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Coworking and Sustainable Business Model Innovation in Young Firms

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Abstract: In larger cities, we see a rising trend of more people working outside their traditional offices, and engaging in a practice called co-working by sharing office space. The public policy makers of innovation-driven economies, on the other hand, have been availing co-working spaces and related support to promote innovation and entrepreneurship. Despite the growing significance of this area, there has been limited research on the link between coworking and innovation among young firms. This research examines the relationship between coworking space and innovation, particularly business model innovation (BMI) for sustainable performance. Based on an empirical study of 258 young tenant firms operating in 13 coworking spaces in Singapore, we establish that the space creativity of coworking spaces is positively related to the BMI outcome of tenant firms. Tenant firms' opportunity recognition and exploitation (ORE) process positively mediates the relationship between the space creativity of coworking spaces and the BMI outcome of tenant firms. While the social climate of the coworking space is found to have no direct effect on the BMI outcome of tenant firms, tenant firms' ORE process positively mediates the relationship between the social climate of coworking spaces and the sustainable BMI outcome of tenant firms.

Keywords: coworking space; creativity; social climate; sustainable business model innovation; opportunity recognition and evaluation

1. Introduction

Since the global financial crisis of 2008, a new economic order has been taking shape and is characterized by low-level growth equilibrium, affecting the business climate that firms operate in. This has brought about not only fundamental changes in the governance and structure of many organizations, but also significant shifts in the policies of many governments in the 21st century. A phenomenon that has emerged, particularly in innovation-driven economies, is the rising popularity of coworking spaces and their increasing association with innovation and inclusive growth. We observe that the new economic conditions contribute to the growing significance of coworking and innovation in several ways.

First, the reduction in foreign direct investment and capital flows between countries after the 2008 crisis has increased the cost of capital for the business community. This has precipitated the expansion of the role of governments in finding alternative engines of economic growth, such as innovation and entrepreneurship [1]. We have seen the introduction of new public policies that encourage coworking as low-cost alternatives to office spaces in support of the formation of new ventures and the sustenance of existing businesses. The deliberate co-location of coworking spaces with key innovation ecosystem stakeholders such as public research institutes and institutes of higher learning

underscores the importance the governments have accorded to their roles in fuelling innovation-driven economic development.

Second, the decline in trade in goods and services in the new economic conditions would spell increasing burden of regulation and taxation [2]. The increasing rigidity of labour markets in response to populist opposition in many countries have led to a shortfall in the global supply of engineers and technical professionals [3]. As firms find it more challenging to deploy fund and shift activities across borders in the traditional way, they look towards coworking as alternative channels to acquire resources such as space, professional talent, and value chain partners [1].

Third, in the face of economic volatility pursuant to the worldwide financial crisis, companies have become more wary of making investment in capital assets such as land, buildings and equipment. As these capital assets take a longer time than current assets to recover the cash investment used to acquire the assets, the investing firms are exposed to monetary policy risks (e.g., interest rate and exchange rate changes) that may devalue their assets. To minimize such risks, firms prefer to rent coworking spaces that come with a range of facilities and services to support their operations, an expense that can recorded immediately for computation of their net profits [4].

Fourth, before the crisis, multi-national enterprises (MNEs) were welcome as benefactors that could provide opportunities for the local communities to get employment and upgrade skills. However, after the crisis, the political sentiments have shifted to support local businesses and community. To respond to this change, MNEs take their cue from the local communities for their stakeholder engagement strategy. MNEs begin to tie up with coworking space operators to gain visibility in supporting local innovation and startup ecosystem stakeholders. For example, Procter and Gamble and JP Morgan have collaborated with coworking space operator, Impact Hub Singapore, to introduce innovation and impact laboratory programs to grow the local startup landscape [5]. Other MNEs such as L'Oréal have partnered coworking space operator, Block71 Singapore, to launch startup challenge to invite collaboration with early-stage startups and small enterprises in the Asia Pacific region [6].

All these developments emphasize the increasing significance of coworking space and innovation in new economic conditions, especially for innovation-driven economies that are characterized by intense rivalry among firms in wages as well as the development of new products, production processes and business models [7]. However, there is limited research on the link between coworking and innovation. Is this just about locating firms in the coworking space where they will flourish automatically? Are there specific characteristics about the coworking space that encourage certain types of innovation among tenant firms? Do tenant firms need to have certain processes in place to optimize their innovation outcome for sustainable performance at the coworking space?

The purpose of our study is to examine and explain the relationship between coworking space and innovation, particularly business model innovation (BMI) in innovation-driven economies. We also examine the key process that enables tenant firms to enhance and sustain their BMI outcome at the coworking space.

Empirically, we conducted a survey on 258 tenant firms operating in 13 coworking spaces in 2016. Our analysis of the survey results establish that the space creativity of coworking spaces is positively related to the BMI outcome of tenant firms. Tenant firms' opportunity recognition and exploitation (ORE) process positively mediates the relationship between the space creativity of coworking spaces and the BMI outcome of tenant firms. While the social climate of the coworking space is found to have no direct effect on the BMI outcome of tenant firms, tenant firms' ORE process positively mediates the relationship between the social climate of coworking spaces, and the sustainable BMI outcome of tenant firms.

Our findings contribute to the management literature in several ways. First, our research has shed light on an emerging topic in the study of firm-level innovation, namely BMI by demonstrating that the coworking space creativity can have important effects on the BMI of tenant firms. Prior research tends to examine the activities and outcome of BMI in general, rather than investigating the antecedents of BMI in the context of firms located in coworking spaces. Second, our empirical study

of 258 tenant firms across 13 coworking space operators will extend and add generalizability to the extant coworking studies. Extant studies have largely focused on conceptual models and qualitative studies of the coworking spaces, rather than quantitative research of their tenant firms. Third, we complement current research on entrepreneurship by considering the tenant firms' ORE process within the coworking space under the conditions of the new economic conditions that are characterized by volatility, uncertainty, complexity and ambiguity, rather than in a general environment.

2. Background and Hypotheses

The conceptual framework in this paper uses as a starting point Assenza's [8] proposed model for empirical measurement of the interaction between spatial dimensions and economic value creation. Drawing on Assenza's theoretical propositions, we develop and test hypotheses examining whether the innovation outcome of firms is influenced by coworking space characteristics. Innovation is a well-established antecedent for firm's economic performance in the literature [9]. An original contribution of this paper is the focus on an emerging topic in the study of firm-level innovation, namely BMI. The empirical literature, although sparse, shows that business model design and innovation have an impact on firm performance [10,11].

2.1. Business Model Innovation

The concept of the business model (BM) has only recently received growing scholastic attention although business models have been an integral part of economic behavior even in ancient civilizations, as noted by Teece [12]. In their wide-ranging review of the management literature, Zott, Amit, and Massa [13] linked the growth in BM studies to the broad diffusion information and communications technology, especially the Internet. These technological advances transformed how businesses use and share information, leading the way to more experimentation with BMs and the way that business activities are organized and structured [14].

There are multiple conceptualizations of the BM as pointed out by Zott et al. [13] and Massa and Tucci [15]. However, by synthesizing the commonalities across multiple views, a broad definition is derived: a BM is a systemic understanding of how an organization orchestrates its activities for the purpose of value creation. A BM is not just what the firm does, but how it does it. A more in-depth definition provided by Amit and Zott [14] (p. 511) describes the business model as 'the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities'. In studies of BMs and firm strategy, the perspective is widened to encompass the firm's exchanges with external parties, in service of delivering customer-focused value [16,17].

There is general consensus in the literature that innovation and the BM are related concepts. One strand of the literature views the BM as a vehicle for firms to commercialize innovative ideas. By designing and implementing appropriate BMs, firms can better translate technology into value creation [17–19]. Technology and innovative ideas in and of themselves have no economic value. The BM is the mediating mechanism that connects technologies and ideas to the market.

A second complementary strand of the literature posits that the BM represents a new dimension of innovation [15]. In this view, firms consider the BM itself as a subject of innovation [20]. The term BMI emerged from this school of thought and is gaining increasing prominence. The BMI concept argues that a firm can compete through its novel business model [21] and that the business model can be part of a firm's intellectual property [22]. In fact, Chesbrough [23] suggested that BMI may be more important strategically than other forms of innovation, as having a better business model than competitors is more advantageous than possessing a better idea or technology.

Researchers have developed different approaches to examining the BMI phenomenon, reflecting the multi-dimensionality of the concept. Massa and Tucci [15] propose that BMI may refer to (1) business model design (BMD), which is the entrepreneurial activity of creating a business model in a new firm, or (2) business model reconfiguration (BMR), which is the process of changing an existing business model. Zott and Amit [24] view the BM as a system of boundary-spanning interdependent activities

and suggest that BMI can be achieved by (1) adding new activities, (2) linking activities in novel ways, and (3) changing which party performs the activity. Giesen, Berman, Bell and Blitz [25] adopt a more outcome-driven perspective, classifying BMI into three groups: (1) industry model innovation, which consists of innovating the industry value chain by moving into new industries, redefining industries or creating new industries, (2) revenue model innovation, which innovates the way that revenues are generated, and (3) enterprise model innovation, which changes the role the firm plays in its value chain.

In this paper, we examine the outcome of BMI in firms. We adapt from the three categories of BMI proposed by Giesen et al. [25] to derive three groups of outcome, namely (1) new or expanded markets, (2) new sources of revenues and profit, and (3) improved efficiency and productivity.

Several studies have established that BMI is key to firm performance [25–27]. This justifies the focus on BMI outcome as the dependent variable in our conceptual framework. Research on antecedents of BMI has identified the importance of leadership and management agenda [28] and configuration of resources [29]. Cheah, Ho and Li [30] have demonstrated that the positive mediating role of BMI in the relationship between industry turbulence and firms' sustainable competitive advantage in the retail and hospitality industries. Significantly, no prior studies have examined BMI in the context of firms located in coworking spaces, nor of the role of space design in fostering BMI in firms.

2.2. Coworking Space Characteristics

Coworking spaces are designed to be extremely open and inclusive. The space is shared by people from all walks of life with different backgrounds and fulfilling distinct economic roles: entrepreneurs, freelancers, artists, researchers, students, and so on. Flexibility is inherent to coworking spaces as tenants can rent a table in an open space for any desired period. Many coworking spaces feature movable dividers and desks that allow for reconfiguration of work areas to adapt to developing businesses as well as community activities such as physical or online conferences [31].

The modern coworking space has evolved beyond its beginnings as a "desk share" space providing independent contractors with professional settings to work and meet customers. It draws inspiration from open sources, human interaction and professional training. The principles of co-location, collaboration and shared resources explain the economic rationale for firms to choose coworking spaces [32,33]. However, the physical design of the space itself and the community in the space are often highlighted by coworking space operators as important factors [34]. Open areas, modern furnishings, bright colors, architectural lighting, access to amenities such as coffee and tea, games and videos are all common [8]. Tenants also seek a sense of community from the space [35], to make connections, foster collaboration, and share knowledge.

The characteristics of coworking space are based on important values of openness, interaction, sharing and participation [31]. We will introduce two aspects of space characteristics, which we postulate to impact on the BMI outcome of firms in coworking spaces.

2.2.1. Space Creativity

Previous studies have inferred that the design of a work place, including architecture and layout, can inspire and motivate people to be creative [36]. In the framework of coworking space, we focus on the physical aspect of space creativity, which can affect an enterprise's performance through space structuring [37].

Many organizations are now paying attention to the design of the physical environment to raise their levels of innovation [38]. The work areas in most coworking spaces are designed to stimulate creativity, modelled after the offices in high-tech corporations such as Apple and Google [8]. These design elements are intended to interact with the cognitive and social functioning of tenants to generate novel ideas and foster collaborative connections. The structural configuration of a space in terms of architecture, decoration and layout influences the behavior of occupants [39]. Kristensen [40] and Magadley and Birdi [41] found that the design and configuration of physical space influenced the creativity and idea generating process of individuals. Spaces designed to encourage creative thinking,

such as innovation labs and brainstorming rooms, would eliminate elements of the traditional office environment such as rectangular rooms and tables [42]. Coworking spaces have borrowed these ideas and typically feature multiple working rooms, round tables, exhibition spaces, refreshment areas, and creative cues such as pictures or irregular geometric shapes.

A conducive physical design also allows tenants to easily and effectively exchange existing knowledge. The overall "openness" of the coworking space layout creates potential opportunities for interacting in a spatial environment. In addition, the space visibility has been found to promote both team communication and interaction [43]. By facilitating tenants' participation in community activities and personal interaction opportunities, the spatial space design can afford unplanned interaction that allows for creative "collisions" that can increase the transfer of ideas [8,44,45]. Space creativity in coworking space is also important to provide a basis for value creation. The space is designed not only as physical space, but also as a lived social context and as a conceptual space, within which production or individualized personal practice occurs [8]. The physical proximity in the coworking space also provides additional space for informal communication and resource acquisition [37,43].

The physical design of a coworking space is intended to anticipate the needs of the participants, providing a work environment where multiple creative and ultimately productive activities are encouraged. Spatial design should attract entrepreneurs and other participants who feel comfortable enough to interact with the space [8]. Space creativity stimulates the cognitive process of tenants to actively seek new knowledge and materialize new ideas and concepts [40]. Additionally, space creativity encourages informal knowledge exchange in the coworking space. By effectively acquiring internal and external information from noncompetitive, complementary tenants within the community, innovative ideas are more likely to emerge. Therefore, we propose the following hypothesis:

Hypothesis 1 (H1a). *Space creativity of coworking spaces is positively related to sustainable business model innovation outcome of tenant firms.*

2.2.2. Social Climate

Several previous studies have produced results that support the relationship between social climate and innovative outcome. Innovation often occurs in the cyclic and iterative process which is established and maintained in collaborative environment through social interaction [46]. Thus, innovation is considered a social process in which social interaction provides a variety of input and improvement [47].

To some extent, the coworking space arrangement brings socialization back into the workplace. A coworking space can be seen as a work community that can be instrumental to enrich networks [48]. Coworkers are attempting to work in flexible ways, seeking workplaces that are used by other creative self-employed people who understand the value of forming networks and the power that derives from collaboration [48,49]. In the coworking space, entrepreneurs can share their experience in a harmonious social environment of like-minded individuals [31]. The formation of networks and collaborations is enhanced by a favorable social climate.

An essential purpose of coworking is the community that is constructed by physical co-location and as such, relationships within the community are less confounded by external motivations roles, and structures [35]. A community is a mode of relating [50]. According to McMillan and Chavis [51] the sense of community is characterized by four basic properties: membership, influence, integration and emotional support. This view of community underlines our conceptualization of social climate, which emphasizes interpersonal relationships [52] and trust [53]. Coworking can be seen as trust-based community-oriented environments which stimulate encounters and collaborations inside [54]. Trust supports learning and continuous improvement innovation development, and encourages greater information sharing and improved coordination between partners [55].

A favorable social climate fundamentally contributes to the well-being of tenant firms by reducing or eliminating workplace frictions. Psychological security confers a common understanding that

coworkers can safely take risks, express opinions, share knowledge and try new ideas [56,57]. When there is overlapping knowledge and opportunities for spillovers, a positive social atmosphere and sense of trust enhance the capabilities of coworkers to adopt others' views and ideas [58].

The coworking space is a convergence of creators and innovators. It is believed that this concentration of creative types will shift the interpretation of a task towards a cognitive frame that desires creativity over routine performance, and may motivate creative actions [59,60]. Previous studies established that creative emulation is linked to an increase in creative potential [61]. Creative emulation among coworkers is facilitated by a positive social climate as there are less relational tension and struggle between proponents of established versus novel approaches.

Thus, we find the theoretical evidence supports a hypothesis that a positive social climate will positively influence the sustainable BMI outcome of firms in coworking spaces. We propose the following hypothesis:

Hypothesis 2 (H2a). *Social climate in coworking spaces is positively related to sustainable business model innovation outcome of tenant firms.*

2.3. Opportunity Recognition and Exploitation

The process of identifying and developing opportunity process is a key part of entrepreneurship [62] and innovation strategy of established firms [63]. Timmons argues that an opportunity "has the qualities of being attractive, durable, and timely and is anchored in a product or service which creates or adds value for its buyer or end user" [64] (p. 87). Opportunity recognition is defined as an individual's efforts in searching and identifying opportunities [65,66], which has been argued as a key contributor to competitive advantage and superior performance [67,68]. Opportunity development is centered on seeking and gaining information. Firms have long tapped different external sources of knowledge to develop new products, processes, systems, and business models. Much knowledge-based research has suggested that firms access external knowledge in order to deploy such knowledge in the context of innovation [69–72], thus linking the opportunity process to innovation.

Tapping into external knowledge sources may help firms not only to recognize new strategic opportunities [62,73] but also to exploit them to gain competitive advantage [63]. As argued by Ardichvilli, Cardozo and Ray [74], opportunities are intended to deliver value and the opportunity process should therefore extend to the implementation of the opportunity. There are three important concepts in the opportunity process: Opportunity recognition, development, and evaluation. We adopt this wider view of opportunity, which we term opportunity recognition and exploitation (ORE).

The fundamental nature of coworking is aligned to the conditions for ORE to take place. Coworking provides a creative physical space which promotes collaboration, networking and incubator-like sharing of ideas. By engaging in peer-to-peer interactions in different configurations, coworkers can network their activities and activity systems within the space [75]. Activities such as organizational design, networking, and knowledge management [63,76,77] aid firms in exploiting opportunities.

We posit that the ORE process positively mediates the relationship between coworking space characteristics and BMI outcome. The reinvention of a business model requires the firm to build a boundary-spanning business network with its external stakeholders to effectively exploit opportunities and capture value [78].

As earlier hypothesized in H1a, space creativity is associated with better BMI outcome. Drawing on conceptual and empirical studies, Ardichvilli et al. [74] concluded that creativity is one of five key factors in the opportunity development process. Specifically, it is proposed that creativity is related to "alertness" which is the propensity to be sensitive to information about unsolved problems, unmet needs and novel combination of resources. Coworking firms that engage in ORE are able to capitalize more on the creative design of the physical space. As such, we hypothesize that:

Hypothesis 1 (H1b). *Opportunity recognition and exploitation positively mediates the relationship between space creativity of coworking spaces and sustainable business model innovation outcome of tenant firms.*

The quality and strength of social ties are important to the opportunity identification process [74,79]. Gravonetter [80] argues that more distant or casual acquaintances are bridges to information that may not be available within a strong-ties network of close friends or family. Extended networks contribute to higher levels of opportunity discovery.

Coworking spaces are carefully designed to foster connections and to increase opportunities for collaboration and conversation among tenants from vastly disparate backgrounds. Coworkers operate in different industries and markets, and have different strategies and business models. Such heterogeneity can lead to the discovery of potential collaborations and innovations on the peripheries [81]. The community aspect of coworking facilitates the formation of informal networks by promoting a friendly and trust-based social environment. In short, a favorable social climate can help a tenant firm to improve its ORE process.

Mu and Di Benedetto [82] hypothesized that opportunity discovery mediates the relationship between networking capability and the firm's performance in new product development. They argue that the network serves as a conduit of information through which important technological news can be brought to the early notice of the firm. In this way, the opportunity discovery process helps firms to validate technology trends and reduce the probability of errors on untried projects. As a corollary, we propose that the social climate in a coworking space provides the setting for a firm to interact with an extensive network of coworkers and to obtain unique information. The diversity of coworkers provides insights on different business models for value creation and value capture. At the same time, a positive social atmosphere and sense of trust enhance the firm's capability to exploit opportunities by adopting new ideas [58] and practicing creative emulation [59,60]. The ORE process therefore increases the likelihood of BMI in the firm. We thus hypothesize that firms that engage in ORE can better leverage on social climate to achieve sustainable BMI outcome.

Hypothesis 2 (H2b). *Opportunity recognition and exploitation positively mediates the relationship between social climate in coworking spaces and sustainable business model innovation outcome of tenant firms.*

The conceptual model and hypotheses developed in this paper are summarized in Figure 1.

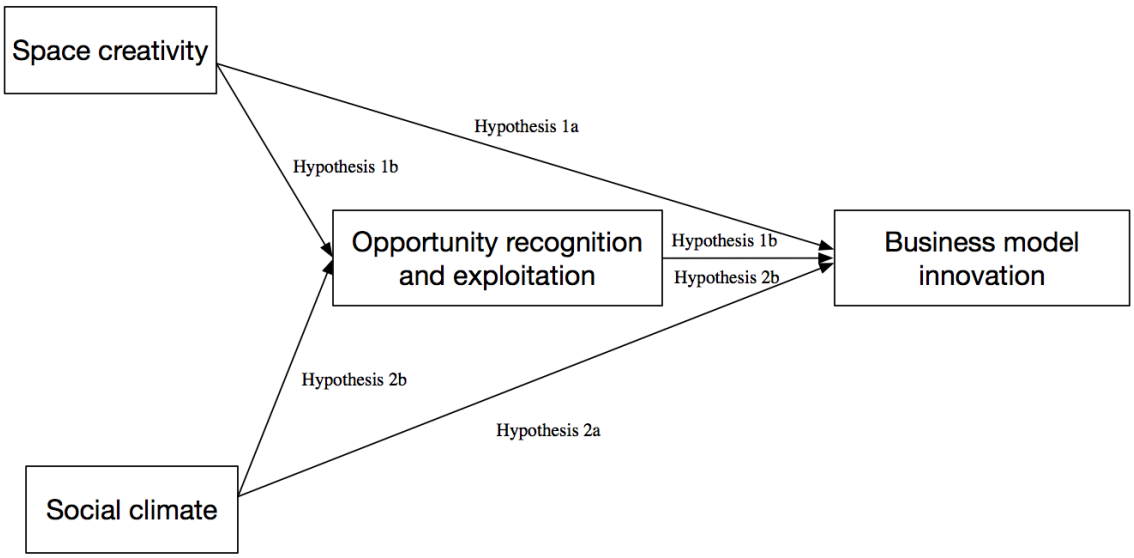

Figure 1. Conceptual model.

3. Methods

3.1. Data Collection and Sample

Singapore is an ideal research context. The Singapore government has long understood the important role of entrepreneurship in maintaining Singapore's leading position as an innovation-driven economy. Due to the lack of natural resources, Singapore has no choice but to rely on its human resources and intellectual capital as a source of competitive advantage. As part of the effort to develop a dynamic entrepreneurship ecosystem, its policy makers have invested in building infrastructure to support the formation and growth of new enterprises, including coworking spaces.

This research adopts the quantitative research method to understand the impact of coworking on the tenant firms and their business model innovation outcome. As of March 2016, we scanned the coworking landscape in Singapore and found a total of 36 operators from a variety of sources such as major media channels that focus on startups and innovators. Of these operators, there were two broad categories. The first category was made up of 13 operators that catered mainly to individuals such as professionals, hobbyists, freelancers and craftsmen, while the second had 23 operators that targeted at setups, startups and small businesses. As our study focuses on companies as units of analysis, we reached out in August 2016 to the second group, of which 13 responded positively to our request for surveys. After we had explained to them the purpose and scope of our study, 13 operators welcomed and supported our survey of their 447 tenant firms. By November 2016, we collected responses from 279 tenant firms, of which 21 were unusable due to errors. The final sample size thus consisted of 258 company responses, which falls within the recommended range of 30 to 500 that is appropriate for most research studies [83]. Table 1 provides a breakdown of the sample size by coworking space operator.

Table 1. Breakdown of Sample Size by coworking space (CS) operator.

Coworking Space (CS)	Population of CS	No. of Responses Collected at CS	Response Rate of CS
CS1	3	2	67%
CS2	33	20	61%
CS3	62	33	53%
CS4	60	30	50%
CS5	10	9	90%
CS6	8	4	50%
CS7	56	43	77%
CS8	60	32	53%
CS9	20	13	65%
CS10	20	10	50%
CS11	15	8	53%
CS12	70	38	54%
CS13	30	16	53%
Total	447	258	60%

3.2. Measures and Variables

We use innovation performance as the dependent variable, specifically focusing on sustainable performance in business model innovation (BMI). The independent variables are two characteristics of coworking space – space creativity and social climate. The process of opportunity recognition and exploitation (ORE) is included as a mediating variable.

The dependent, independent and mediator variables are measured using multi-item constructs scored on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). In order to ensure the reliability and discriminatory validity of items included our survey questionnaire, we draw on the literature and adapt items that have been successfully used in previous studies. The items and measures of construct validity are shown in Table 2.

Table 2. Measures and validation.

Items	Loading
Space creativity (Alpha = 0.829; CR = 0.840; AVE = 0.642)	
Our coworking space design encourages creative thinking	0.863
Our coworking space design encourages playfulness	0.627
Our coworking space design generates idea of higher quality	0.887
Social climate (Alpha = 0.895; CR =0.895; AVE = 0.518)	
In our coworking space, the coworking community has a full sense of cooperation among members	0.747
In our coworking space, mutual aid, sharing and cooperation is important in the coworking community	0.679
In our coworking space, there is a friendly atmosphere	0.531
In our coworking space, the relationships in the coworking community are close and cosy	0.737
In our coworking space, there is a sincere relationship in the coworking community	0.744
The coworking community members can depend on one another even in difficult situation	0.791
The coworking community members typically look out for one another	0.805
The coworking community members have faith in the integrity of one another	0.687
Opportunity recognition and exploitation (Alpha = 0.916; CR =0.917; AVE = 0.648)	
We can take advantage of product development opportunities with the help of the coworking community	0.789
We are very responsive to the technological opportunities that circle in the coworking community	0.762
We can develop new products to catch market opportunities with the help of coworking community	0.848
We get insights into new ways to approach product development	0.794
We can make several alternative solutions for each problem the project team encountered with the help of coworking community	0.861
We can learn the technical know-how held by the coworking community	0.769
Business model innovation (Alpha = 0.922; CR =0.921; AVE = 0.665)	
The coworking space services enabled us to open new market(s)	0.786
The coworking space services enabled us to increase market share	0.867
The coworking space services enabled us to generate new sources of revenues	0.951
The coworking space services enabled us to generate new sources of profits	0.939
The coworking space services enabled us to improve operational efficiency	0.660
The coworking space services enabled us to raise productivity level/reduce reliance on manpower	0.631

3.2.1. Dependent Variable

The dependent variable is a construct that measures the sustainable outcome of BMI in coworking tenant firms. We developed items by adapting from the three categories of BMI proposed by [25]. We derived six items that encompass three groups of outcome from achieving BMI, namely (1) new or expanded markets, (2) new sources of revenues and profit, and (3) improved efficiency and productivity.

3.2.2. Independent Variables

We developed items that measure space creativity and social climate in coworking spaces. Space creativity items capture the extent to which the physical design and configuration of the space encourage creativity, playfulness and idea generation [41]. Social climate items measure the congeniality of atmosphere of the coworking community and the degree of trust among tenant firms, reflecting the interpersonal relationships in the coworking space. Items are drawn from adapting previous studies by Erdil and Ertosun [52] and Daly and Finnigan [53].

3.2.3. Mediating Variable

ORE is included as the mediating variable in our analysis framework. Six items were used to measure the tenant firms' process for opportunity recognition and exploitation, adapted from Mu and Di Benedetto [82].

3.2.4. Control Variables

Control variables are included in the analysis in order to control for structural differences in the survey sample. As innovation performance can be affected by industry and business characteristics, we use industry, firm size and firm age as control variables. We use 11 dummy variables to control for the industry classification of the focal firms following Mu and Di Benedetto [82]. Firm size is measured as a firm's annual revenue in natural log form. Firm age is measured as the squared term of a firm's number of years since founding.

4. Results

To determine the adequacy of our hypothesized measurement model, we used confirmatory factor analysis (CFA) in MPlus 7.0 [84]. Items for the two components of space characteristics (space creativity and social climate), ORE and BMI were included in the CFA. The results shown in Table 3 suggest that a 4-factor model provides a good fit to the data (c2 = 759.069, df = 224, CFI = 0.878, RMSEA = 0.096, SRMR = 0.062). We also tested a series of alternative models, all of which provide a significantly worse fit. The results of our CFAs consistently suggested that the hypothesized measurement model provides the best fit to the data.

Table 3. Confirmatory factor analysis.

Model	X^2	Df	X^2/DF	CFI	TLI	SRMR	RMSEA
1	759.069	224	3.389	0.878	0.862	0.062	0.096
2	949.690	227	4.184	0.835	0.816	0.072	0.111
3	1372.577	229	5.994	0.738	0.711	0.094	0.139
4	1994.564	230	8.672	0.596	0.556	0.110	0.172

Note: CFI = comparative factor index; TLI = Tucker-Lewis index; SRMR = standardized root of approximation; Model 1: Space creativity, social climate, ORE, BMI; Model 2: Space creativity + social climate, ORE, BMI; Model 3: Space creativity + social climate + ORE, BMI; Model 4: Space creativity + social climate + ORE + BMI.

Table 4 presents the means, standard deviations, and correlations among variables. It shows that the independent variables (space characteristics) are positively related to the mediating variable (ORE) and dependent variable (BMI). Moreover, the mediator variable ORE is also positively related to dependent variable BMI.

Table 4. Means, standard deviations, and correlations of the variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	SD
1. Size (log)	1							5.969	0.629
2 Age (squared)	0.241 **	1						97.28	853.078
3. Industry	−0.052	0.071	1					6.60	2.759
4. Space creativity	0.011	0.079	0.055	1				3.680	0.860
5. Social climate	0.087	0.093	−0.032	0.585 **	1			3.728	0.715
6. Opportunity recognition and exploitation	−0.009	0.005	−0.008	0.475 **	0.595 **	1		3.309	0.875
7. Business model innovation	0.092	0.080	−0.034	0.467 **	0.459 **	0.655 **	1	3.273	0.955

Note: * $p < 0.05$; ** $p < 0.01$; all two-tailed tests.

4.1. Main Effect Hypotheses

To validate the main effect Hypotheses 1a and 2a, we tested our proposed model using path analysis in MPlus 7.0. We included all possible direct paths between the space characteristics constructs and the mediator and dependent variables, controlling for the possible influence of firm age, firm size and industry. The results are summarized in Table 5. The direct path between space creativity and BMI was significant, and the estimated coefficient was positive ($\beta = 0.222$, $p < 0.01$), thereby supporting Hypothesis 1a. In contrast, social climate does not have a significant direct effect on BMI ($\beta = -0.009$). Thus, Hypothesis 2a is not supported.

Table 5. Results of path analysis.

Dependent Variable	Independent Variable	Effect
Opportunity recognition and exploitation	Space creativity	0.195 **
	Social climate	0.600 ***
Business model innovation	Space creativity	0.222 **
	Social climate	−0.009
	Opportunity recognition and exploitation	0.616 ***

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4.2. Mediating Effect Hypotheses

To test the mediating effect Hypothesis 1b and 2b, we estimate the mediating effects, also known as indirect effects, of space creativity and social climate on BMI. The indirect effect of each independent variable is the product of coefficients from regressing (1) the mediator ORE on the independent variable, and (2) the dependent variable BMI on the mediator ORE. We used the bootstrapping approach for mediation analysis to test for the significance of the indirect effect [85–87]. In this non-parametric approach, the indirect effect of independent variables on the dependent variable is estimated multiple times by resampling with replacement from the dataset. A sampling distribution is generated from the multiple estimates and forms the basis for significance testing of the estimated indirect effect. The bootstrapping approach has been used extensively in empirical studies in sociology, psychology, and management research [88–90].

This approach is implemented using bootstrapping procedure in MPlus 7.0 (across 10,000 samples) to estimate indirect effects for each of the space characteristics on the dependent variable BMI, through the mediator variable ORE, as depicted in Table 6. Space creativity is found to have a significant indirect effect on BMI (unstandardized indirect effect 0.120, 95% CI 0.029, 0.228) through ORE, showing support for Hypothesis 1b. Similarly, our results suggested that social climate had a significant indirect effect on BMI (unstandardized indirect effect 0.370, 95% CI 0.262, 0.526) through ORE, in support of Hypothesis 2b.

Table 6. Results of mediating effect.

Relationship	Effect	95% CI
Space creativity → Opportunity recognition and exploitation → Business model innovation	0.120 *	[0.029, 0.228]
Social climate → Opportunity recognition and exploitation → Business model innovation	0.370 ***	[0.262, 0.526]

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The path coefficients computed using structured equation modelling for our conceptual model are presented in Figure 2.

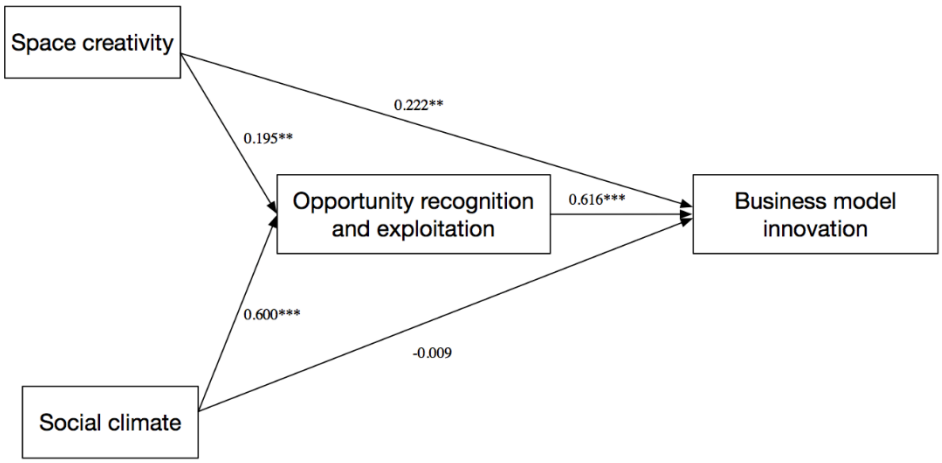

Figure 2. Structural equation modeling results. Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

5. Discussion

Prior studies on BMI have largely focused on the activities and outcome of BMI in general [24,25]. In contrast, our research considers the relatively understudied antecedents of BMI in the context of firms located in coworking spaces in the innovation-driven economy Singapore. We begin to examine the link between coworking space and BMI. Our research illuminates not just the relationship between coworking space characteristics and BMI outcome, but also the key process that enables tenant firms to enhance and sustain their BMI outcome at the coworking space.

In this study, it is evident that the mere provision of coworking space is not enough to foster BMI. The empirical results support our view that a coworking space design that encourages creativity can drive BMI outcome. Our survey results support our hypothesized relationship between the space creativity of coworking spaces and the BMI outcome of tenant firms (H1a). The physical design of the space plays a role in not only encouraging creative thinking and playfulness, but also generating ideas of higher quality, thereby helping tenant firms achieve greater levels of BMI.

We then proceed to address the key mechanisms that firms employ at the coworking space to optimize and sustain their BMI outcome. Our empirical results support our arguments that tenant firms' ORE process positively mediates the relationship between the space creativity of coworking spaces and the sustainable BMI outcome of tenant firms (H1b). As creativity is one of the key factors in opportunity development [74], tenant firms that have internal ORE process in place are in a better position than those that have not, to identify, evaluate and commercialize the higher-quality ideas generated in a coworking space that is well-designed for creativity.

The internal ORE process of tenant firms is also instrumental in enabling them to harness the power of a favorable social climate provided by the coworking space. Our findings lend support to our postulations that tenant firms' ORE process positively mediates the relationship between the social climate of coworking spaces and the sustainable BMI outcome of tenant firms (H2b). A conducive social climate in a coworking space enables tenant firms to interact with extensive network of other tenants to provide useful social ties and knowledge, which are the key factors of opportunity development process [74]. To maximize the benefits of a conducive social climate, tenant firms should have established ORE process to leverage the social ties and market and technology knowledge that are pivotal for enhancing and sustaining their BMI outcome.

We had anticipated that the social climate of the coworking space would be important to allow tenant firms to freely exchange ideas for opportunity identification and evaluation, as well as facilitate discussion for collaboration on idea exploitation, thereby positively impacting their innovation performance [59,60]. Contrary to the expectations we formulated in Hypothesis 2a, the social climate is found to have no direct effect on the sustainable BMI outcome of tenant firms. This finding could reflect the challenges that coworking space operators face in configuring their social climate to meaningfully support the ORE process of their tenant firms. To address this challenge, the operators should develop greater familiarity and empathy with their tenant firms' profiles and processes, before working closely with their event partners to ensure their activities, such as hackathons, idea pitching sessions and investor presentations, seamlessly address the needs, goals and opportunity development processes of their tenant firms [91].

5.1. Policy Implications

This study has important policy implications, particularly for innovation-driven economies. First, to improve the social climate of coworking space in support of ORE and BMI of tenant firms, the public policymakers can play a more active role to enhance the quantity and diversity of tenant firms. Applying the principles of co-location, collaboration and shared resources [32,33], the government may formulate policies or programs to encourage the inshoring of foreign ventures in local coworking space. In Singapore, for example, the government has funded the operation of several coworking spaces (e.g., Block71 Singapore) to attract foreign ventures to use these sites as a launch pad to enter the Southeast Asian market.

Second, in a similar way, the government can support offshoring of domestic ventures into overseas coworking space. By supporting the construction of overseas coworking space facilities (e.g., Block71 San Francisco, US), the public policymakers can enable domestic ventures to use the overseas site to make foray into foreign markets.

Third, the government can provide incentives to encourage coworking service providers to offer a range of complementary services to meet the needs of young tenant firms to foster innovation. Operators granting access to physical resources and office support are found to enhance the survival

rate of the tenant firms, while those offering programs to gain access to venture capital and supply chain network are more likely to increase investment in new ventures [1,54,92].

5.2. Managerial Implications

Our research has identified implications for management practice. First, coworking space operators should understand that the physical design and social climate of their space can play a bigger role than merely providing colocation for economic reasons [8]. While the tenant firms value a conducive environment for generating and bouncing off ideas, they also demand some form of idea protection. Further thoughts should therefore be put into the design, policies and practices of coworking spaces, which are expected to balance between the collaboration and privacy needs of the firms. Coworking space operators should also be mindful of increasing cost pressures as they face the need to differentiate themselves from the growing population of coworking spaces fueled in part by the new economic conditions [4].

Second, as MNEs partner local coworking spaces to engage innovators and entrepreneurs, it is inevitable that differences in their culture and approaches to innovation may give rise to tension and conflicts, thereby adversely affecting the quality of new knowledge shared and new ideas generated [57]. To effectively leverage the partnership to achieve their objectives, the MNEs should define and implement appropriate internal processes to guide their interactions with their coworking space partners and the tenant firms.

Finally, even the best coworking space boasting creativity-enhancing design and favorable social climate can be lost on a firm that has under-developed process for opportunity development. It is therefore imperative for tenant firms to establish efficient and effective ORE process internally to optimize the benefits of operating in a coworking space.

5.3. Limitations and Future Research

Although this research offers illuminating insights into the relationships among coworking space characteristics, tenant firms' ORE process and their BMI under the new economic conditions, it has several limitations, which open up opportunities for future research.

First, we used cross-sectional data, where the results represent only a snapshot perspective of dynamic processes. Although this limitation does not invalidate the basic logic of our argument, we recommend future research to employ a longitudinal study design, where the dynamic phenomena may be observed and causal relationships investigated.

Second, survey-based studies traditionally suffer from common method bias. Due to systematic measurement error, the estimates of self-reported data could be biased [93]. To ascertain such bias, this study adopted the guidelines of Radicic and Pugh [94], where Harmon's one-factor test was used to check the validity of our data with exploratory factor analysis on all the independent variables. From our unrotated principle component factor analysis, the first unrotated factor was found to account for only 47.4 per cent of the total variation in the other independent variables of our conceptual model, suggesting that the common method bias is unlikely to take place.

Future studies could use more objective data (e.g., percent of sales from new products also known as innovative sales) to measure the innovation performance of the tenant firms, as a proxy for commercial success of innovation. Third, this study focuses on tenant firms that are already operating in coworking spaces. Further research should find matched sample of companies that are not located in coworking spaces so as to control for possible factors that contribute to variances in their BMI performance.

6. Conclusions

We make at least three significant contributions to the literature on management. First, we investigate the relatively understudied antecedents of BMI in the new economic order prevailing for innovation-driven economies. Prior research tends to examine the activities and outcome of BMI in

general, rather than investigating the antecedents of BMI in the context of firms located in coworking spaces. We establish empirically that the coworking space creativity can have important effects on the BMI of tenant firms. The physical design of the space is found to play a role in not only encouraging creative thinking and playfulness, but also generating ideas of higher quality, thereby helping tenant firms achieve greater levels of BMI. Our empirical results support our arguments that tenant firms' ORE process positively mediates the relationship between the space creativity of coworking spaces and the sustainable BMI outcome of tenant firms. This process is also found to positively mediate the relationship between the social climate of coworking spaces and the sustainable BMI outcome of tenant firms. Tenant firms that have internal ORE process in place are in a better position than those that have not, to identify, evaluate and commercialize the higher-quality ideas generated in a coworking space that is designed for creativity. To benefit from a conducive social climate, tenant firms should have well-defined ORE process to leverage the social ties and market and technology knowledge that are pivotal for enhancing their sustainable BMI outcome. Second, our empirical study of 258 tenant firms across 13 coworking space operators will extend and add generalizability to the extant coworking research. Current studies have largely focused on conceptual models and qualitative studies of the coworking spaces, rather than quantitative research of their tenant firms. Third, we complement prior studies on entrepreneurship by considering the tenant firms' ORE process within the coworking space under the conditions of the new economic order, rather than in a general environment.

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