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BUSINESS INCUBATION AND INNOVATION SPEED: MEDIATING ROLE OF ABSORPTIVE CAPACITY

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Abstract

Startups suffer from very high mortality rates—much higher than those of larger, well-established companies. Many researchers believe that business incubation (BI) acts as a helping hand and encourages entrepreneurial development by creating a network of knowledge and resources. Still, few have studied the effect of the incubation on knowledge gain, which leads to quicker innovation compared to their competitors. This study used a resource-based view and organizational learning theory to explore the effect and mechanism of incubation on the absorptive capacity (ACAP) and innovation speed (IS) of startups in the Indian context. Using survey data from a sample of 344 technology intensive incubator firms in India, we demonstrated that the incubation mechanisms, namely business incubator selection performance, monitoring, and business assistance intensity and resource munificence, help startups to explore, transform, and exploit knowledge and information to bring technology and products to market quickly. Data were analyzed using hierarchical regression, and mediation was tested using Baron and Kenny's (1986) method and a Process macro developed by Hayes (2013). The results of this study prove that absorptive capacity dimensions such as exploratory, transformative, and exploitative learning among startups are augmented by business incubation services, which results in the rapid commercialization of technological products.

Keywords: *Business Incubation, Startups, Innovation Speed, Absorptive Capacity*

1. INTRODUCTION

Technology startups have been identified by academicians and policymakers as an essential source of innovation and economic growth for local, regional, and national levels (Dee et al., 2019). Because startups are more susceptible to failure due to their liability of newness, policymakers widely promote business incubation as a protective mechanism for early-stage firms (Eveleens et al., 2017). Entrepreneurship scholars thus have shown a keen interest in understanding the types and effects of business incubation services over the last decade (Bruneel et al., 2012; Mian et al., 2016; Hausberg & Korreck, 2020; Bollingtoft & Ulhoi, 2005). Incubator firms vigorously have pursued opportunities for profitability and growth through business incubators (Chen, 2009). However, research evidence of the quantifiable benefits of business incubation services has been contradictory (Al-Mubaraki & Busler, 2013). This paper examined a critical performance criterion for the incubator startups, namely their innovation speed. Innovation speed, also called speed to market, represents the time elapsed between innovative ideation and the final market launch of the innovation (Kessler & Chakrabarti, 1996). Although innovation speed is a significant performance criterion for incubator firms, little empirical research has

been conducted on this topic (Clausen & Korneliussen, 2012). Therefore, a better understanding of how incubator startups can achieve the required innovation speed is imperative.

Business incubators act as hubs through which emerging young firms can network (Hughes et al., 2007), and thus exposes developing young startups to synergetic opportunities to collaborate, learn, and acquire knowledge (Dee et al., 2019). Learning refers to the ability of the organization to gain new skills, which it can use in its processes (Lichtenthaler, 2009; Lane & Lubatkin, 1998). Grounded on the resource-based view and organizational learning perspective, incubation opens the door to new networking contexts of various organizational systems and structures, causing businesses to learn the best practices in global markets (Wu, 2007). Business incubators also improve the capacity of an organization to leverage its established capacities and resources when exploring innovative options (Pettersen et al., 2015). Exploitative learning among startups focuses on using the existing information, abilities, and resources of the organization in existing and first-hand markets, as well (Zahra, 2005). However, excessive emphasis on transforming new and existing capacities can lead to organizational clinkers and roll-back (Lichtenthaler, 2009). Business incubation lessens this risk by stimulating exploration activities among young firms (Hughes et al., 2007). This can promote innovation and expand the variety of strategic options open to the firm (Hackett & Dilts, 2004; Bruneel et al., 2012).

The preceding argument indicates that merely registering with a business incubator or engaging in business incubation activities does not ensure innovation speed (Clausen & Kornelieussen, 2012) and performance (Voisey et al., 2006). Much depends on the ability of the startup to find effective ways of exploiting its skills and capabilities (Hughes et al., 2007) and acquiring new knowledge (Theodorakopoulos et al., 2014) from the networked business incubator (Pena, 2004) and the startup's competing markets (Mian, 2016). This ability depends to a certain extent on the absorptive capacity of the startup firm (Jansen et al., 2005; Zahra, 2005; Lane et al., 2006).

Consequently, innovation speed, which is a significant criterion for firm performance, depends on the firm's absorptive capacity and its applications, and it has major implications for the early-stage development of firms, mainly firms which have limited business resources and network experience (Wu, 2007). Such constraints limit the accumulation of resources which could extend the firm's knowledge base, which, in effect, limits the entrepreneurial capacity of the startup firm (Zahra et al., 2009). Compared to other stable factors such as the founder's education qualifications and experience, the absorptive capacity of a firm can be changed and developed (Zahra et al., 2005; Zahra et al., 2009). Business incubation is considered to be one solution to these constraints, because it provides access to a variety of on-site live resources, services, mentoring, and training (Hackett & Dilts, 2004a; Hackett & Dilts, 2004b). Although the ability of incubation to help early-stage firms is implicit and convincing, the extent to which it supports the startups in knowledge exploration and transformation of opportunities by exploiting new and existing information is unknown (Eveleens & Rijnsoever, 2017).

This study examined how the incubation process can augment the knowledge attribute of absorptive capacity to help improve the innovation speed of new technology startups. The study examined the mechanism by which a technology business incubator increases the startup's absorptive capacity by allowing the exploration of knowledge and critically promoting the transformation of information into resources that supports business performance through innovation, creating sustainable development. Empirically, this study is built on survey data collected from a sample of 344 technology-intensive incubator firms registered with government-supported technology business incubators in India.

We used the lens of organizational learning to suggest that startups participate in business incubation activities to gain new skills and capabilities that allow them to leverage new opportunities and innovation in competitive markets effectively. Consequently, businesses should build a stock of relevant information within their own innovative operations. This paper discusses the topic in greater depth. The paper is arranged in four sections. First, we clarify the concepts of business incubation, absorptive capacity, and innovation speed. Secondly, we propose a relationship between them. The third section discusses the research methodology and the empirical results. Lastly, managerial and theoretical implications are discussed.

2. THEORETICAL BACKGROUND

2.1 Business Incubation and Innovation Speed

The key objective for both business incubators and incubated startups is the speedy commercialization of new technology and innovation (Grimaldi & Grandi, 2005). The success of the incubator depends on the ability of its tenant ventures to develop and market new products and processes quickly (Patton et al., 2009). Rapid commercialization is critical for incubator firms to achieve the required market share, early sales, growth, and survival (Chen, 2009; Clausen & Korneliussen, 2012). Most of India's technology incubators are supported in whole or in part by the government, which provides a learning ground for startups, and they are focused on the commercialization of science- and technology-oriented processes and applications rather than on the generation and growth of the general business. The creation of technology-based incubators in India stems from the government's belief that fostering such mentoring practices promotes the development of a knowledge-based economy that is competitive enough to compete on the global marketplace (NASSCOM, 2018).

Innovation speed is a capability that can yield a significant competitive advantage for a firm when combined with core practices (Kessler & Chakrabarti, 1996). Consequently, by increasing the speed of effective innovation, companies can fully exploit research-related assets, amortize research project costs through the more-efficient introduction of new products, and thus maximize profit (National Research Council, 2003). Due to unpredictable markets and systemic let-downs that restrict the ability of small technology-based startups to survive and overcome the complexity and challenges associated with the early stages of ideation and development, policymakers widely promote a business incubation environment (Eveleens et al., 2017; Dee et al., 2019). Although policymakers have acknowledged that the incubation process can bring a competitive advantage by expanding the knowledge base of incubator firms (Hillermane et al., 2019), the majority of the literature to date has concentrated on recording the effects of incubator outcomes, and not on the aftermath of incubation (Hackett & Dilts, 2004; Hackett & Dilts, 2008; Bergek & Norman, 2008; Stephens & Onofrei, 2012). Therefore, several studies have called for more incubatee–incubator research that explores incubation through the lens of incubator firms (Voisey et al., 2006, Stephens & Onofrei 2012; Hackett & Dilts, 2008; Patton et al., 2009), incubator best practices (Bergek & Norrman, 2008), the process within startups (Ayatse et al., 2017), networking among startups (Pettersen et al., 2015), and interactions with incubation networks (Bollingtoft & Ulhoi, 2005; Pettersen et al., 2015). There is no consensus about what constitutes the quality of successful business incubation services and how these services can generate the requisite value-added outcomes (Mian, 1996; Patton et al., 2009; Dee et al., 2019; Hillemane et al., 2019).

A major gap in the literature on innovation is that most innovation speed studies are conducted at the process level, and the firm level should be considered. Therefore, we focused on the firm-level innovation speed and, in particular, the position of external and strategic constructs that can promote faster innovation speed. From the literature on speed to market, which is synonymous to innovation speed (Claussen & Kornelieussen, 2012), we take the view that it is especially important to examine constructs that directly affect the organization and are subject to firm-level influence. The role of strategic support' is among the factors highlighted as areas for future research. Established on the resource-based view, business incubation is a construct that illustrates the role of strategic approaches and the role of management support as a driving force behind the rapid commercialization of new products (Hackett & Dilts, 2008; Voisey et al., 2006, Patton et al., 2009; Pettersen et al., 2015; Eveleens & Rijnsoever; 2017) in new and emerging firms. This study argues that business incubation can be a significant antecedent of innovation speed.

Hypothesis 1: *Business incubation is positively related to the innovation speed of startups.*

2.2 Business Incubation and Absorptive Capacity

Business incubation provides an essential systematic environment for startups to acquire knowledge for innovation and growth, and it provides access to critical resources, which relates to the underlying concept of the resource-based view. Based on organizational learning theory, a sustainable en-

vironment is necessary for continuous learning. Business incubation leads to continuous learning of new skills and capabilities that significantly improve the ability of a firm to innovate, take risks, and develop new revenue streams (Bruneel et al., 2012; Etzkowitz, 2002; Arshad et al., 2020). It also acts as a guiding mechanism that enhances a firm's ability to explore new knowledge, transform useful and adequate information, and exploit its new and existing capabilities and resources for achieving growth and innovation (Al-Mubaraki & Busler, 2013; Freund et al., 2020).

Emerging startups obtain their knowledge and perform their learning mainly through network relations (Hughes et al., 2007), and such learning manifests the logic underpinning incubators (Pena, 2004). Incubators should help develop and coordinate such dynamic linkages to ensure that firms learn to explore, transform, and exploit the knowledge acquired (Patton, 2014; Borges & Beuno, 2020). Absorptive capacity is a key dynamic capability which refers to the ability of the startup to gain new knowledge that it can utilize in its innovation and venturing operations (Zahra & Hayton, 2008). Every piece of new knowledge that a firm has gained will contribute to performance and innovation, and thus represents a potential source of competitive advantage (Zahra & Hayton, 2008; Xin et al., 2020) among incubator firms. Absorptive capacity consists of three dimensions, encompassing exploratory learning via new knowledge, the exploitation of the existing knowledge, and the combination of the two through transformative learning (Lane et al., 2006). This study employed the framework of Lane et al. (2006) to describe absorptive capacity, because it is useful in the specific context of incubator startups that promote technology advancements through innovative new products and services (Gebauer, Worch & Truffer, 2012).

Exploratory learning is a way of discovering and comprehending new external knowledge (Jansen et al., 2005). When the approach of a firm guides its efforts, the firm's previous knowledge, which is a function of prevailing models, affects the vital assessment of new external information (Tzokas et al., 2015). Transformative learning necessitates many mechanisms that influence how the newly acquired knowledge and the existing are integrated (Jansen et al., 2005; Lane et al., 2006). Knowledge management methods influence how such knowledge is disseminated and passed to various areas of the firm (Argote, McEvily & Reagans, 2003). The inclusive outcome of these processes is a transformation of the combined nature of various organizational divisions arising from the assimilation of new knowledge (Tzokas et al., 2015; Jansen et al., 2005; Lane et al., 2006).

The last dimension reveals how exploitative learning is used to apply the assimilated external knowledge (Lane et al., 2006). Companies do not simply achieve the absorptive capacity they need to thrive, primarily because of their liability of newness. In reality, it takes an adequate and critical climate to help improve the requisite absorptive capacity required to achieve a competitive edge. Business incubation exposes the companies to varying networked environments, operating in a world marked by rapid and persistent transition, which provides the opportunity for persistent learning from the incubator network (Hutabarat & Pandin, 2014). This type of transition makes room for startups to learn continuously to survive, let alone succeed (Patton, 2014). Inevitably, this routine allows firms to learn continuously from highly experienced experts, mentors, and peer networks to advance their knowledge, skills, and capabilities (Grandinetti, 2016).

Thus, the incubator environment allows the firms to improve the techniques of exploration, transformation, and exploitation of knowledge to achieve their commercial ends (Jansen et al., 2005). Such exposure makes it possible for a firm to forecast more accurately the nature and commercial prospect of technological advances (Cohen & Levinthal, 1990) and to develop specialized innovative products (Tzokas et al., 2015). Therefore, it is best to assume that business incubation will have a positive impact on absorptive capacity, which can be understood as a combination of exploratory, transformative, and exploitative learning. Based on these arguments, we propose the following hypothesis:

Hypothesis 2: *Business incubation positively relates to a startup's absorptive capacity in terms of three dimensions, exploratory learning, transformative learning, and exploitative learning.*

2.3 Absorptive Capacity and Innovation Speed

Current success and future sustainability in a rapidly changing world rely on continuously learning to do things differently and better (Talwar et al., 2015). Knowledge is both the raw material that underpins learning and the outcome of it, offering new opportunities and new revenue streams (Gibb, 2002). Economic growth always has been driven by the desire to invent and evolve, which is to create new knowledge and ideas realized through processes, products, and ventures (Al-Mubaraki & Busler, 2013). Current thinking goes beyond merely recognizing it as a source of competitive advantage for a new venture; instead, it is argued that the conversion of knowledge into innovation is the main reason for startups to exist and establish.

Startups operating in global markets need to absorb tremendous knowledge rapidly to leverage new business opportunities in those markets and gain an economical advantage (Zahra & Hayton, 2008; Paliokaite, 2019). This challenge is complicated by the fact that the knowledge gained often is complex and contextual, and represents the cultures and locations in which it was created (Talwar et al., 2015). A startup's ability to absorb, transform, and exploit this knowledge can influence the extent to which it rapidly can innovate and generate profits or growth in revenues in the presence of supporting external mechanisms (Zahra & Hayton, 2008). Absorptive capacity can accelerate innovation processes in small firms, which can confer strategic advantage (Huang & Rice, 2009). Accelerating innovation is important, because any window to exploit technological advances is shrinking continually due to the spillover of information, the replication of processes and operations by rivals, and technological obsolescence that makes most of the benefits temporary (Huang & Rice, 2009). Despite differences in terms of organizational knowledge, there is increasing consensus in the new venture literature that absorbing capacity explains new venture innovation at the firm level.

Cohen and Levinthal (1990) described absorptive capacity as the ability of a startup to explore, understand, transform, and assimilate the knowledge acquired from external sources. Consistent with this definition, we focused on the antecedent effect of absorptive capacity on innovation speed at the level of the startup firm in a business incubator by focusing on the sources of knowledge fostered through incubation activities and networks. Although much has been written about absorptive capacity and its value, very little attention has focused on how absorptive capacity is created and used in a new venture to accelerate innovation. Whereas the majority of the literature focused on the absorptive capacity of established firms (Zahra & George, 2002; Lichtenthaler, 2009; Zahra et al., 2009), the present study focused on its influence on incubated early-stage firms' growth and development, because absorptive capacity is the knowledge which is acquired externally (Zahra & George, 2002). Based on these arguments, the following hypothesis is proposed:

Hypothesis 3: *Absorptive capacity dimensions such as exploratory learning, transformative learning, and exploitative learning are positively related to innovation speed.*

2.4 Mediating Role of Absorptive Capacity

Organizational learning, described here as absorptive capacity, is a firm's collaborative and iterative processes to acquire new technologies and know-how from business incubation (Lane & Lubatkin, 1998). Based on organizational learning theory, business incubation facilitates the development of new skills and capacities that strongly enhance the capacity of a company to innovate, take risks, and build new revenue streams (Patton et al., 2009). Absorptive capacity is the ability of a firm to utilize knowledge held externally through the three processes of exploratory learning, transformative learning, and exploitative learning (Tzokas et al., 2015). It involves a path from identifying and acquiring external knowledge (exploratory learning) through assimilation, understanding, and retention (transformative learning), to its transmutation and application (exploitative learning) (Tzokas et al., 2015; Jansen, 2005). Business incubation introduces a startup to new opportunistic market environments with untapped potential, which encourages companies to explore, transform, and exploit in order to survive the competitive market (Patton et al., 2009).

The diversity of mentors, investors, university networks, client groups, peer startups, and political systems associated with business incubation also can expand a startup's search for new knowledge (Scillitoe & Chakraborti, 2010). Business incubation often links startups in their fields of business or other sectors with allied companies and networks (Bruneel et al., 2012). According to the theory of organizational learning, the introduction of such specific and diverse expertise into the operations of small firms enhances and accelerates the absorptive capacity, augmenting their innovative output (Zahra & Hayton, 2008).

Business incubation services paves way to ACAP's exploratory, transformative, and exploitative learning (Hillemane et al., 2019). To achieve rapid innovation, incubator startups require strong technological support, mentoring and assistance, and allied services from incubators for the exploration of new knowledge and technologies (Lalkaka, 2001). When an incubator firm is in a new product development process, it is more likely to be open to new external knowledge available from its incubator network (Scillitoe & Chakraborti, 2010). This receptivity further increases the speed of innovation by allowing the firm to access new technological developments, workshops, and live interactive sessions as a reinforcing cycle of exploratory innovation (Lane et al., 2006; Lichtenthaler, 2009). Thus it offers a lean process which increases the speed with which the firm is able to discover new opportunities and decreases the cycle time of build, measure, and learn (Carayannis & Zedtwitz, 2005; Ghezzi, 2019). Therefore, the higher the degree of assistance and resources offered by the incubator, the greater is the potential for start-ups to participate in exploratory innovation (McAdam & McAdam, 2008).

At the same time, business incubators should ensure that the knowledge acquired by the tenant firms is accumulated and stored for the sustainable growth and development before and after the cycle time of new product development (Schwartz & Hornych, 2008; Lalkaka, 2002). The accumulation of knowledge not only increases product innovation skills, but also a firm's ability to engage in the transformation learning process through assessment, use, and application of new technologies (Gebauer et al., 2012; Tzokas et al., 2015).

Similarly, an entrepreneurial venture with strong incubation support tends to engage in more exploitation alliances to gain access to complementary assets (Hughes & Morgan, 2007). As firms accumulate more knowledge and skills from the incubator, they become more effective in deploying their existing knowledge, and thus develop more exploitative activities due to the obvious self-reinforcing nature of learning (Kowalski, 2018). Thus, the higher the level of incubation support, the greater is the probability of catalyzing more exploitation in that field (Klofsten et al., 2019). At the same time, innovation speed also can be associated with a firm's performance (Claussen & Kornelieussen, 2012). In the context of rapid technological innovations, a strong resourceful environment, along with ACAP, enhances the benefits of novel innovations and contribute positively to a firm's innovative and financial performance (Zahra & George, 2002; Lane et al., 2006; Hughes & Morgan, 2007; Patton, 2014).

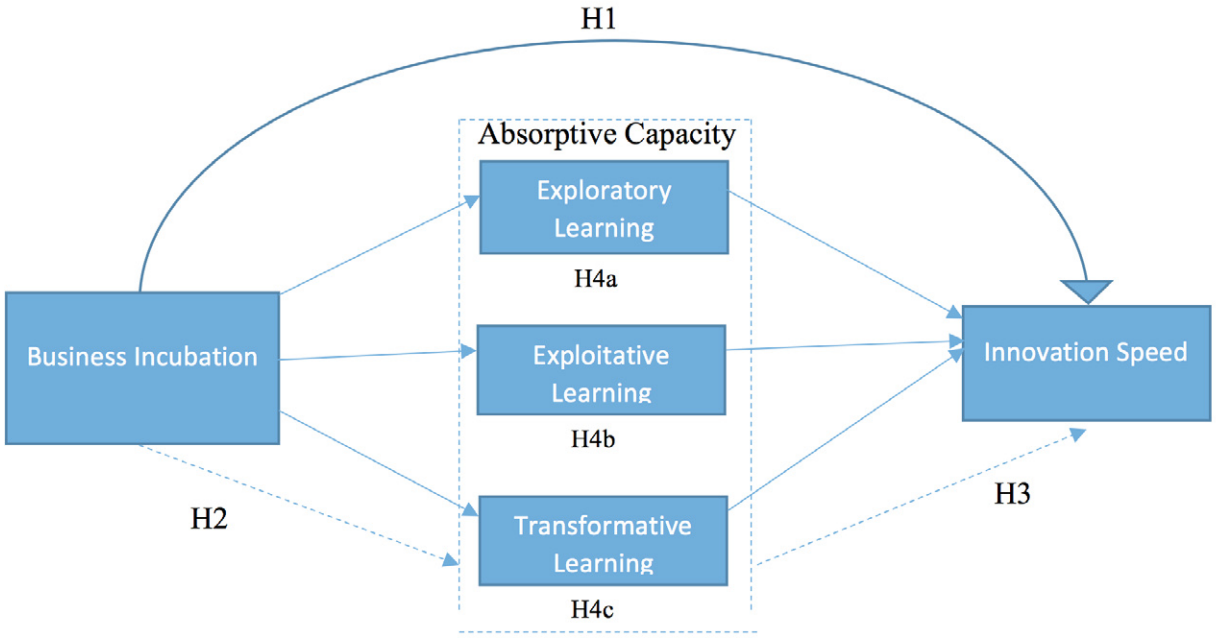
Despite the prospective value addition of business incubation services, they may not guarantee boosting a startup's knowledge (Dee et al., 2019). Unwillingness to share knowledge by team members and the reluctance of peer startup teams to share information might be the reason for this problem (Cardon et al., 2017). Even if team members and peer startup groups share their skills, the recipient startup may not have the absorptive capacity necessary to explore, transform, and exploit the knowledge (Cardon et al., 2017) it acquires from business incubation. We argue that the greater the absorptive capacity, the stronger is the relationship between a firm's use of business incubation services and innovative performance. Therefore:

Hypothesis 4a: *Exploratory learning mediates the relationship between business incubation and innovation speed.*

Hypothesis 4b: *Transformative learning mediates the relationship between business incubation and innovation speed.*

Hypothesis 4c: *Exploitative learning mediates the relationship between business incubation and innovation speed.*

Figure 1: Research model with hypotheses



The relationships expressed through the four formulated hypotheses are represented in the research model with continued associations (Fig. 1).

3. METHODOLOGY

3.1 Sample and collection of data

To test the hypothesized relationships between BI, ACAP, and IS empirically, the researchers adopted a descriptive research design using survey data obtained from incubator firms. Survey data were gathered in the context of government-supported technology business incubators in India. These incubators are open to enterprises with a new product idea and are established for less than five years. An important goal of the technology business incubator system is a technology development and the commercialization of new innovative products (Claussen & Kornelieussen, 2012). This background is appropriate in testing the influence of business incubation on startup innovation speed in the context of absorptive capacity. Hence the population of the study was CEOs of technology-based startups incubated in government-supported technology business incubators in the state of Kerala, India. There were 540 such startups incubated in 32 technology business incubators established within the major cities of the state of Kerala.

A list of firms with the names and email addresses of the CEOs was obtained from respective incubator managers, and also from the government agency that supports the technology business incubators. Following a census survey method, survey questionnaires were administered directly to all 540 CEOs (and emailed to those who were not physically present in the incubator during the time of data collection) to collect the required data. All incubator managers were asked to motivate the founder CEOs in their incubation facilities to respond to the survey questionnaire. The researchers collected 344 valid responses out of 540 incubated businesses, following numerous follow-ups and visits. This is a response rate of 64%, which is a much higher rate than in most other survey-based research aimed at new ventures and startup firms. The survey data were gathered from September to December, 2019. Some of these respondents started ventures immediately after college; a few are still in college; the majority of them worked for corporations before starting their own businesses. The demographic profile of the respondents is given in Table 1.

Table 1: Demographic profile of respondents

Variable	Category	N	Percentage
Firm age (years)	≤2	229	66.6
	>2	115	33.4
Gender	Male	315	91.6
	Female	29	8.4
Education	Completed	284	82.6
	Not completed yet	60	17.4
Previous startup experience	Had previous startups	272	79.1
	No previous startups	72	20.9
Previous work experience	No work experience	66	19.2
	Work experience	278	80.8
Family-owned business	Family has business	97	28.2
	No family business	247	71.8

3.2 Measurement

Independent Variable

The items to measure business incubation were adopted from Khalid et al. (2012), which was based on the seminal work by Hackett and Dilts (2008). The items were measured from the incubator firm perspective, taking into account the Indian startup and business incubation environment, which resulted in a set of measures that encompassed business incubator selection performance, monitoring, business assistance intensity, and resource munificence involving 31 items. The items were measured using a five-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree, with greater values representing higher amounts.

Mediating Variable

The new venture literature identifies three important indicators for absorptive capacity: exploratory, transformative, and exploitative learning. The measurement of absorptive capacity followed the method used by Tzokas et al. (2015), which is a summated scale including all three dimensions which includes 11 items, was adopted for this study. All items were measured using a five-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree.

Dependent Variable

We began by synthesizing scales from the literature in developing measures that reflect product speed, speed to market, and innovation speed. We considered speed to market to be synonymous with innovation speed (Claussen & Kornelieussen, 2012) Thus, to measure innovation speed, we adopted the scale of Fang (2008), which consisted of four items. The items were measured using a five-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree.

Control Variables

Data were collected for several control variables: firm age, CEO gender, education, prior startup experience, prior work experience, and family entrepreneurial experience. Firm age and gender are two significant basic features that may be associated with innovation speed. We controlled for education, because it may lead to better business performance because the founders can use their knowledge from formal education to better exploit resources needed to develop and market the product faster.

We also controlled for prior startup experience by measuring whether the founding CEO had started a previous new venture. According to the lit-

erature, prior work experience of the founding team also has a significant impact on small-firm innovation. Family business and entrepreneurial family has a significant influence on startup founders. We used binary variables 0 and 1 to measure all the control variables.

We sought to reduce common method bias because each questionnaire came from one respondent. We also implemented corresponding control measures in research design and statistical analysis, as suggested by Podsakoff et al., (2003). In line with our research design, we assured participants that their responses would be anonymous, that there would be no correct or incorrect answers, and that they should answer questions as fairly as possible. We applied Harman's single-factor method for statistical remedies. A variance inflation factor (VIF) test was conducted using SmartPLS 3, because it is one of the most reliable tests and can spot the presence of this bias if single-factor analysis fails (Kock, 2015). The variance inflation factor test it is an automatic procedure in SmartPLS 3 which allows the full collinearity test for all the latent variables in the model. A VIF higher than 3.3 indicates the presence of an unacceptable level of common method bias. In this study, the VIF values of all latent variables were under the prescribed limit.

We subjected all the main variables to factor analysis and then assigned the number of factors that accounted for the variance in the measures. In addition, the reliability of the multi-item scales was assessed with Cronbach's alpha. All variables had reliability scores above 0.7 (Table 2), and hence the subsequent step in the analysis could be performed.

Table 2: Results of reliability test

Variable	No. of items	Total variance accounted for (%)	Cronbach's alpha
Business incubation	31	14.43	.923
Exploratory learning	4	27.73	.850
Transformative learning	3	39.82	.857
Exploitative learning	4	50.11	.876
Innovation speed	4	55.68	.777

Table 3: Descriptive statistics and correlations

No.	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1	Startup age	1.33	0.472	1										
2	Gender	1.08	0.278	0.015	1									
3	Education	1.18	0.382	0.008	−0.012	1								
4	Prior startup experience	1.21	0.425	−0.182	−0.393	−0.030	1							
5	Prior work experience	1.81	0.393	−0.052	0.123	−0.054	−0.019	1						
6	Family-owned business	1.71	0.460	−0.024	−0.049	0.031	0.043	−0.054	1					
7	Business incubation	3.63	0.915	−0.005	0.089	−0.031	−0.044	0.124*	−0.044	1				
8	Exploratory learning	3.95	0.830	−0.043	−0.079	−0.128*	0.029	0.071	−0.032	0.293**	1			
9	Transformative learning	3.89	0.790	−0.027	−0.028	−0.118*	−0.025	0.103	−0.103	0.312**	0.726**	1		
10	Exploitative learning	3.85	0.815	0.003	−0.013	−0.080	−0.004	0.102	−0.062	0.383**	0.619**	0.692**	1	
11	Innovation speed	3.11	0.900	−0.063	0.039	−0.044	−0.060	0.067	−0.068	0.505**	0.378**	0.314**	0.340**	1

*Note: SD = standard deviation. *p < .05, **p < .01, ***p<.001*

4. RESULTS

Table 3 reports the means, standard deviations, and coefficients of Pearson correlation for the major variables. The results showed that the correlations between the key research variables were significantly interrelated. These were in line with the aforementioned research hypotheses. The potential presence of multicollinearity was investigated using SPSS software using the variance inflation factor estimated for each variable in the ordinary least squares (OLS) regression. VIF statistics greater than 10 indicate multicollinearity issues. VIF statistics ranged from 1.005 to 1.714, indicating multicollinearity is not an issue in our analysis.

We followed the procedure recommended by Baron and Kenny (1986) to test the mediation hypothesis. First, the dependent variable was regressed on the independent variable. Subsequently, the mediating variable (separate dimensions) was regressed against the independent variable. Finally, the dependent variable was regressed against both the independent variable and the mediating vari-

Table 4: Business incubation regressed on innovation speed

Variable	Unstandardized coefficients	
Startup age	−0.140	−0.140
Gender	−0.133	−0.097
Education	−0.165	−0.145
Prior startup experience	0.118	−0.005
Prior work experience	0.006	−0.068
Family-owned business	−0.121	−0.097
Business incubation	—	0.494***
R^2	0.019	0.265
Adjusted R^2	0.001	0.250
ΔR^2	—	0.246
F	1.067	17.338***

Table 5: Business incubation regressed on absorptive capacity

	Exploratory learning		Transformative learning		Exploitative learning	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Star-up age	−0.071	−0.071	−0.054	−0.054	0.009	0.009
Gender	−0.371	−0.351	−0.319	−0.300	−0.217	−0.193
Education	−0.040	−0.029	−0.114	−0.103	−0.032	−0.018
Prior startup experience	0.140	0.073	0.180	0.115	0.190	0.106
Prior work experience	−0.206	−0.245	−0.135	−0.174	−0.072	−0.122
Family-owned business	−0.053	−0.040	−0.164	−0.151	−0.096	−0.080
Business incubation	—	0.267***	—	0.262***	—	0.336***
R^2	0.031	0.115	0.037	0.127	0.020	0.159
Adjusted R^2	0.014	0.097	0.020	0.109	0.002	0.142
F	1.784	6.251***	2.171	6.983***	1.140	9.093***

Table 6: Mediation analysis

	Innovation speed					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Startup age	−0.140	−0.140	−0.121	−0.130	−0.142	−0.124
Gender	−0.133	−0.097	−0.001	−0.040	−0.061	−0.004
Education	−0.165	−0.145	−0.137	−0.126	−0.142	−0.141
Prior startup experience	0.118	−0.005	−0.025	−0.027	−0.025	−0.026
Prior work experience	0.006	−0.068	−0.001	−0.035	−0.045	−0.002
Family-owned business	−0.121	−0.097	−0.086	−0.069	−0.082	−0.089
Business incubation		0.494***	0.422***	0.445***	0.432***	0.416***
Exploratory learning			0.272***			0.273***
Transformative learning				0.189***		−0.047***
Exploitative learning					0.187***	0.054***
R^2	0.019	0.265	0.321	0.289	0.289	0.322
Adjusted R^2	0.001	0.250	0.305	0.250	0.272	0.302
F	1.067	17.338***	19.797***	17.053***	17.053***	15.835***

able dimensions. If there was a mediation effect, the effect of the independent variable would decrease or even become insignificant.

Tables 4–6 present the results of hierarchical multiple regressions. Table 4 reports the regression results of business incubation and innovation speed. The results showed that the incubation mechanism had a significant impact on innovation speed. This empirical result firmly supports H1.

Table 5 shows the regression analysis results of business incubation and absorptive capacity dimensions. Models 1, 3, and 5 involved only the control variable, whereas Models 2, 4, and 6 indicated that business incubation had a significant impact on absorptive capacity dimensions such as exploratory learning, transformative learning, and exploitative learning. Thus H2, H2a, H2b, and H2c are supported by the data. Overall, there was a significant positive effect of business incubation on absorptive capacity dimensions.

Table 6 presents the mediating effect of absorptive capacity dimensions on the relationship between business incubation and innovation speed. Model 1 involved only control variables, and Model 2 tested the effect of business incubation on innovation speed. On the basis of the two models, exploratory, transformative, and exploitative learning were added to the analysis. Compared with Model 2, the results of Models 3–5 indicated that exploratory learning (β = 0.272, p < 0.001), transformative learning (β = 0.189, p < 0.001), and exploitative learning (β = 0.187, p < 0.001) had a direct effect on innovation speed and had a significant positive mediating effect. Therefore H3, H4a, H4b, and H4c are supported. In Model 6, when the three types of learning were included, each had a significant effect on innovation speed, whereas transformative learning had a negative effect (β = −0.047, p < 0.001).

To further test Hypothesis 4 to determine the mediation effect of absorptive capacity, we followed the bootstrapping method recommended by Hayes (2013), using a Process macro. We bootstrapped 5,000 samples to obtain a 95% bias-corrected confidence interval for the mediation effect. The path (direct effect) from business incubation to absorptive capacity was positive and significant (b = 0.2929, standard error = 0.0600, p = <0.001), indicating that if improved business incubation facilities are provided, the absorptive capacity of startups increases. The direct effect of absorptive capacity on innovation speed also was positive and significant (b = 0.2858,

standard error = 0.0566, $p < 0.001$), indicating that greater absorptive capacity and knowledge building ability of startups increases rapid technology commercialization and innovation speed. The results obtained prove that the indirect effect of business incubation on innovation speed through absorptive capacity dimensions (indirect effect = 0.2041; 95% confidence interval = 0.1014, 0.3003) is significantly positive. The results again prove H4a, H4b, and H4c.

5. DISCUSSION AND CONCLUSION

We found that business incubation and absorptive capacity dimensions (mediator) are positively and directly associated with innovation speed. From a theoretical perspective, our study provides additional empirical evidence that giving young startups effective business incubation may lead to higher levels of innovation and product success. The results are consistent with those of previous studies by Patton (2014) and of Scillitoe and Chakraborti (2009) regarding the incubator knowledge ecosystem and its impact on innovative outcomes of startups. It also addresses a call made by Eveleens and Rijnsoever (2016) related to the need to examine the quality of relationships within the incubator ecosystem in order to better understand the dynamics of knowledge sharing for generating innovation among incubator firms. Additionally, the findings provide an understanding of how entrepreneurial learning influences small-firm innovation. In their pursuit of knowledge, intellectual entrepreneurs push their firms to achieve rapid innovation through the incubation network. However, the pursuit of rapid innovation by intellectual entrepreneurs requires an entrepreneurial process that leads to fulfilling the goal. ACAP realizes this role (Zahra & George, 2002). Through its emphasis on exploratory, transformative, and exploitative learning in the pursuit of new opportunities, ACAP enables the identification and development and of creative ideas for small-firm performance (Jansen et al., 2005).

One of the major objectives of this study was to analyze the mediating effect of absorptive capacity, and the study found a significant mediating effect of absorptive capacity, which is consistent with previous studies (Aljanabi, 2018; Hernández-Perlines & Xu, 2018). Unlike previous research that focused on the nature of business incubators (Hackett & Dilts, 2008; Voisey et al., 2006; Grimaldi & Grandi, 2005), this study highlighted the content that flows through the relationship between an incubator and incubator firm, specifically the internal and external knowledge flow. Although the type, model, and use of services may differ among incubator firms (Voisey et al., 2006), as previous research suggests, the resources that every startup seek within incubators and the use they make of these resources may be the same. This finding is also consistent with those of Voisey et al. (2006) and Claussen and Kornelieussen (2012), which indicates that all startups receive a similar type of support from their business incubators, but they excel differently due to their varying capabilities in learning to explore, transform, and exploit. Thus the study used the concept of learning to develop the theoretical arguments concerning how a learning strategy such as ACAP (Engelens et al., 2014) can enhance faster innovation in a resourceful environment, thereby addressing Hackett and Dilts' (2008) call for research on how to improve business incubation mechanisms for fruitful outcomes.

5.1 Theoretical and Practical Implications

This study could be the starting point for proposing new or improved public policies to invest in the world of innovation and entrepreneurship through the role of incubators. From a theoretical point of view, this manuscript has advanced the organizational learning literature by highlighting the role of incubation as an antecedent for learning and innovation. One of the study's key propositions is that business incubation induces and enhances organizational learning. The results are equally important for incubators and incubator firms because it documents the various types of knowledge a firm might gain from incubation. This finding indicates that potential market speed depends on having the requisite absorptive capacity. Therefore, startups need to identify gaps within their knowledge, receive adequate incubation support to resolve these gaps, and eventually, through learning, apply their enhanced competencies to attain rapid innovation. Incubation acts as a tool for startups, mentors, and managers to collaborate effectively to build the required absorptive capacity.

Therefore, absorptive capacity is connected not only to new entry but also to how easily new entry is achieved. This paper highlighted and confirmed that absorptive capacity is one such source of startup innovation performance. Another important aspect is that we concentrated on incubator companies rather than on incubators to explain why incubator companies vary in terms of performance (i.e., innovation speed). It has been argued (Ayatse et al., 2017; Dee et al., 2019) that much research has been done at the incubator level on the economic performance of incubators, whereas few studies have examined the driving forces behind incubator firm performance. Our findings suggest that such a firm-level outlook is indeed useful and that more work should be conducted at the firm level to better understand incubator outcomes.

We also seek to open a new research area focusing solely on the innovation speed of incubator firms. Most previous research focused on incubator and incubator firm performance by contrasting and comparing incubator firm performance with that of non-incubator firms as a controlled group. As an alternative to focusing on economic performance, which is similar to the measure of large companies, this study explained the driving force for performance. We assume that this is a significant strand of literature that provides interesting insights into whether incubator programs have their intended effects on startups to achieve the required momentum for innovation. Furthermore, we contend that it is important to focus solely on incubator firms and to explain the innovation performance, which provides parallel insights and interpretations in contrast with research focusing solely on incubator economic performance. Insight into how incubator managers can better assist and enhance their tenant firms' growth, speed, and performance can be obtained when researchers analyze performance sources within incubated firms.

5.2 Limitations and Future Research

This paper adopted the Hackett and Dilts (2008) model of business incubation, which includes three factors explaining the business incubation process. Although it is the most-accepted framework of incubation, there may be additional mechanisms affecting incubated firms depending on the nature of business incubation services offered by a specific country. Therefore future research should consider other attributing mechanisms, mainly due to varying country contexts that require investigation and develop contributing relationships.

In addition, because the results are based on business incubation survey measures, other sources of data should be considered. Although we presented results of reliability and validity, secondary data can contribute to the accuracy of our empirical findings. The study used the exploratory, transformative, and exploitative measures of the firm to evaluate the function of the absorptive capacity, which is a common measure in the literature. The robustness of our findings can be established by alternative measures of absorptive capacity. These measures might include a firm's ability to absorb, assimilate, transform, and exploit available knowledge.

One of the main propositions of the study is that business incubation facilitates organizational learning. Learning is not an automatic outcome of business incubation, and incubators have to dedicate the resources necessary to form the processes that initiate and encourage learning among startups. Therefore, researchers need to explore a generalized incubator model that can enhance learning through business incubation. Because in this study business incubation consisted of selection criteria, monitoring and assistance, and resource munificence, it would be helpful to determine whether these areas can be improved, augmented, and altered by the incubator managers to cater to the specific requirements of incubated firms.

Another important question is whether business incubation, absorptive capacity, and innovation speed are connected with an incubator firm's economic performance. It is important to examine this relationship. In the end, what is important is the actual economic results produced by incubator firms. Another limitation of our study is that all the main variables were measured based on a single survey, which might lead to common method bias. However, the data were collected in a cross-sectional design, measured as a paper-and-pencil exercise, and

some were collected through online survey. By using two different modes of data collection, our design can mitigate the bias resulting from common method variance.

Furthermore, a comparative study of incubator and non-incubator firms will lead to more insights on the various differences in absorptive capacity and innovation speed among startups, which can establish the need of incubators to promote the startup community for economic growth and innovation. Future research can consider comparative studies that will further substantiate our findings.

EXTENDED SUMMARY/IZVLEČEK

Za zagonska podjetja (angl. startups) je značilna visoka stopnja »umrljivosti« – le-ta je veliko višja kot pri večjih, že dobro uveljavljenih podjetjih. Številni raziskovalci verjamejo, da podjetniški inkubatorji pomagajo kot podpora in spodbujajo podjetniški razvoj z ustvarjanjem mreže znanja in virov. Kljub temu jih je vpliv podjetniških inkubatorjev na pridobivanje znanja, ki vodi do hitrejših inovacij v primerjavi s konkurenco, proučevalo le nekaj. Ta študija je s pomočjo različnih virov in teorije organizacijskega učenja raziskovala učinek ter mehanizem podjetnniških inkubatorjev na absorpcijsko sposobnost in hitrost inovacij zagonskih podjetij na področju Indije. Z uporabo anketnih podatkov iz vzorca 344 tehnološko intenzivnih inkubatorskih podjetij v Indiji smo pokazali, da inkubacijski mehanizmi, kot na primer uspešnost izbire podjetniškega inkubatorja, spremljanje in intenzivnost poslovne pomoči ter pomembnost virov, pomagajo zagonskim podjetjem pri raziskovanju, preoblikovanju in izkoriščanju znanja ter informacij za hitro uvedbo tehnologije in izdelkov na trg. Podatki so bili analizirani s pomočjo hierarhične analize, mediacija pa je bila preizkušena z uporabo metode Barona in Kennya (1986) in PROCESS makrom, ki ga je razvil Hayes (2013). Rezultati študije dokazujejo, da so razsežnosti absorpcijske zmogljivosti, kot so eksplorativno, transformacijsko in eksploatacijsko učenje med zagonskimi podjetji, povečane s storitvami podjetniških inkubatorjev, kar rezultira v hitri komercializacija tehnoloških izdelkov.

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