DV)	1: Totally disagree 5: Totally agree	Do you think the co-working space has multiple cooperation modes with space users? Could you please introduce the main methods of cooperation with customers to me?	
Organisational resilience (OR)	1: Very weak 5: Very strong	How about the ability of the co-working space to effectively cope with the COVID-19 pandemic? Could you please introduce the situation of this space during work resumption to me?	

Results

As recommended by Schneider and Wagemann (2010), we addressed the sufficient conditions by presenting a model: $OR=f(IE, CA, NA, AA, DV)$, with acronyms corresponding to industrial experience, communication ability, networking ability, adaptive agility, and diverse value co-creation with customers. The symbol (\sim) represents the absence of a condition or outcome.

Analysis of necessary conditions

When assessing the presence of necessary conditions, a consistency value of 0.90 or greater is recommended (Fiss, 2011). Necessary tests on each antecedent condition against organisational resilience showed that no condition surpassed the 0.90 consistency threshold (See Table 2). Therefore, no conditions were considered necessary for this study.

Analysis of sufficient conditions

Truth tables are important tools for analysing sufficient conditions. We produced a truth table based on the frequency and consistency criteria. In the QCA approach, frequency indicates the number of observed cases containing each combination of causal conditions. For small samples, the acceptable frequency cut-off is 1, and the recommended minimum acceptable consistency threshold is 0.75 (Kraus et al., 2018). Table 3 presents the causal configurations that lead to

organisational resilience. The solution coverage was 0.79, explaining 79 % of the sample cases with a high level of organisational resilience. The solution consistency was 0.91, surpassing the minimum acceptable consistency threshold proposed by Ragin (2006).

Solution 1 combines industrial experience, communication ability, networking ability, and diverse value co-creation with customers. Adaptive agility is a redundant condition in this solution. Founders of such co-working spaces usually possess a lot of industrial experience before setting them up, and they also have strong communication and networking abilities. These spaces maintain multiple cooperative relationships with the customers. The Uchen co-working space is a typical example of Solution 1. Prior to entering the co-working space industry, its founder created an enterprise in the gaming and software industry that accumulated various industrial resources. In 2018, Uchen was created, focusing on the incubation of businesses in the entertainment industry (e.g. comics, films, games, and derivatives). Based on its founder's industrial resources, this space sought to link upstream and downstream organisations and build multinational cooperation platforms, such as industrial alliances involving entertainment industry resources from China, Japan, and Korea. Meanwhile, Uchen paid close attention to value co-creation with customers and set up several funds for business incubations. Its industrial resources helped industry cooperation and it invested in some promising entrepreneurial teams, maintaining various relationships with its customers. At the time of work resumption in 2020, Uchen's founder believed that space users needed to resume work in physical spaces as soon as possible, based on his prior industrial experience that information transfer between companies through offline methods was much more reliable than that through online methods. The founder quickly allocated resources from the alliance networks and maintained cooperative relationships with customers. While preparing the resumption of work, Uchen communicated actively with the local government. This co-working space was the first to resume operation in the Chengdu high-tech zone, and it recovered to its original state as early as March 2020. As a typical case in Solution 2, the founder of Chaos Space lacked industrial experience, and was not good at persuading others. However, this space successfully conducted value co-creation activities, and the founder paid significant attention to establishing and maintaining good relationships with space participants. Value co-creation and networking abilities play pivotal roles in the development of platform resilience. Based on these typical cases, Proposition 1 is supported.

Table 2
Analysis of necessary conditions.

Outcome variable: high level of organisational resilience		
Conditions tested	Consistency	Coverage
IE	0.55	0.74
~IE	0.62	0.78
CA	0.65	0.88
~CA	0.54	0.68
NA	0.75	0.85
~NA	0.46	0.69
AA	0.73	0.81
~AA	0.44	0.70
DV	0.81	0.91
~DV	0.47	0.72

Table 3
Configurations for organisational resilience.

Conditions	Solutions				
	1	2	3	4	5
Industrial experience	●	⊗	⊗	●	⊗
Communication ability	●	⊗	●	⊗	●
Networking ability	●	●	⊗	●	●
Adaptive agility		⊗	●	●	●
Diverse value co-creation with customers	●	●	●	⊗	⊗
Raw coverage	0.26	0.26	0.25	0.24	0.18
Unique coverage	0.10	0.10	0.12	0.11	0.04
Consistency	0.95	0.95	0.95	0.90	1
Solution coverage	0.79				
Solution consistency	0.91				

Notes: ● = the presence of a core condition; ⊗ = the absence of a core condition; ● = the presence of a peripheral condition; ⊗ = the absence of a peripheral condition; blank space indicates “don’t care.”

Solution 3 does not require industrial experience, and the typical samples of this solution possess communication abilities and adaptive agility. They depend mainly on diverse value co-creation with customers to form platform resilience. The Executive Center, a comprehensive co-working space, is a representative case of Solution 3. The founders of the Executive Center did not have industrial experience and demonstrated weak networking abilities. However, they could effectively communicate with investors to obtain support and quickly find business opportunities during the pandemic by updating the online office system and integrating multiple functions, such as entrepreneurial lectures and cooperation negotiations. They focused on the nested relationships with space users, and nurtured numerous start-ups. Therefore, Proposition 2 is supported.

Solution 4 and 5 highlight the condition wherein space founders have strong networking abilities and adaptive agility, however, these spaces do not present diverse value co-creation with customers. Among the sample spaces, 3W Coffice (a case of Solution 4) is a professional co-working space that focuses on one industry, and the founder has significant industrial experience in the self-media industry. As a result of the COVID-19 pandemic, individuals minimised physical closeness, resulting in a vacancy of shared spaces and more time spent on online platforms. Many freelancers in the self-media industry (i.e. live broadcasting rooms and short videos) required a good physical environment to display their products. 3W Coffice was quick to identify this new demand and used its industrial resources to build cooperative relationships with live broadcasting room merchants by providing locations for filming. It also advertised novel products (physical spaces with nice decorations) through space users in the self-media industry, effectively utilising collaborative networks. By anticipating the possible steps taken by competitors and innovating its products (services), this space was able to quickly occupy vacant spaces and create new ways to gain profits, largely increasing the odds of surviving from the environmental shock. Compared to 3W Coffice, MyDreamPlus (a case of Solution 5) is a

comprehensive space involving multiple industries. Although its founder did not have industrial experience, he was skilled at communicating with stakeholders, such as the local government and investors, to obtain their support at the beginning of the recovery phase. Comparing these two solutions, we suggest that under certain circumstances (networking ability, adaptive agility, and ~diverse value co-creation with customers), a substitutional relationship exists between industrial experience and communication ability. Proposition 3 is supported based on the typical cases.

Another interesting phenomenon was observed during our interview process: while some co-working spaces had the ability to survive from the challenges presented by COVID-19, their managers were unsure whether they could cope with a wide variety of shocks. Ms Jiang, the founder of Cohesion space, told us, ‘We were so lucky because finally our co-working space resumed operation. Two years ago, we began to integrate resources with other members from the local co-working space consortium. This indeed helps us to obtain complementary resources and we even have opportunities to cooperate with some leading enterprises. This pandemic did affect our space’s offline operation. However, what we did not expect was that certain relationships established before COVID-19 supported us in 2020. Therefore, I think that many of the efforts we made in the past play an important role in our recovery process. But a VUCA environment usually presents us with varying degrees of shocks, we cannot predict each crisis. Different companies are vulnerable in different aspects, and it is impossible to always show strong recovery abilities when confronted with adverse events’. Based on the above, we suggest that organisations do not always possess resilience. Organisational resilience depends to a great extent on the scenarios experienced by organisations, which are subject to the influence of internal and external factors. From our point of view, organisational resilience, deeply embedded in recovery processes, enables organisations to use their abilities to interact with a complex environment in an adaptable manner, maintaining effective operations throughout.

Robustness test

As suggested by Skaaning (2011), we analysed the robustness of our results by changing the consistency cut-off thresholds. This test was repeated using a consistency threshold of 0.85. The results of the robustness analysis were consistent with those presented in Table 3.

Discussion

Theoretical implications

This study contributes to research on organisation resilience and co-working space. First, relevant research on organisational resilience is primarily dominated by studies on large-scale enterprises (Hillmann, 2021; Kahn et al., 2018; Rehak, 2020), with relatively few studies on SEMs, such as small and medium-sized platform organisations involving complex relationships among stakeholders (Khurana et al., 2022; Kotsopoulos et al., 2022; Linnenluecke, 2017; Yuan et al., 2022). In this study, we advance the theory of resilience by analyzing how organisation recovery abilities can be cultivated in the context of platforms - in response to calls made in prior research (Field et al., 2021; Floetgen et al., 2021; Sala et al., 2023). This study is conducive to a better understanding of organisational resilience in a novel context. The results of our analysis lay the foundation for further research on platform resilience, possibly encouraging more scholars to conduct in-depth research on this topic.

Second, although existing studies have indicated the antecedent conditions of organisational resilience through a qualitative approach, few studies have considered the combined effects of these conditions (Mcdonald, 2017; Shook et al., 2003). We contribute to the literature on organisational resilience by elucidating the configurations of different antecedent conditions. We build on the state of the research on the net effect of organisational resilience and combining qualitative and quantitative research methods to illustrate five causal configurations, making substantial contributions to prior research that, by and large, only examined the influence of individual factors (Bundy et al., 2017; Duchek, 2020; Tasic et al., 2019; Yang et al., 2022). This study opens the 'black box' of organisational resilience and paves the way for an improved understanding of its enablers. Through the analysis of typical co-working spaces, our findings suggest that (1) diverse value co-creation with customers creates both economic and non-economic value, facilitating the handling of crises, and (2) the networking ability of platform organisations accelerates the recovery of the system network, and this recovery process consists of two stages, namely network recovery and network reconfiguration. Additionally, we examined the neglected links between core conditions and recovery processes, enriching the findings of previous analyses (Do et al., 2022; Isensee et al., 2023; Yuan et al., 2022).

Third, there is currently no consensus on the definition of organisational resilience. Many scholars regard it from the perspective of ability and consider that it reflects an organisations' abilities to maintain sustainable operations under significant shocks (Bundy et al., 2017; Duchek, 2020; Iftikhar et al., 2021). Others have explored this from the perspective of process and stated that it is a dynamic process (Williams et al., 2017). We define organisational resilience by subtly combining these two perspectives. In other words, we reveal its nature and expand the contributions of previous researchers (Duchek, 2020; Iftikhar et al., 2021; Kahn et al., 2018; Karunarathne & Gress, 2022; Tasic et al., 2019; Williams et al., 2017). The results of our analysis indicate that organisational resilience triggered by the external environment is displayed while experiencing significant shocks and plays multiple roles in different adaptive stages.

Fourth, we explain why co-working spaces demonstrate different survival capabilities, particularly useful given the various invisible factors affecting organisations, offering theoretical and empirical foundations for future research. We find that much of the existing

literature has focused on indicating the tangible aspects (e.g. spatial functions, design style, fixed assets) that impact the performance and competitive advantages of co-working spaces (Bergman & McMullen, 2021; Bouncken et al., 2020; Kojo & Nenonen, 2016; Shearmur, 2021; Tiwari, 2023), and the invisible elements of the surviving spaces have not yet been addressed in the literature. This study extends the knowledge on how co-working spaces can survive under unfavourable conditions by concentrating on invisible factors, such as prior experience, key abilities, and value co-creation. In China, under the government's 'mass entrepreneurship and innovation' strategy, co-working spaces have been expanding significantly. However, the phenomenon of homogenisation is evident. Many shared spaces with similar tangible resources and services are copycats that merely imitate competitors' discernible features. There are clear differences in the survival abilities of co-working spaces when faced with similar external environments (e.g. similar natural surroundings, government regulations, supportive policies, economic development levels, industrial competition, and entrepreneurial culture). The shock resulting from the COVID-19 pandemic has also led to a thinning of copycat spaces that have not properly developed their strengths. Our research investigates two categories of cases: the presence and absence of industrial experience. It was shown that most pathways containing the presence of industrial experience pertain to professional spaces focusing on a certain industry, whereas pathways containing a lack of industrial experience involve more comprehensive spaces related to various industries.

Managerial implications

This study also provides important insights for practitioners to act in response to external shocks. The paths can be divided into two types according to whether the platform founders have sufficient industrial experience. When managers or founders lack related industrial experience, communication ability, and adaptive agility, it is recommended that they first consider how to diversify their value co-creation methods with customers. By sharing entrepreneurial elements, such as entrepreneurial projects, formal and informal relationships, and financial support, multifarious resources are effectively gathered, and spaces can profit from entrepreneurial projects. Exploring multiple approaches to value co-creation may reduce the possibility of bankruptcy. If managers or founders lack related industrial experience, but possess communication abilities and adaptive agility, they should consider improving their networking abilities or diversifying their methods of value co-creation. Joining industry alliances may be a good choice for managers, as they help increase heterogeneous resources from various channels.

If managers or founders possess related industrial experience and networking abilities, we suggest two ways to accelerate the development of organisational resilience: (1) they can try to improve their communication abilities and diversify the methods of value co-creation with their customers, and (2) they may improve their adaptive abilities. Platform founders choose to participate in training courses or learn from successful entrepreneurs to develop communication skills. When external disturbances, such as the COVID-19 pandemic occur, customer demand usually changes temporarily and new business opportunities emerge. Co-working spaces should innovate their services to increase customer loyalty and attract potential customers. Spaces can engage in cross-border cooperation with enterprises from other industries and consider new services, such as online lectures and seminars.

Conclusions

Employing the fsQCA approach, this study explored the configurations leading to the resilience of small and medium-sized platform organisations. We expand the knowledge of organisational resilience

and analyses a number of underlying factors influencing the survival of co-working spaces at the time of crises. Organisations today need to pay a great deal of attention to the development of organisational resilience. Successful navigation in such a complicated environment requires multiple well-developed abilities and skills.

The limitations of this study should be addressed in further research. First, our study considered co-working spaces in the Chengdu high-tech zone, and it remains to be confirmed whether the results also apply to other regions. Researchers can expand the sample size to include more cases from other industries and compare their results with ours. Second, based on prior studies and our observations of co-working spaces, we identified five antecedent conditions. Although the results of this study are insightful, more antecedent conditions should be considered when studying other types of platform organisations. A vibrant stream of research elaborating on the resilience of platform organisations will contribute to their sustainability. In addition, co-working spaces did not appear in China until recently. Studying spaces that have operated for a longer period of time may provide new directions for future research.

Declaration of competing interest

The authors have no relevant financial or non-financial interests to disclose.

Appendix A. Representative quotes

Theme	Representative quotes
Industrial experience	'(...) In the game industry, considering the security of information transmission, related employees need face-to-face communication through offline method. Therefore, many companies in this industry are looking forward to returning to our co-working space'. (A senior manager of Officezip)
Communication ability	'We quickly established daily communication with the regional health bureau. We dynamically monitored and reported whether people in our space had suspected conditions. (...) Since we meet the conditions of work resumption required by the local government and actively communicated with them, we could resume work and production as soon as possible'. (A senior manager of Ucommune) 'In the process of communicating with space members, I was able to express my thoughts clearly (...)'. (A co-founder of MyDreamPlus)
Networking ability	'(...) It is inevitable that there are some different opinions in our cooperation. (...) When we encounter these problems, we usually take the initiative to exchange opinions with our partners and handle the conflicts between us'. (A senior manager of Officezip) 'To our knowledge, two companies have established contacts through Chengdu-Chongqing regional entrepreneur activities. (...) At present, they have established new business relationships. (...) They will jointly explore the intelligent medical products in the future'. (A co-founder of Work+)
Adaptive agility	'(...) Our space has offered a variety of solutions for live broadcast teams at different development stages. (...) We subtly combine both office places and video shooting venues. (...) This can be a good solution to the temporary idle space problem, while creating video shooting venues'. (A senior manager of Tecent Space)
Diverse value co-creation with customers	'Now, many companies only rent spaces for their workplaces. Under the shock of the COVID-19 pandemic, they realized the importance of resource integration and tried to cooperate with space operators and other space members. (...) There is a company that cooperates with our space to develop anti-epidemic robots. The company provides novel ideas, and our space provides industry resources in the field of artificial intelligence. (...) The resource sharing and cooperation mode obviously increase the probability of successfully incubating entrepreneurial projects'. (A senior manager of Foun Town) '(...) These settled companies actively participate in space cultural construction. They often share their previous experience regarding product innovation. (...) In my opinion, this can encourage more companies to innovate and provide substantial support for the sustainable development of our space after work resumption'. (A senior manager of Officezip)
The combined effects of antecedent conditions	'(...) Although we lacked industrial experience and networking ability, we mainly depended on actively communicating with multiple participants, quickly meeting customers' needs and fostering diversifies relationships through co-creation activities'. (A co-founder of Ubespace) 'Considering the cost constraints, we did not focus on providing new services. To speak frankly, I did not possess the industrial experience and communication skills. However, we paid considerable attention to nurturing entrepreneurial projects with our customers, and sometimes we used partner networks to support these entrepreneurial teams'. (A co-founder of ShenJing Space)

CRedit authorship contribution statement

Wanyue Wei: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing. **Zheng He:** Conceptualization, Project administration, Resources, Writing – original draft, Writing – review & editing. **Guangming Xiang:** Investigation, Methodology, Validation, Writing – review & editing.

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Appendix B. Basic information of the co-working spaces and interviewees

Co-working space	Year of establishment	Informant	Time per interview (hours and minutes)	Ownership	Space area (Square meters, m ²)
NEXT Entrepreneurial Space	2017	1 co-founder	01:20	private	1000 m ²
Officezip	2015	1 senior manager	01:25	private	850 m ²
MyDreamPlus	2016	1 co-founder	01:32	private	955 m ²
Uchen	2018	1 co-founder	01:27	private	900 m ²
Rongchuang Teahouse	2016	1 senior manager	01:30	private	1000 m ²
Hi-coffee	2016	1 co-founder	01:34	private	845 m ²
Makers Family	2015	1 co-founder	01:41	private	916 m ²
Tecent Space	2017	1 senior manager	01:35	private	1000 m ²
Bauhinia Valley	2018	1 co-founder	01:43	private	868 m ²
Shenjing Space	2017	1 co-founder	01:26	private	960 m ²
UJujia	2015	1 co-founder	01:45	private	853 m ²
Maker Street	2016	1 co-founder	01:33	private	970 m ²
ChuangFuGang	2016	1 senior manager	01:38	private	910 m ²
Cohesion	2018	1 co-founder	01:24	private	1000 m ²
PitStop	2017	1 senior manager	01:41	private	980 m ²
C Space	2018	1 co-founder	01:10	private	1000 m ²
FireFly	2016	1 co-founder	01:17	private	880 m ²
Ucommune (Chengdu Intime)	2017	1 senior manager	01:22	private	970 m ²
Foun Town	2015	1 senior manager	01:25	private	935 m ²
UESTC National Science Park	2016	1 co-founder	01:33	private	1000 m ²
The Executive Center	2019	1 co-founder	01:15	private	865 m ²
3RD Sharing Life Style Space	2017	1 co-founder	01:28	private	922 m ²
Miss Startup	2016	1 co-founder	01:36	private	937 m ²
Work+	2015	1 co-founder	01:19	private	826 m ²
3 W Coffee	2016	1 co-founder	01:35	private	955 m ²
United Innovation Services	2015	1 co-founder	01:13	private	960 m ²
Chaos Space	2017	1 co-founder	01:16	private	840 m ²
Ubespace	2015	1 co-founder	01:22	private	986 m ²
Galaxy Incubator	2016	1 senior manager	01:33	private	875 m ²
Entrepreneurial College	2017	1 senior manager	01:36	private	893 m ²
Medinformation Dark Horse Camp	2016	1 senior manager	01:18	private	1000 m ²
Fintech Dreamworks	2016	1 co-founder	01:29	private	885 m ²
Huashengbai Hatch Market	2015	1 senior manager	01:25	private	930 m ²
Reson Laboratory	2016	1 senior manager	01:35	private	1000 m ²
Medlinker Space	2016	1 co-founder	01:43	private	950 m ²
Jinke Wisdom Factory	2017	1 co-founder	01:13	private	825 m ²

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