Introduction to the *Handbook of Research on Business and Technology Incubation and Acceleration*

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THE NEED FOR THIS *HANDBOOK*

The motivation to write this *Handbook* came from the continued and widespread interest and use of the business and technology incubation mechanisms, which have been in vogue for well over the last six decades. The interest in these ‘novel’ venture development tools has continued to burgeon particularly over recent decades (Mian et al. 2016; Galbraith et al. 2019). Incubation mechanisms’ use as intermediaries has matured, particularly among the policy circles developing pro-active and dynamic knowledge and technology-based regional entrepreneurial ecosystems; and is a well-accepted policy development (Goswami et al. 2018; Audretsch and Keilbach 2004; Audretsch et al. 2019). Their successful organizational and bridging role and professionalization of policies can be witnessed through better integration of the venture development activities with the surrounding environment, the acquisition of resources, thoughtful tenant recruitment, as well as a focus on societal concerns such as sustainability, green technology and equal opportunity issues (Lamine et al. 2018; Bank et al. 2017). By now, incubation mechanisms have become an integral part of the lexicon of new venture development and an essential component of any modern entrepreneurial ecosystem, supporting the growth of innovative economy based on a broad range of measures (Hausberg and Korreck 2020).

Despite the worldwide acceptance and growth of various incubation mechanisms there is no authentic research-based publication to provide policy, program design and operational guidance (Mian et al. 2016; Phan et al. 2016). This *Handbook* is intended to fill this gap in the new venture support literature based on incubation and take a forward-looking approach within this research and policy area.

For this purpose, the editorial team reached out to several well-known scholars, accomplished writers and experienced practitioners of business and technology incubation and invited them to participate in this pioneering project. In this endeavor, we have succeeded in involving several dozen accomplished scholars and practitioners from different parts of the globe, including Europe, North America, Asia, Latin America, Africa, and Australia. The key objective was to educate the reader with a solid research-based analytical platform from which to make incubation program planning, development, and assessment decisions. In doing so the work will provide a foundational understanding of the emerging role of modern incubation tools in promoting ecosystem development for targeted entrepreneurial growth.

This first *Handbook* focusing on both the theory and practice of business and technology incubation and acceleration offers several distinguishing features: a broad coverage of major incubation mechanisms, wider international scope, and economic as well as social use of the tools. We believe, the *Handbook* will not only deepen our understanding of the

incubation approach to new venture development for achieving targeted economic and social objectives but will uniquely equip researchers, policy-makers and practitioners to more confidently handle and build their future business and technology incubation and acceleration programs, and entrepreneurs to benefit from their effective use.

We hope to shed new light by presenting thoughtful analyses of worldwide cases of incubation and acceleration programs drawn from varying and diverse contexts. These cases are written by some of the best-known authors in the field representing relevant academic disciplines (economics, business and management, science and engineering, geography, and regional planning) including some with rich practitioner backgrounds, providing their experiential perspectives. This fills a long-standing need of a premier source of state-of-the-art authentic information on this important and timely subject of economic development through new ventures with the help of incubation tools.

OVERVIEW OF THE CONTRIBUTIONS

In this section, we introduce different parts of the *Handbook*, and summarize the chapters providing an overview of each contribution (Table 0.1). A total of 29 chapters authored or co-authored by more than 60 scholars, researchers, and senior practitioners are organized into four parts covering key themes of (I) Understanding Incubation and Acceleration (II) Incubation Mechanisms and Entrepreneurship Ecosystem Development (III) National/Regional Incubation Policy Studies (IV) Incubation Practice and Assessment.

Part I: Understanding Incubation and Acceleration

To begin, Chapter 1 ('Whither modern business incubation? Definitions, evolution, theory, and evaluation' by Sarfraz A. Mian) articulates definitional challenges, presents evolution of incubator models, use of theoretical lenses, and program evaluation for benchmarking. The author asserts that after six decades of use incubation mechanisms have matured, and they continue to be popular policy tools for planned entrepreneurial development, preferably as part of an entrepreneurship ecosystem. Future challenges are identified to include refinement in theory, incubator program sustainability, well-developed benchmarking matrices, use as pedagogy for experiential learning, addressing social equity, and better use of digitization and emerging new technologies. The chapter concludes with a call for further consolidation and refinement of the incubation field through authentic study and reflective practice.

Chapter 2 ('Business incubators and accelerators: a co-citation analysis-based, systematic literature review' by J. Piet Hausberg and Sabrina Korreck) continues the theme and further articulates the contributions made in the field of incubation by extending the analysis to include newer models and approaches such as accelerators along with the increasing role of open innovation, social capital theory, and the resource-based view as frameworks to understand incubation. Three study streams: definitions and typologies of incubators, studies on the incubation process, and studies on impact and performance, are explored in detail. This systematic literature review further highlights worldwide research activity by identifying prominent researchers, publication outlets, and world

Table 0.1 *Chapters in the Handbook of Research on Business and Technology Incubation and Acceleration*

Authors (Countries)	Questions Addressed	Lessons and Recommendations
<i>Part I: Understanding Incubation and Acceleration</i>		
Sarfraz A. Mian (USA)	How do we define incubator mechanisms? What do we understand about the process and theory of business incubation? How have incubation models emerged over the past decades? How to assess incubation programs to develop best practice models? What is incubation's future direction?	Incubation has emerged as an established concept. An array of incubation models with overlapping objectives and functions make definitions and assessment challenging. The traditional models are maturing and new models such as accelerators are emerging. Multiple theoretical lenses used. Search for a unified theory continues.
J. Piet Hausberg and Sabrina Korreck (Germany)	What does a systematic review and with co-citation analysis of incubation literature reveal? What are the key areas of study, prominent researchers, and trends in incubation research?	The research shows the use of open innovation and social capital theory, which complement the resource-based view as a framework to understand incubation. Key areas of study, research trends, active researchers are highlighted.
Henry Etzkowitz (USA)	How should the practice of incubation evolve within an entrepreneurial university as a learning tool for entrepreneurship?	This chapter emphasizes a broader definition and role of incubation as an experiential learning approach in academe. No organizational boundaries are envisaged.
Jonas Van hove, Jana Thiel and Bart Clarysse, (Switzerland)	How are accelerators adding value by nurturing varied types of technology venture? What design adjustments are warranted for deep-technology firms?	Accelerator design needs to be adapted based on tenant types. Unlike the digital and mobile start-ups, deep-tech ventures require flexibility in opportunity selection while minimizing the risks in opportunity execution.
Alberto Albahari (Spain)	Why governments and universities invest in science parks? And why start-ups and mature firms decide to locate in a science park?	Proximity to talent and research, high value-added services, and the perceived image are the major reasons why science parks are supported and are attractive to start-ups.
<i>Part II: Incubation Mechanisms and Entrepreneurship Ecosystem Development</i>		
Mark Rice and Erik Noyes (USA)	How to define the boundary between an incubator and the ecosystem in which it operates? And what is the nature of the flow of 'value' between incubators and the larger ecosystem?	Given that elements of an entrepreneurship ecosystem are interconnected/overlapping, it is difficult to isolate any component and find directionality of inputs. The ecosystem is a dynamic incubator of individuals, ventures, institutions, and resources.
Magnus Klofsten and Dzamila Bienkowska (Sweden)	What is the role of business incubators in developing sustainable entrepreneurial ecosystems around them?	Through external collaborations, incubators should integrate competence on sustainable business development into their daily operations.
Josep Miquel Pique, Aline Figlioli, Francesc Miralles, and Jasmina Berbegal-Mirabent (Spain and Brazil)	How does the role of Triple Helix (Gov-Ind-Univ) agents modify over the lifecycle of modern urban science parks that combine talent, technology, and capital in developing an innovation milieu for entrepreneurial growth?	Authors combine Triple Helix theory, knowledge-based urban development, clusters theory, and lifecycle of a venture as theoretical lenses to develop a model. The model is applied to a comparative assessment of 22@Barcelona (Spain) and Porto Digital in Recife (Brazil).

Table 0.1 (continued)

Authors (Countries)	Questions Addressed	Lessons and Recommendations
Cornelis Eldering and Wim Hulsink (the Netherlands)	What are the contributions of the European Space Agency's Incubation Centers (ESABIC) to the commercial sector?	Using an extensive network of incubators, a brokerage model of technology push and market pull is used to transfer space technology to existing private companies.
Marnie LaVigne (USA)	What are the key characteristic of US VDOs? What is the role of VDO programs in incubating high-growth technology start-ups in the Central New York region?	VDOs have to be in tune with the changing dynamics of start-up support in their market, nimble in adapting and pivoting their organization, open to strategic partnerships, and willing to bootstrap as they gain traction.
Nasir Ali and Michael D'Eredita (USA)	What role does incubation and acceleration mechanisms play in developing the entrepreneurial ecosystem of an economically challenged city/region?	Using Sarasvathy's effectuation thinking coupled with Feld's ecosystem framework, the authors showed how a city's transformation can be realized by the mindset and actions of its start-up community builders.
<i>Part III: National/Regional Incubation Policy Studies</i>		
Laura Lecluyse and Mirjam Knockaert (Belgium)	What are the key characteristics and activities of European Science parks, using an organizational design perspective?	Most European science parks are established for similar reasons. However, research shows significant variations exist among the parks regarding their structures and activities.
Nobuya Fukugawa (Japan)	How did the characteristics of Japanese entrepreneurship ecosystems evolve with the way the country's incubation intermediaries have emerged and developed?	In Japan, sectoral patterns of incubation support are advocated which require examination of whether the characteristics of incubators adapt to the start-up's needs (technologies, life-cycle stages) to fit with regional contexts.
Li Xiao, Cunjun Wang and Zhi Zu (China)	What is the relative involvement of public and private sponsors of incubators in supporting innovative start-ups in Guangdong, China's innovation hub?	Incubators' future policies should enable them to make contextual adaptations in collaboration with corporate and state actors to adjust their roles to fit with local needs and environments for successful entrepreneurial activity.
Supriya Sharma and Neharika Vohra (India)	What are the temporal and evolutionary patterns of incubation in India? Based on the analysis of nationwide incubation schemes, what are the lessons and future promise of incubation?	For the success of an incubation program a symbiotic partnership between government and academia, talented and driven incubator personnel and developing relevant performance measurement metrics are imperative.
Shahid Qureshi, Syed Zahoor Hassan and Sarfraz Mian, (Pakistan and USA)	How have the incubation support programs developed in Pakistan? What are the roles of state, university, and private actors in various national incubation schemes?	A program assessment framework is proposed and applied to various incubation programs in the country. The analysis shows that despite a number of initiatives the jury is still out in terms of the impact of these programs.
Tiago Ratinho and Michael Mitsopoulos (Portugal and Greece)	Why and how the adaptations experienced by the five newly established incubation programs have varied in the different regional contexts of Greece?	The findings challenge common boundaries of incubation programs while suggesting that entrepreneurship support responds to systemic needs of the wider ecosystem.

Table 0.1 (continued)

Authors (Countries)	Questions Addressed	Lessons and Recommendations
Guilherme Ary Plonski, Claudia Pavani and Sheila Oliveira Pires (Brazil)	How has the Brazilian incubation landscape shaped in light of the policy changes? What is the future scenario of incubation in the country?	Starting mid-1980s, governments at all levels have collaborated with universities to experiment with broad incubation applications which continue to reshape the national incubation landscape with a promising future.
Maribel Guerrero (Mexico)	What is the role of incubators/ accelerators in the Latin American entrepreneurial ecosystems?	Pointing toward a dearth of incubation research in the area, the author identifies several policy patterns and discusses new challenges/trends in Brazil, Chile, Colombia, and Mexico.
Wassim Aloulou (Saudi Arabia)	How do the emerging business incubation programs support the entrepreneurial ecosystem in Saudi Arabia?	Saudi Arabia has a burgeoning and dynamic incubators and accelerators ecosystem. The author presented a taxonomy of incubators across the country.
Jasmine Meysman, Sven De Cleyn and Johan Braet, (Belgium)	Does government funding for incubators generate a return for society and how could that be measured?	Incubators generate a net profit for the society. Second-tier tax income has a higher impact compared to direct company profit tax.
David Hochman (USA)	What are the growth patterns of the New York State's (NYS) incubation support infrastructure during the decade of 2005–2016? What is the future direction in the NYS's incubation business?	NYS with an activist government and vigorous private business/financial sector presents a wide range of incubators and investments over the past decade. But they have also raised the bar for performance and relevance in the development of future incubation programs.

Part IV: Incubation Practice and Assessment

Ali Ahmad (UK)	What role heuristics and biases play in decision-making in the client selection process at university incubators? How is this decision-making conundrum addressed?	To minimize the role of systematic biases and effort of mental shortcuts, or heuristics, during the client selection decision, a new 'entrepreneurial readiness' heuristic is proposed to aid decision-making using a set incubator-specific criterion.
Chaffick Bakkali, Karim Messegheem, Sylvie Sammut, and Adelaziz Swalhi (France)	In nonprofit government programs, are incubation process and tenant selection strategy really the determinants of success? Does one make more difference than the other?	The selection strategy and the incubation process are two key factors for nonprofit incubator performance. A combination of strict selection strategy and an efficient incubation process will lead to successful incubator performance.
Danny Soetanto and Magnus Klofsten (UK and Sweden)	What type of networks are developed by tenants within incubators compared to the networks of other firms which are located outside the incubator?	Entrepreneurs located on and off incubators establish different recourse in networking patterns. The success of incubation process is influenced by the networking support to incubatees who develop and change network during their entrepreneurial journey.
Lise Aaboen, Kari Djupdal, Dag Håkon Haneberg,	How does time spent in the student incubator and the type of services provided influence the development	Incubators need to be patient and aware of the extensive time it takes to develop key venture-creation skills. The short-

Table 0.1 (continued)

Authors (Countries)	Questions Addressed	Lessons and Recommendations
Vetle Slagsvold Øien, Torgeir Aadland, and Roger Sørheim (Norway)	of student entrepreneurs' venture- creation skills?	term programs such as 'hackathons' in comparison do not add much value in terms of skills development.
Martin Bliemel, Steven D'Alessandro, Saskia de Klerk, Ricardo Flores, Geoff Harrison, and Morgan Miles (Australia, Canada, and New Zealand)	What are the descriptions and perceptions of the value of mentorship as understood by the accelerator managers?	The impact of mentors in accelerators might be more educational, reflective, and intangible than previously addressed in the research.
Klaus Fichter and Karsten Hurrelmann (Germany)	What constitutes a framework of sustainable business incubation in an ecosystem development sense?	Sustainability-oriented business incubation should be incorporated in the development of a sustainable entrepreneurial ecosystem.
Hans Löfsten (Sweden)	What are the differences between New Technology-Based Firms (NTBF) incubatees and non-incubator firms in terms of business performance?	Firm dimensions: growth orientation, external financing, partnerships, and business networks are considered more important by incubatee NTBFs than outside NTBFs. So, there are significant differences between NTBFs on and off incubators in their business performance.

regions which contribute to the scholarly effort deriving current themes and a future research agenda.

Chapter 3 ('The movement from incubator to incubation in the entrepreneurial university: past, present and future' by Henry Etzkowitz) turns our attention to a broader educational role of incubation. According to the author, a transition is underway from the incubator, as a distinct organizational and physical entity to support the early stages of firm formation from academia, to incubation as a distributed function, ranging across and integrating the university's education, research and out-reach missions. The shift from 'narrow' to 'broad' incubation, from incubator facility to incubation function is highlighted. The author asserts that within academe this includes translational research and entrepreneurship training prior to firm formation and participation in mentoring to financing and other growth phases of the entrepreneurial project through a variety of innovative formats. This, according to him, is a part of legitimating entrepreneurship as the third academic revolution spearheaded by an 'entrepreneurial university'.

Chapter 4 ('Fiddling around with the startup engine: exploring acceleration patterns in technology ventures' by Jonas Van hove, Jana Thiel, and Bart Clarysse) brings our attention toward the heavy use of accelerators for digital start-ups, and the need to know how typical accelerators affect important outcomes like investor readiness and attractiveness of high-tech and science-based ventures to commercialize. The authors investigate

by looking at the relationship between accelerator-based experimental learning and outcomes across indicators of venture performance and identify the emergence of distinct learning paths over time, culminating in different venture outcomes upon exit from accelerator. They explore linkages between these learning paths and venture conditions of technological readiness and prior market knowledge in the team. The findings provide insights that are important for accelerator design and practice.

Chapter 5 ('The logic behind science and technology parks' by Alberto Albahari) discusses the logic behind the use of Science and Technology Parks (STPs) which are built to establish an entrepreneurial and innovation milieu. The author finds these incubation mechanisms still popular in several parts of Europe and elsewhere with a large number of STPs worldwide. Several national and local governments have invested heavily in STPs; for instance, in Spain, central and local government innovation policies have very much focused on STPs. In other countries, such as the UK, most STPs are university initiatives. The author addresses key questions such as: Why are these governments and their universities investing in STPs as a major innovation and local development policy tool? And why are many new technology and knowledge-based start-ups as well as established firms located in a science park? Finally, the author proposes theoretical arguments and rationale to address the above questions.

Part II: Incubation Mechanisms and Entrepreneurship Ecosystem Development

Chapter 6 ('Incubators as catalysts in entrepreneurship ecosystems' by Mark P. Rice and Erik Noyes) employs an ecological perspective to investigate the important role which incubation mechanisms play in the development of an entrepreneurship ecosystem. This chapter examines the various boundaries between incubators and the entrepreneurial ecosystems in which they operate. The authors examine the historically shifting boundaries between incubators and their regional environments of ideas, talent, and resources. They analyze the origin stories and evolution of incubator-ecosystem boundaries for three prominent university incubation programs and probe the input-output relationships between incubators and their surrounding resource bases, aiming to map the changing locus of value-creation vis-à-vis boundaries. The chapter emphasizes the need to sustain dynamic markets for ideas, capital, and talent, which in turn periodically requires resetting boundaries between incubators and the entrepreneurship ecosystem.

Chapter 7 ('Business incubators within entrepreneurial ecosystems: sustainability aspects of new venture support and development' by Magnus Klofsten and Dżamila Bienkowska) explores incubators' challenges in developing sustainable entrepreneurial ecosystems. A survey of 96 incubators from three European nations shows how many of them, perceived to be profiled as environmentally sustainable, are, however, desirous of more concrete actions to fulfill such ambitions. The Incubators' sustainability engagement was assessed using an index, which shows that German incubators had relatively more cases of sustainability forerunners but also have many laggards; while most of the Swedish respondents were either strivers or fledglings without any forerunners; and a majority of Finnish respondents were laggards with only one forerunner. The authors recommend that incubators integrate competence on sustainability in daily operations and collaborate with each other to find ways to enhance their sustainability engagement.

Chapter 8 ('The role of modern urban science parks in developing entrepreneurship

and innovation ecosystems' by Josep Miquel Pique, Aline Figlioli, Francesc Miralles, and Jasmina Berbegal-Mirabent) highlights how active partnerships among university, industry, and government (Triple Helix, TH) can support the development of urban science parks (USP) as enabling incubation mechanisms for innovative start-ups. The chapter presents a conceptual framework that combines theoretical lenses of Triple Helix, Knowledge-Based Urban Development, Clusters of Innovation, and Lifecycle of a New Venture, which aims at improving the current understanding of how USPs evolve, and how the role of TH agents change over the lifecycle of USPs. Application of the framework is illustrated by a comparative case study of two prominent USPs, 22@Barcelona (Spain) and Porto Digital in Recife (Brazil).

Chapter 9 ('Incubation with space – space for incubation: the European Space Agency's network of business incubation centers', by Cornelis Eldering and Willem Hulsink) articulates the European Space Agency's (ESA) efforts to commercialize market-proven applications for use by non-space business organizations outside ESA, while the start-up entrepreneurs who apply the technologies are not sourced by ESA itself, but come from a variety of backgrounds, i.e. external entrepreneurs and consultants. The authors explore the history, lessons learned, and guiding principles that have shaped the basis of the ESA Business Incubation Center (BIC) approach of managing 20 business incubators in 60 locations across Europe with the same operational procedures. They focus on local entrepreneurs and their resources which are part of a regional economic development strategy and are operated by local partners.

Chapter 10 ('Incubating high-growth technology firms through venture development organizations: an overview of the US and the case study of Launch NY' by Marnie LaVigne) introduces the venture development organizations (VDOs) used for incubating innovation-based businesses with high-growth potential. Typically structured as non-profits in the US, VDOs include two main components: mentorship and capital access. As highlighted by information on more than a dozen VDOs in the US, they can vary on several dimensions such as their target audience, breadth of business support and financing programs, and metrics that ideally are tailored to the needs of their local and regional economic development strategies. The chapter features a case study of the development and growth of Launch NY, a nonprofit VDO formed in 2011 serving a 27-county urban and rural region in the western half of New York State.

Chapter 11 ('Incubators as centers of collaboration and alignment in resource constrained regions' by Nasir Ali and Michael D'Eredita) chronicles the transformation of Syracuse, New York's downtown area, by unleashing the local entrepreneurial potential and innovative talent with the help of an incubation strategy. The creation of Tech Garden (an incubator) served as a rallying point for public-private collaborations. A youthful and vibrant college educated entrepreneurial community steadily emerged, and the collective impact was increased by the return of locally rooted firm founders to co-locate their national and global businesses within the now gentrified city center. The authors trace the history of the ecosystem building process; filling the need of high-growth models, mentors, and risk capital in the local area; and the success achieved by tapping into overlapping networks of local business leaders, college alumni, and expatriate entrepreneurs.

Part III: National/Regional Incubation Policy Studies

Chapter 12 ('Science parks in Europe: a comparison of science park characteristics and activities in Belgium, Spain and Denmark' by Laura Lecluyse and Mirjam Knockaert) comprises of an exploratory study of 42 science parks in three European nations. Unlike previous studies, which often relied on a small number of cases or focus on a single region, lacking a unified understanding of science park characteristics and facility designs, this study attempts to draw a more comprehensive picture of science parks in Europe by comparing and contrasting science park characteristics and activities using an organizational design perspective. The findings show significant differences and some similarities between science parks in terms of organizational purpose, structure, activities, and personnel. This work contributes to the science park literature and holds important implications for science park managers, policy-makers, and their tenant firms.

Chapter 13 ('Emergence and development of entrepreneurship and innovation intermediaries: the case of business incubators in Japan' by Nobuya Fukugawa) provides an overview of the Japanese incubation policy scenario where incubators act as intermediaries in the broader regional innovation ecosystem. According to the author, the initial private sector attempts in the early 1980s to establish incubation programs were unsuccessful because of the system failures rendering the public sector a key founder of new wave of incubators. The resulting policy changes rapidly increased incubators until the early 2000s under regional development policies that aimed to reallocate high-tech agglomerations without focusing sectoral opportunities. New macroeconomic challenges in the 1990s forced policy-makers to reach out to individual entrepreneurs, with a fundamental shift from hard support to soft support measures. The last three decades of results suggest that policy goals and support instruments had changed according to changes in the system requirements.

Chapter 14 ('The role of technology business incubation in supporting innovative start-ups in China' by Li Xiao, Cunjun Wang, and Zhi Xu) uses the empirical data from China's Guangdong province to show that corporate private investors overtake government and universities, with the former accounting for two-thirds of the most advanced Technology Business Incubators (TBIs) in the region. However, the fund size of government TBIs is two to three times larger than that of private TBIs, and government TBIs are generally more attractive to high-tech ventures for this reason. Considering TBIs in China as a whole, the effects of support services by TBIs on the performance of tenant start-ups are shaped by both TBI ownership and other exogenous factors. The authors assert that Chinese TBIs therefore should make contextual adaptations and adjust their roles to fit with local environments to promote entrepreneurial activity.

Chapter 15 ('Indian business incubation ecosystem: a multilevel analysis' by Supriya Sharma and Neharika Vohra) provides a comprehensive account of incubation programs in India with an objective to assess their role and impact on start-ups, understanding the challenges faced by the local incubation industry. A survey of 22 incubation centers funded by a government scheme was conducted with in-depth interviews of incubatees; this was supplemented with secondary data collected from 284 incubators across India, which included the four largest incubator support schemes in the country. The purpose, objectives, processes, and success metrics of incubators specific to the Indian context are discussed. Findings from this chapter are considered useful to researchers, policy-makers and incubation champions from emerging economy nations pursuing such programs.

Chapter 16 ('Business incubation and acceleration in Pakistan: an entrepreneurship ecosystem development approach' by Shahid Qureshi, Syed Zahoor Hassan, and Sarfraz A. Mian) presents the state of incubation industry in Pakistan. Using the 5P framework (Purpose, Patrons, Process, Potential, Pitfalls) a survey and assessment of more than 40 major incubation programs (including the flagship National Incubation Centers, Public University Incubators, Private University Incubators, Semi-government Autonomous University Incubators, Virtual Incubators and Accelerator programs) is carried out with the help of in-depth interviews of program managers; and the data is supplemented from secondary sources. This comprehensive analysis of various incubator program models and their impact on incubated firms led to several insights, which are presented in the form of recommendations for government policy-makers, university administrators, and private sector stakeholders, with lessons for other developing countries like Pakistan.

Chapter 17 ('New forms of entrepreneurship support in a growing entrepreneurial ecosystem: the case of incubation in Greece' by Tiago Ratinho and Michael Mitsopoulos) describes Greece's incubation support programs for the provision of valuable resources for start-ups. This chapter presents a study based on five new incubation programs in Greece, with a nascent and growing entrepreneurial ecosystem. The authors show that each program offered a unique form of entrepreneurship support to address the area's systemic needs. These emerging models blend several defining aspects of other well-known entrepreneurship support sources. The authors argue that future models of entrepreneurship support are not dependent on incremental improvements of traditional support sources and are likely to emerge due to localized systemic needs. The chapter concludes with implications for business incubator managers, prospective tenants, and public policy-makers.

Chapter 18 ('The development and practice of incubation mechanisms in Brazil' by Guilherme Ary Plonski, Claudia Pavani, and Sheila Oliveira Pires) describes the evolution of business incubators in Brazil, which started by a governmental initiative in 1984; their slow initial pace changed in 1994, due to radical improvements in the macroeconomic situation. The number stabilized in 2006 and Brazil currently has 363 incubation programs nationally. In addition to this there are several business accelerators and science parks in the country. A recent survey done by the authors showed that 60 percent of the incubators in the country are connected to and maintained by universities. The three main beneficiary economic sectors are information technology, agribusiness, and health and life sciences with the creation of 70 000 jobs, and the generation of US\$6 billion gross income. Among future trends affecting Brazilian incubators are the diversification and dissemination of innovation habitats and the multiplication of spaces hosting start-ups that are mere real-estate projects, without value-added services.

Chapter 19 ('The role of incubators and accelerators in the Latin American entrepreneurial and innovation ecosystems' by Maribel Guerrero) highlights the diversity in incubation mechanisms used in the region. This diversity is manifested in the form of public-private partnerships with mixed organizational structures to support the creation and development of entrepreneurial initiatives, over the past several decades. Prior literature on incubation has predominantly paid attention to the North American and Western European experience with little or no mention of the developing economy contexts (e.g., Latin America, Asia, and Africa). Inspired by the academic discussion, this chapter aims to discuss the role of incubators and accelerators in the Latin American entrepreneurial

ecosystems. The author identifies several developmental patterns as well as discussing new challenges faced by the incubation industry. Several implications for academics, university managers, and policy-makers emerge from these findings.

Chapter 20 ('Mapping incubation mechanisms in Saudi Arabia: the state of the art and challenges for the future' by Wassim J. Aloulou) presents the experience of Saudi Arabia in the use of incubation and acceleration mechanisms to nurture new business start-ups and technology-intensive firms. The chapter highlights the importance of such mechanisms in fostering entrepreneurship and innovation among Saudi Arabian entrepreneurs. In Saudi Arabia, these mechanisms are generally attached to universities in science, technology, and economic cities. Moreover, they are established in partnership and collaboration between university, industry and private sector, and government agencies, aimed at promoting technology transfer and diffusion into the local economy. Reviewing the status of Saudi incubation programs as an emerging industry, this chapter provides analysis of the adopted models and shows their current and projected impact, opening up perspectives for future research directions.

Chapter 21 ('Do government incubation efforts pay off? The development of a quantitative efficiency assessment model' by Jasmine Meysman, Sven H. De Cleyn, and Johan Braet) focuses on government funding of incubators and the manner in which these investments generate returns. The authors develop a quantitative efficiency assessment model for government funded incubators, focusing on first and second-tier income that incubators generate. The first stage model is applied to a Belgian government funded incubator, and it is observed that it does generate a net benefit for the funding agency through job creation, but it is rather modest. When it comes to the generated net benefit to the government per job it was estimated around €40000 a year. It was shown that the second-tier tax income has a much higher impact than the direct tax start-up owes on its profits.

Chapter 22 ('Business incubation in New York State: last decade of changes, emerging models, and future directions' by David Hochman) provides an assessment of the New York State's incubation policy during 2005–2016. The author highlights the emergence of adjacent investment mechanisms in the private sector during this decade, along with the changes among incubator funders at the federal and state levels, and other strategic choices made by gleaning his industry insights. Based on his research and expertise, the author encourages incubator managers to ask questions about how they define the value they provide to various stakeholders, what kind of start-ups they wish to assist, and how different incubator models fit with the interests of both public as well as private stakeholders. The author asserts that changes over this decade have improved the status of business incubation in the investment community, but they also raised the bar for performance and relevance.

Part IV: Incubation Practice and Assessment

Chapter 23 ('Tenant recruitment at university incubators: a selection conundrum' by Ali J. Ahmad) posits that the client selection decision is arguably the most important consideration in the incubation process. The predominant view in the literature is that client selection ought to be carried out using a robust selection criterion linked to critical success factors. The author points out that in fact incubators do not follow a wholly rational

process linking client attributes to critical success factors. Instead, a combination of both rational and non-rational or intuitive processes help assessors select clients which ‘appear’ most promising on a range of both written and un-written criteria. Due to the cognitive computational complexity and the limitations inherent in traditional information collection mechanisms, assessors consistently deploy the heuristic of attribute substitution to make selection decisions. The author proposes a new ‘entrepreneurial readiness’ heuristic to aid decision-making.

Chapter 24 (‘The selection strategy or the incubation process: what matters most?’ by Chaffik Bakkali, Karim Messegheem, Sylvie Sammut, and Abdelaziz Swalhi) examines the determinants of performance in nonprofit incubators. The selection strategy and the incubation process are two important variables, the relative influences of which have not been explored earlier. Based on a dataset of 126 nonprofit French incubators, the authors studied causal relationships between these two variables using hierarchical linear regression analysis. Results showed that selection strategy and incubation process had positive and nearly identical impacts on nonprofit incubator performance, indicating that they are the key factors. Moreover, these results suggest that the combination of a strict strategy of project selection and an efficient incubation process will lead to successful incubator performance. These findings provide public funders and incubator managers with a greater understanding of performance determinants and thus help them to better prioritize their actions.

Chapter 25 (‘Do networked incubators matter? The impact of entrepreneurial networks on firms’ performance’ by Danny Soetanto and Magnus Klofsten) takes the stance that in starting new ventures, entrepreneurs are prone to failure due to their limited knowledge, skills, and resources. Here, the role of incubators comes into play as they provide abundant support for the entrepreneur. However, the question arises as to whether incubators influence the creation of entrepreneurial networks, which is important for resource-seeking activities. In response to the query, the authors attempt to fill the knowledge gap by collecting data from entrepreneurs located on and off incubators. Empirically, they found that incubators help entrepreneurs to develop networks, especially in the early stage. The finding also shows that entrepreneurs located on and off incubators develop a different pattern of networks during the development of new ventures. The study also confirms that the change of networks is necessary for resource-seeking activities.

Chapter 26 (‘The importance of time in a university student venture incubator’ by Lise Aaboen, Kari Djupdal, Dag Håkon Haneberg, Vetle Slagsvold Øien, Torgeir Aadland, and Roger Sørheim) presents a study where human capital is used as a theoretical base to develop a set of hypotheses, which were tested on a population of 338 student founders (with a response rate of 36 percent) in a university student venture incubator. The empirical findings show that time and guidance are important elements in developing key venture-creation skills. The results suggest that incubators should be more patient and conscious of the role of time when developing key venture-creation skills. Short initiatives such as ‘hackathons’ are valuable as inspiration for those students who are interested in entrepreneurship, but such activities will not likely lead to more venture creation among students.

Chapter 27 (‘The value of mentors in incubation and acceleration: a managerial perspective’ by Martin Bliemel, Steven D’Alessandro, Saskia de Klerk, Ricardo Flores, Geoff Harrison, and Morgan P. Miles) describes findings from a longitudinal study of

accelerators and the perceptions of accelerator managers conducted from 2013 to 2019 in the evolving Australian entrepreneurial ecosystem. To address a significant gap in the accelerators literature, the authors apply Linguistic Inquiry and Word Count (LIWC) methods to help understand the descriptions and perceptions of the value of mentors by accelerator managers. The findings suggest that mentors do not necessarily add tangible rewards to their protégés. Instead, they find that the impact of mentors in accelerators may be less instrumental or tangible, and might be more educational, reflective, and intangible than previously observed in the literature. The chapter explores the practical and research implications of these findings.

Chapter 28 ('Sustainability-oriented business incubation: framing and supporting sustainable entrepreneurship' by Klaus Fichter and Karsten Hurrelmann) discusses sustainability-oriented business incubation as a relatively new and emerging topic. The authors emphasize the contribution of their work as threefold: First, they provide a conceptual framework which makes it possible to identify starting points and key factors for effectively integrating sustainability into the framing, design, and impact assessment of business incubation programs. Second, they provide a comprehensive overview of tools and methods which can be used for sustainability-oriented business model development. Third, for the first time they provide data on the use of these tools and methods in business incubation practice and entrepreneurship research. The chapter ends with the managerial implications for future sustainability-oriented business incubation, pointing out knowledge gaps that could be addressed in future research.

Chapter 29 ('Firm characteristics and internal and external dimensions: differences between incubatees and non-incubator firms in Sweden' by Hans Löfsten) examines the differences between incubatees and non-incubator outside firms in terms of business performance along four dimensions: growth orientation, external financing, partnerships, and business networks. This study uses data from a 2016 survey covering 401 new Swedish technology-based firms (NTBFs), of which 38 firms were in incubators (incubatees) and 363 firms were not (non-incubator outside firms). The differences in these dimensions can be an important factor for firms' future business performance. The underlying assumption and rationale are that NTBFs in incubators regard these dimensions, more important than do NTBFs off incubators. Results on all four dimensions are supported because incubatees regard them as more important than do non-incubator firms.

THE PROMISE OF BUSINESS AND TECHNOLOGY INCUBATION AND ACCELERATION

The chapters in this *Handbook* offer the reader a comprehensive perspective of the incubation mechanisms, covering the concept, historic emergence of various models, and lessons learned through practice and documented by studies conducted in different parts of the world. Research has also shown that incubation mechanisms in their various forms and manifestations can fit varying needs of the entrepreneurs and their ventures as well as have proven to facilitate new venture creation and development by lowering the odds of failure (Hackett and Dilts 2004; Shankar and Shepherd 2018).

The intense global interest in the incubation phenomenon, followed by decades of worldwide use has prompted the emergence of an array of incubation models and

strategies, often with overlapping objectives and functions based on the sponsorship and contexts they serve (Bergek and Norrman 2008; Klofsten et al. 2019). Hence the need for well-defined programs and a contingency approach to address contextual adjustments (Mian et al. 2016).

The recent emphasis on entrepreneurship ecosystem building (Stam 2015) merges the National Innovation System (NIS) literature (focusing on structures, institutions) with entrepreneurship literature (studying entrepreneur, firm), and highlights the role of context such as social, temporal, spatial platforms, and other open innovation initiatives (Autio et al. 2018). In this scenario of building dynamic entrepreneurial ecosystems, we will more generally benefit from a variety of intermediate organizations (Clayton et al. 2018) with a key role of incubation mechanisms (Mian and Figlioli 2019; Novotny et al. 2020). This *Handbook* attempts to address the question of how incubation mechanisms may fulfill different roles for start-ups within these entrepreneurship ecosystems.

From the entrepreneurs' standpoint incubators and accelerators offer an opportunity for start-up aspirants to mitigate the risks of failure through learning by doing and vicarious transfer of knowledge and expertise from experienced mentors and resource providers (Phan et al. 2016). Moreover, we should not overlook the need for networking opportunities that the young entrepreneur often looks for when entering the incubation system. Not only accessing different types of 'hard' and 'soft' resource but also entering a network context of other entrepreneurs in business creation and development in an enabling incubation environment, who share similar opportunities and challenges (Klofsten et al. 2019).

As the incubation industry is maturing, we experience major advancements in digitization and other emerging technologies (i.e., AI, IoT, automation and robotics, augmented and virtual reality, 3D printing) and are confronted with megatrends (green technology, crowdsourcing, equity consciousness), and new challenges to innovate entrepreneurship support intermediary organizations such as incubators, accelerators and science parks (IASP 2019; Galbraith et al. 2019).

As the reader will discover, the public policy discussion emerges repeatedly throughout this *Handbook*, suggesting that business and technology incubation and acceleration has become a popular and widely used approach of targeted support for technology and knowledge-based entrepreneurial development. From this standpoint the general evidence suggests reasons for optimism, providing a well-tested and relatively low-cost (compared to the NIS) and more focused (than the 'laissez-faire') ecosystem development approach for an informed economic development policy.

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