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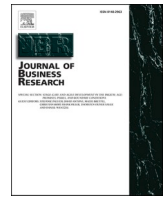
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## Developing business incubation process frameworks: A systematic literature review

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### ABSTRACT

The business incubation process has proven increasingly important for startups, and there are now over 10,000 incubators globally, as well as a significant body of literature on the incubation process with an array of discussions on its interventions and outcomes. It is thus now important to synthesize the available literature on how different frameworks can shape specific outcomes of the incubation and provide a research agenda for the future. Drawing on the Context, Intervention, Mechanism, and Outcome (CIMO) framework, we analyze and synthesize four key literature streams: incubator typology; incubator impact and stakeholders; resources, capabilities and technology; and knowledge transfer and incubator performance. The study facilitates a better understanding of the incubation process and the mechanisms used to shape specific outcomes and performance. It also discusses future directions of research, and help policymakers and incubation managers design interventions according to the specific incubator type and incubation process context.

### 1. Introduction

A number of studies in entrepreneurial literature have emphasized the role of incubators in entrepreneurial activity (Theodoraki et al., 2020; Audretsch et al. 2021a), and the impact of the incubation process (Albert-Morant & Ribeiro-Soriano, 2016; Mas-Verdú et al., 2015).

The first business incubator was established in New York in 1959 (Lewis, 2001), and the concept of business incubation started spreading in the 1960s and 1970s (Campbell et al., 1985; Hackett & Dilts, 2004). However, the evolution of business incubation process did not accelerate until after the 1990s. A key purpose of the incubator process is to support startups in their initial stages to increase their chances of survival and further growth (Aernoudt, 2004). With the spread of the incubation concept and the propagation of different forms of business incubation, such as corporate incubators, technology incubators, university incubators, accelerators, innovation centers, and working and co-working spaces, it is difficult for scholars and practitioners to agree on a single definition or approach guiding the process of a business incubation (Hackett & Dilts, 2004). Authors attempting to define the incubation process have proposed the business incubation theory. According to Hackett and Dilts (2004), the incubation process happens inside an

incubator's "black box", where the incubatee undergoes value-addition activities. With the number of business incubators worldwide growing exponentially (Startupblink, 2023), it is essential to understand the processes which lead to an increase in survival and growth, and which can become an effective mechanism for the knowledge spillover of entrepreneurship (Acs et al., 2013), creativity (Audretsch & Belitski, 2013; Belitski & Desai, 2016), and innovation (Audretsch & Belitski, 2022a).

Since Hackett and Dilts (2004) proposed the business incubation process theory, many attempts have been made further to explore the notion of the business incubation process theoretically and empirically (Hong & Lu, 2016; Iyortsuun, 2017; Ssekiziyivu & Banyenzaki, 2021; Theodoraki et al., 2020). However, there is still a paucity of knowledge about the mechanisms and the context and business incubator models. Systematic literature reviews are very impactful and useful if authors use appropriate methodology, and craft such articles with systematic rigor (Denyer et al., 2008; Rousseau et al., 2008; Lee, 2009). Designing review articles in a way that provides directions for future research helps advance the subject (Claire et al., 2020; Ferasso et al., 2020; Kraus et al., 2018).

To date, there are fifteen available literature reviews on business

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incubation. This includes systematic literature reviews (Albert & Gaynor, 2000; Ayatse et al., 2017; Bergman & McMullen, 2021; Galbraith et al., 2019; Gerlach & Brem, 2015; Hackett & Dilts, 2004; Madaleno et al., 2022), bibliometric analysis (Albort-Morant & Ribeiro-Soriano, 2016; Mora-Valentín et al., 2018; Devece et al., 2019), and co-citation-based analysis (Hausberg & Korreck, 2021), including literature reviews focused on a certain type of incubator, such as university incubators (McAdam et al., 2006; Mian, 1997), technology incubators (Hillemane et al., 2019; Poonjan & Tanner, 2020), corporate incubators (Kötting, 2020), and accelerators (Crişan et al., 2021). These earlier reviews made a substantial contribution to identifying the themes of the business incubation process.

The extant literature reviews also explained the incubation process in terms of the various services that are provided to the startup, and also discussed the various outcomes of business incubators. These include entrepreneurial development (Branstad & Saetre, 2016); innovation (Corrocher et al., 2019; Zeng et al., 2021; Mendes & Tahim, 2020); firm survival and growth (Mas-Verdú et al., 2015; Ssekiziyivu & Banyenzaki, 2021); and the commercialization of new knowledge by starting a new business (Audretsch & Belitski, 2019). Contemporary review studies have focused on different business incubator types (Al Mubarak & Busler, 2011; Grimaldi & Grandi, 2005) and their impact on regional and entrepreneurial outcomes. Despite a systematic summarization of the business incubation process literature, there has been little synthesis and the results are fragmented, which limits our understanding of the mechanisms of business incubation across different incubator types. Further systemic literature reviews are needed to help policymakers, incubator managers and scholars to systemize existing research streams and identify future research areas, as well as to guide policymakers on how to effectively create government support programs for entrepreneurship and nurture entrepreneurial culture through the incubation process.

Against this background, and drawing on prior systematic literature review studies (Denyer et al. 2008; Rousseau et al., 2008; Adams et al., 2016; Khlystova et al., 2022a), this study sought to analyze the available literature and answer the following research questions. Firstly, what are the key patterns and pathways of contexts, interventions, mechanisms and outcomes of the business incubation process to date?

Secondly, what are the future research streams for the incubation process and its implications for business incubators and policymakers?

This review starts with a source analysis to understand the dynamics of the current literature on the business incubation process. It then draws on the Context- Intervention-Mechanism- Outcome (CIMO) methodology (Denyer et al., 2008), which was applied recently to business accelerators by Crişan et al. (2021), in order to understand different models for the incubation process and to develop the direction of future research in the field. Therefore, the primary purpose of this review is to develop frameworks for the business incubation process using different mechanisms within the CIMO approach. A secondary purpose of this review is to provide future research directions and develop a new research agenda to further understand the incubation process.

Following this introduction, section 2 presents a brief description of the concept of the incubation process, and section 3 covers the research methodology. This is followed by sections 4 and 5 which explain the findings of the bibliometric analysis and CIMO analysis, while proposing business incubation frameworks for various mechanisms. Section 6 discusses the findings while suggesting future directions of research, and section 7 concludes with contributions to theory and practice.

## 2. Theoretical overview

Business incubation is a global phenomenon and is common worldwide. Hackett and Dilts (2004) define incubation as “enterprises that facilitate the early-stage development of firms by providing office space, shared services, and business assistance”. With the proliferation of

incubation centers, various typologies have been introduced based on their sponsors, incubation phases, strategic goals, value creation, target markets, and industry (Aernoudt, 2004; Al Mubarak & Busler, 2011; Barbero et al., 2012; Grimaldi & Grandi, 2005). This multitude of incubator types has resulted in a diversity of service offerings, and there are many different incubator business models (Bøllingtoft, 2012). However, they all have one thing in common: they all aim to facilitate entrepreneurial activity through a business incubation program. A business incubation program is a tool for promoting innovation and economic development (Al Mubarak & Busler, 2011) by providing value-adding activities to the incubatees with the intent of increasing their survivability. These value-adding activities are generally termed the ‘business incubation process’, with several models and theories developed to explain the phenomenon. Most of these incubation models are, however, primarily focused on results, and thus neglect the relationships among these value-adding activities (Bergek & Norrman, 2008).

Campbell et al. (1985) are acknowledged as the first to develop a business incubation process model. Their model has four basic value-adding activities or services whereby incubators contribute to the performance of the incubatees. According to the incubator’s new business proposal, these activities start with a need diagnostics. Once the diagnostics are completed, these incubatee firms are monitored. During the incubation process, the incubatees receive access to capital investment and expert networks. The incubatees then graduate as successful ventures. The limitation of the Campbell et al. (1985) model is that it focuses on private incubators and ignores individual entrepreneurial characteristics.

The Campbell model was later extended by Smilor (1987), who incorporated external environmental factors, namely incubator affiliation and support systems. Smilor (1987) visualized an incubator as “a system that confers ‘structure’ and ‘credibility’ on incubatees while controlling a set of assistive resources”. According to the author, business incubators are services-based and affiliated with the private sector, universities, government, and non-profit organizations. Incubators provide secretarial, facilities, business expertise, and administrative services with the objective of facilitating new product development, profits, job creation, technology diversification, and economic development.

The next development of the business incubation model took place in the early 2000s (Hackett & Dilts, 2004). After a critical analysis of the available literature on the incubation process and analyzing related theories, such as network theory, the resource-based view and real options theory, Hackett and Dilts (2004) conceptualized business incubator as a “black box” and covered both aspects of inside and outside influence. According to Hackett and Dilts (2004), the process starts with selecting incubatees from a pool of prospective candidates. The selected candidates then enter into the “black box” and undergo value-adding activities, including resource munificence, monitoring, and business assistance intensity. Startups leave the incubator with either success or failure. Other factors include incubator size, the level of development of the incubator, population size, and the state of the economy.

The follow-up models have addressed specific incubator types, such as technology or business incubators (Becker & Gassmann, 2006; Chandra & Chao, 2011; Wiggins & Gibson, 2003). The extant literature has also embraced the incubation process with the relationship between incubators and other stakeholders, such as government and universities, and many other environmental characteristics (Chandra & Chao, 2011; Schwartz & Hornych, 2008; Gerlach & Brem, 2015). For example, Gerlach & Brem (2015) consolidated the available incubation process models with respect to incubation phases, namely the pre-incubation, incubation and after-incubation phases.

As discussed earlier, the multitude and diversity of incubator types and service offerings increased the complexity of entrepreneurial support (Messegem et al., 2018). This increased complexity, along with complexities in the incubation process models, call for a better

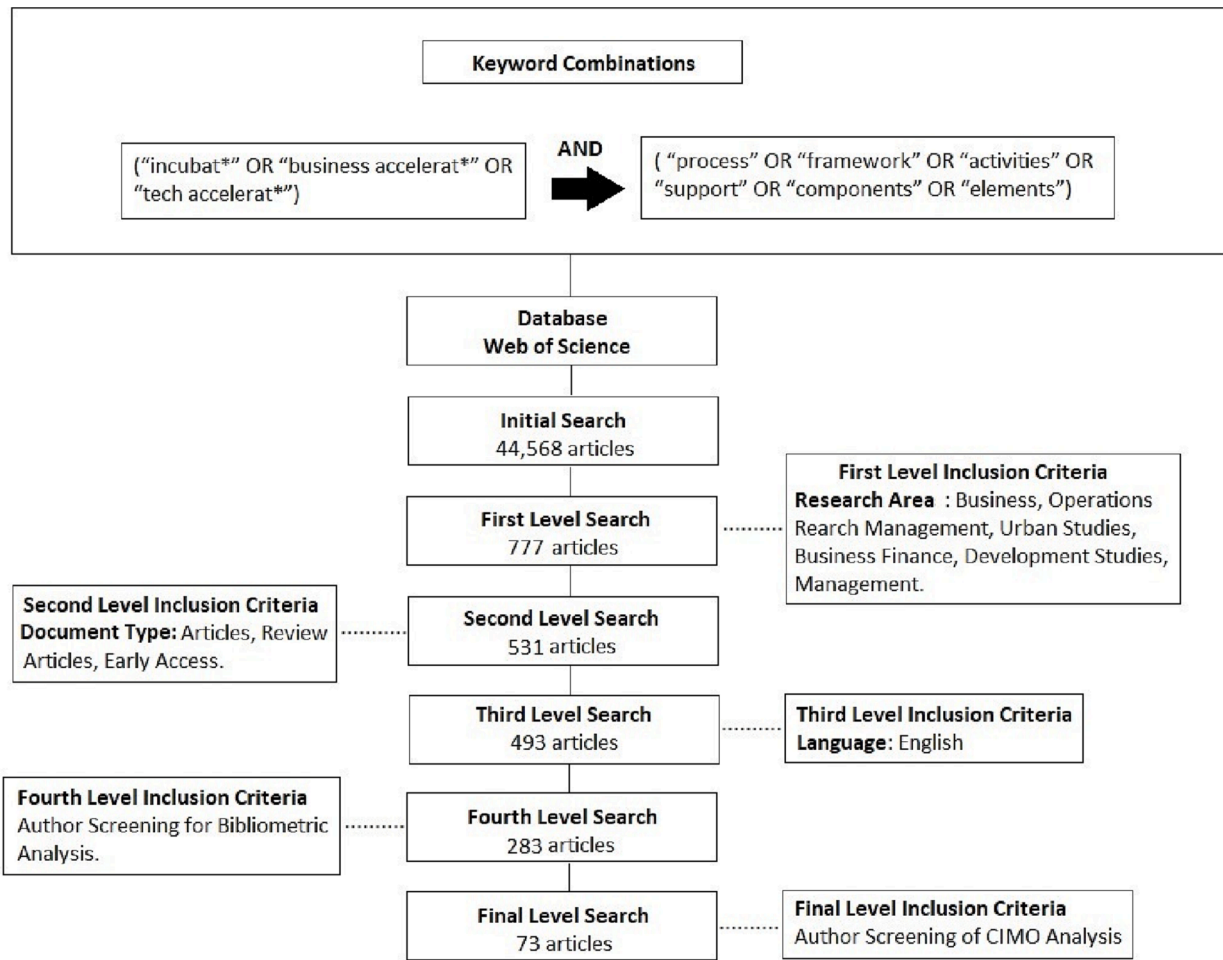


Fig. 1. Five-stage process of data collection.

understanding of the different strategic goals and mechanisms that enable the business incubation process and tailoring it according to the desired objectives of each specific incubation process.

### 3. Methodology

#### 3.1. Overview

In order to answer our two research questions, we utilize the systematic literature review as a method. While there are many different approaches to systematic reviews, we have used a two-step approach for our study. Firstly, we conducted a bibliometric analysis, including a performance analysis (publication and citation analysis) and a network analysis. This allowed us to obtain a one-stop overview of the literature around the incubation process as guided by recent literature review works (Ferasso et al., 2020; Kraus et al., 2018). Secondly, we conducted a systematic literature review using the CIMO methodology as guided by Denyer et al. (2008).

#### 3.2. Literature collection, synthesis and analysis

Since the purpose of this study is to develop frameworks for the business incubation process using different mechanisms we utilize the design-driven CIMO approach for the following reasons. Firstly, Denyer, Tranfield and Van Aken (2008) suggested researchers start by developing design propositions to solve organizational problems using the CIMO approach. This logic for developing design propositions is based on the technological rule presented by Bunge and Bunge (1967), and

specifically fits our research purpose as it explains the logic of causality and implementation as “if you want to achieve outcome O in context C, then use intervention type I”.

Secondly, Pawson and Tilley (1997) augmented the above argument by incorporating causality, that is, through which generative mechanism (s) the intervention produces the intended outcome in the specific context. Thus, by applying the CIMO approach, we can produce a prescription such as “in the case of a certain problematic context, use the intervention(s) type to drive the mechanism(s), and attain the desirable outcome(s)”.

Our study uses the CIMO methodology with the aim of systemizing the scholarship of researching the incubation process in the form of prescriptive design proposition frameworks, such as the role of incubator context (country and incubator type), the key driving mechanisms (purpose and vision), the selection of the most suitable combination of interventions (services), and identifying the targeted outcomes depicting the incubator performance (impact).

To facilitate our analyses using the CIMO approach, we use the systematic literature review and adopt a five-stage process as guided by key scholars (Denyer et al., 2008; Rousseau et al., 2008; Lee, 2009; Adams et al., 2016). In the first stage, we identified the study’s rationale, scope, and aims through the initial study of earlier reviews in related fields (Albort-Morant & Ribeiro-Soriano, 2016; Crişan et al., 2021; Hausberg & Korreck, 2021). These studies were analyzed to identify the current research themes, the limitations of the previous reviews, and the current research aims. Analyzing the current literature reviews helped us to understand current research themes around incubation, including factors affecting the incubation process, the impact of incubation at



various levels, its role in entrepreneurial ecosystems, the various types of incubation, and the incubation process itself. Out of these various streams of research, we limited the scope of this study to further analyze the “incubation process”. The literature on the incubation process is mainly composed of literature in the form of the generic incubation process and is applied across different incubation types and processes, often referring to a university incubator or technology incubator. This literature is fragmented, and further synthesis and consolidation is needed to develop a guiding framework for researchers, policymakers, and incubation managers across different contexts and mechanisms. Thus, the scope of this research was identified as “understanding the incubation process across all incubator types”. We used the Web of Science (WoS) database for this study, as it is considered the most comprehensive database for quality research journals (Hausberg & Korreck, 2021) and is used most frequently to conduct reviews in business research. While WoS is not considered an exhaustive database, Khlystova et al. (2022a) performed the robustness check using WoS and Scopus, concluding after the selection process that all articles selected from the Scopus database were also included in WoS.

In the second stage, we identified the keywords to be used as search terms. These keywords were identified from the available literature. We focused on the combination of keywords explaining “business incubation” and “process”. The initial search key was comprehensive and incorporated many synonyms used in the academic literature for the two keywords, including company builder, technology center, innovation center, and others. The search key was then optimized to obtain the relevant results. Key terms and synonyms were dropped if they did not add any studies to the search results. We did not search for “accelerat\*” without business or tech, because this search turned out to deliver a huge number of false positives even in the most pertinent journals; this was also observed by earlier literature reviews (Hausberg & Korreck, 2021; Hillemane et al., 2019). However, we searched for “incubat\*” without business or tech, because including business or tech before “incubat\*” retained search results relevant to our topic. Similarly, we used many synonyms of the word ‘process’ to reach the optimal search key combination. The optimal keyword combinations identified are presented in Fig. 1.

In the third stage, we combined the search terms with certain constraints to increase the robustness of the search results. These constraints include research area, document type, and language. The first constraint was the research area limitation, which meant it had to appear in one of the following WoS categories: management, business, economics, and management science. This was because studies published in these areas were most likely to be of interest to this systematic review. This restriction meant we could exclude many items from other disciplines, such as biology, health care, engineering, and physics. Another constraint was limiting the search to articles, review articles, and early access papers only (Adams et al., 2016; Tranfield et al., 2003). The third constraint limited the search results to papers in the English language only. The final search key, in combination with all the constraints, yielded 493 articles (see Fig. 1).

In the fourth stage, a fine-grained criteria was established to scrutinize these 493 articles and ensure their relevance for this systematic review. The most important extension to the inclusion criteria extended at this stage was to ensure that the selected studies discussed the “process of incubation”. Hackett (2004) defines the incubation process as the value-added services provided inside the incubator. At this stage, the researchers reviewed the abstracts of all these articles to identify the studies that focused solely on the incubation process. In case of doubt, the article was fully read, and then a decision was made regarding its inclusion or exclusion. This screening process yielded 283 eligible articles published from 1992 to 2021 from 42 different countries. The bibliometric analysis was conducted on these 283 articles.

In the fifth and final stage, the inclusion criteria were made even more stringent in terms of including only those empirical and theoretical studies that provided all four identifiers related to four elements of

**Table 1**

Frequency of the publications on ‘Incubation process’ by country.

Country	Articles
USA	29
United Kingdom	27
Brazil	17
Italy	16
Spain	14
China	13
Sweden	12
Portugal	11
Germany	10
India	10
Norway	9
Australia	8
Netherlands	8
Canada	7
Ireland	7
Belgium	6
Poland	6
Finland	5
Denmark	4
France	4

Source: Analysis by Authors using biblioshiny.

CIMO approach. These are: the role of context in the incubation process (country or incubator type); the type and extent of intervention (services provided by the incubator); the developed or implemented mechanism of the incubation process (the purpose of introducing a specific mechanism and its description); and the incubation process outcomes, including soft and financial outcomes which could directly relate to the impact. This stage led to the final sample of 73 articles which were studied in detail. Data were collected according to the coding scheme as explained.

## 4. Results from the bibliometric analysis

### 4.1. Performance analysis

We started with the bibliometric analysis.

Table 1 presents the main features of the documents collected between 1997 and 2021. There are 283 documents associated with 136 journal sources written by 657 authors; there are only 36 single authors, which signifies the collaboration trend in the field of incubation study. Furthermore, the average citation rate of each document is relatively high, reaching approximately 28 citations per paper, indicating the growing impact of and interest in incubation research. Moreover, 824 authors’ keywords have been used. However, only 540 Keyword Plus (which is more descriptive and contains more unique keywords) were associated with the selected 283 papers.

The topic of the incubation process has appeared in academic research since the year 1992. Fig. 2 shows the trend in business incubation research, and highlights that there are three distinct periods. The initial research period lies between 1992 and 2009, when research on the topic just began. The research grew moderately from 2010 to 2017. Finally, a great surge in the incubation literature can be seen from 2018 onwards, owing to the increasing attention given to start-ups and incubations. The recent fall in numbers in 2021 is indicative of the fact that data were collected in October, and thus only reflects the publication output of part of the year.

Table 1 shows the frequency of the most active countries where researchers are based who published on the business incubation process. The United States, United Kingdom, and Brazil are at the top of the list, followed by Italy, Spain, China and Sweden.

Table 2 identifies top 10 journals where papers on business incubation process were published.

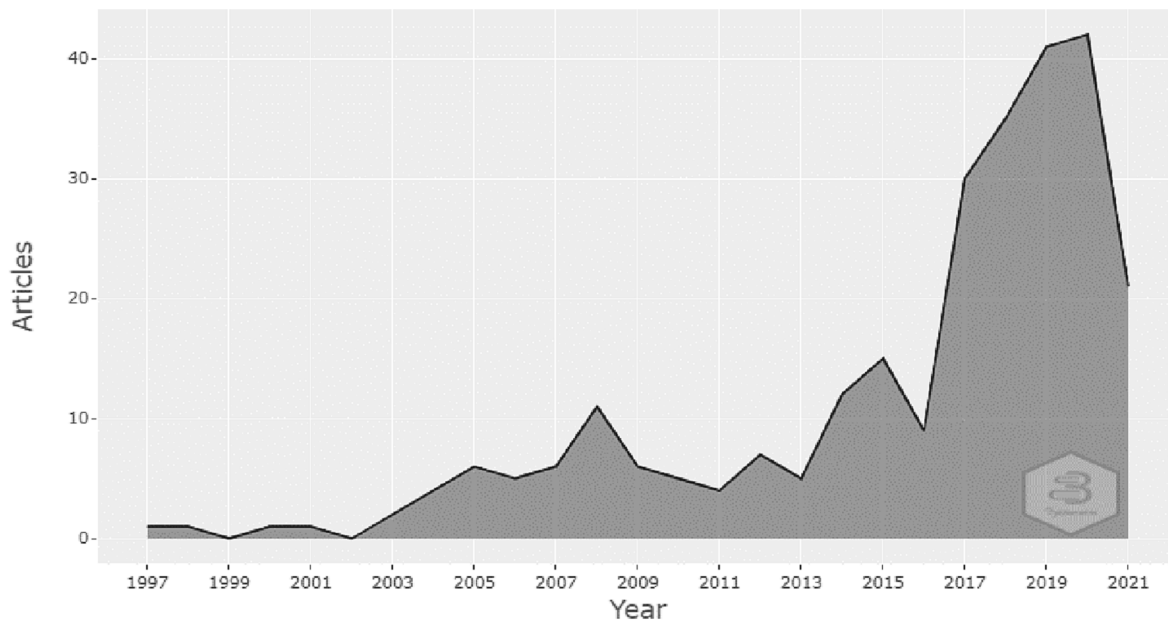


Fig. 2. Annual scientific production of the publications on ‘Incubation Process’ (Source: Analysis by authors using biblioshiny).

Table 2

Frequency of the publications on ‘Incubation process’ by journals (Top 10 journals).

Sources	Articles
Technovation	18
Journal of Technology Transfer	16
Technological Forecasting and Social Change	15
R & D Management	8
European Planning Studies	6
International Journal of Entrepreneurial Behavior and Research	6
International Journal of Technology Management	6
Technology Analysis and Strategic Management	6
Journal of business research	5
International Journal of Innovation Management	5

Source: Analysis by Authors using biblioshiny.

#### 4.2. Keywords and cartography analysis

Keywords analysis helps to understand the dynamics of the incubation process literature and extract the research themes. Using VOS-viewer software we analyzed keywords of the 283 papers and visualized the network of keywords and clusters in Fig. 3. Fig. 3 shows the network visualization of the most frequently used keywords, as we kept a minimum threshold of 10 for occurrences of a particular word. The results demonstrate that the keyword ‘innovation’ was used 116 times, followed by ‘performance’, ‘entrepreneurship’ and ‘business incubators’, which were used 82, 87 and 50 times, respectively. Furthermore, this analysis also confirms our choice of keywords used to extract the data. Overall, using the keyword visualization network we were able to distinguish four key literature streams and group them into the following dimensions: a) incubator typology and entrepreneurship; b) incubator impact and stakeholders; c) incubator resources, capabilities and technologies; d) knowledge transfer and incubator performance.

#### 4.3. Four literature streams on the incubation process

The first literature stream is incubator typology and entrepreneurship.

This literature stream deals with an incubation process across different types of incubators, such as university incubators (Mavi et al.,

2019; Rathore & Agrawal, 2021), technology incubators (Binsawad et al., 2019; Pato & Teixeira, 2020; Sung et al., 2003), corporate incubators (Kötting, 2020), and science parks (Audretsch & Belitski, 2019). The literature uses case studies and a quantitative approach to account for the heterogeneity in the typology of the incubation process, objectives, and strategies. The extant literature also investigates the factors that influence the performance of various incubator types. Among the emerging types of incubators, one can note incubators as regulatory sandboxes (Alaassar et al., 2021), social incubators (Casasnovas & Bruno, 2013), virtual incubators, and open accelerator-incubators (Battistella et al., 2017). These new types of incubator embrace multiple stakeholders (e.g. innovators, universities, and equity investors; universities, government, and banks) and focus on synergies between stakeholders.

The second literature stream analyses the incubator’s impact on entrepreneurs, organizations, and regions. The incubator process literature studies the impact of the incubation process on various internal (e.g. entrepreneurs, founders, incubator managers, startups) (Markovitch et al., 2017; Shetty et al., 2020) and external stakeholders (universities, the quadruple helix, government, other entrepreneurs), as well as the overall economy (Mathews & Hu, 2007; Ratinho & Henriques, 2010). The performance of incubators rather than incubatees is oftentimes measured in terms of the impact they create in the entrepreneurial ecosystem (Audretsch & Belitski, 2017, 2021; Liow & Wong, 2021; Audretsch et al., 2021a), innovation (Cooper & Park, 2008; Corrocher et al., 2019), technology transfers (Sung et al., 2003), commercialization (Lopes et al., 2018; Belitski et al., 2019) and sustainable development (Balling & Masurel, 2020). This literature stream also discusses factors that mediate the impact of the incubation process on economic outcomes (Binsawad et al., 2019; Cánovas-Saiz et al., 2020). Most of these studies use organizational and entrepreneur-level analysis, and a quantitative approach to evaluate the size of the impact often limited to cross sectional studies with few exceptions (Radko et al. 2022; Audretsch & Belitski, 2023a), who used longitudinal data to analyze the size of the impact of incubation process.

Third literature stream is incubator resources, capabilities and technology. The resource-based view is often applied by scholars to understand the role that incubator resources, such as physical, human, technological and social resources, play an important role in the economic performance of incubators and incubatees (Bacalan et al., 2019;





(Denyer et al., 2008).

This study considers the context, which includes both the (1) country and regional context, and (2) the incubator context related to the type of incubator. The context component of CIMO enables us to better understand the first literature stream related to incubator types and entrepreneurship activity. Our sample represents 38 countries (see Table 3), mainly from Europe (7 studies) and the United States (9 studies) where research on the context of incubators took place.

The analysis of the incubation process context demonstrates that most studies on the incubation process originate in developed countries, and use data on incubators in developed countries. The incubation process in developing and emerging countries has been significantly underrepresented, in particular with regards to South-East Asia.

Within the context analysis, we identified eight incubator types that are used in the literature (see Table 4).

The first type is the general business incubator type, which is the most frequently studied (28 studies). Business incubators can be defined as incubators which nurture early-stage entrepreneurs and startup activities in general independently of the specialization of incubatees and the sector where they operate (Kakabadse et al. 2020) without any specific focus on organizational context. The second incubator type is a university business incubator with 16 studies in our sample. University business incubators facilitate faculty, staff, and students to undertake knowledge transfers (literature stream four) and go through the process of launching their startups, managing their intellectual property, and commercializing their innovation (Audretsch & Belitski, 2019; Pellegrini & Johnson-Sheehan, 2021; Audretsch, Belitski & Caiazza, 2021). This literature stream also includes studies on technology transfer offices and knowledge centers in the same category, as they pursue the same purpose as university incubators: to facilitate the faculty, students, and staff to launch and manage their startups. The third incubator type is the business (entrepreneurship) accelerator, with 10 papers in our sample. Accelerators are business incubators with a narrower focus, and are defined as “Essentially a special type of incubator or new generation incubation model albeit, with several configurational differences, such as, they are cyclical, shorter-duration and cohort-based programs rather continuous, and longer-duration support offered by incubators” (Galbraith et al., 2019, p. 268). The fourth incubator type is the technology incubator, with 9 papers in our sample which discuss the role of technology in starting a business (Li et al., 2016). “Technology business incubators (TBIs) belong to a special and dedicated class of incubators helping and supporting Technopreneurs in the development and commercialization of technology” (Rathore & Agrawal, 2021, p. 1500). The fifth incubator type is the science park, with 5 studies in our sample (Amoroso et al. 2019). A science park type of an incubation process may embrace a research park, technology park, or innovation center which is a purpose-built cluster of office spaces, labs, workrooms, and meeting areas designed to support research and development in science and tech. The combination of academic institutions, high-tech companies, entrepreneurs and startups in these spaces create an environment rich in knowledge and enable further knowledge transfers (Radko et al., 2022). The sixth incubator type is the corporate incubator (3 studies), which is established by a corporation and provides most of the services which traditional incubators or accelerators provide. However, the focus of such incubators is on encouraging and helping their employees to create a new business within the organization as a form of corporate entrepreneurship (Kreiser et al., 2021), a new business unit, or a spinoff within an organization (Audretsch et al., 2022). Corporate incubators use outside-in and inside-out open innovation in corporate entrepreneurship (Hausberg & Korreck, 2021). The seventh incubator type is the social incubator (2 papers), which aim to resolve specific social issues. A social incubator “is defined as an incubator that supports more than 50% of startups that aim to introduce a positive social impact. Social incubators perceive social impact measurement and training/consulting on business ethics and Corporate Social Responsibility as being more important services than other incubator types” (Sansone et al., 2020,

**Table 5**

Interventions (services) provided by the incubators as discussed in literature.

Interventions	No. of Studies	Exemplary references
Network resources	57	(Galvão et al., 2019; Miranda & Borges, 2019)
Access to finance	42	(Bacalan et al., 2019; Shetty et al., 2020)
Infrastructure support	38	(Pato & Teixeira, 2020; Somsuk & Laosirihongthong, 2014)
Monitoring services	26	(Ratinho & Henriques, 2010; Yin & Luo, 2018)
Training and Coaching	25	(Bacalan et al., 2019; Franco et al., 2018)
Selection of incubators	15	(Hackett, 2004; Ssekiziyivu & Banyenzaki, 2021)
Legal services	9	(Berbegal-Mirabent et al., 2015; Markman et al., 2005)

Source: Authors.

p.1). One of the two studies on social incubators specifically discusses refugee incubators that focus on the key challenge of refugee entrepreneurship (Meister & Mauer, 2019). Virtual incubators are a new form of incubator which became more common with the development of platform firms and the platform economy (Kenney et al. 2019). Some of the above incubator types may have an online presence in addition to their physical location.

The analysis of context in terms of incubator types highlights the fact that the literature around university and technology incubators is mature, while the literature on social, virtual and corporate incubators is still limited (Amoroso et al. 2019) and requires further research.

## 5.2. Interventions

The interventions component of CIMO refers to the services and resources provided by the incubators for incubatees, and helps us to expand the third literature stream: incubator resources, capabilities, and technology. The majority of studies in our sample identified a set of complementary and support services provided by the incubators of different types, such as selection, monitoring, infrastructure support, access to finance, network support, training/coaching, and legal support (see Table 5). Incubator services align with the access to networks, physical, digital, financial and social resources to facilitate the incubation process for incubatees.

The most commonly provided service consists of sharing knowledge via existing networks, along with exchanging network resources. The role of formal and informal networks is increasingly important for entrepreneurs (Khlystova et al. 2022b) and it has been discussed in 57 papers. Network resources include external linkages (Galvão et al., 2019), research networks (Corrocher et al., 2019), social networks (Miranda & Borges, 2019), alumni networks (Pellegrini & Johnson-Sheehan, 2021), and trade and supply chain networks (Bennett et al., 2017).

Incubators, independently of their type, aim to facilitate access to equity finance by startups with 42 papers explaining that access to resources is a key intervention in the incubation process. This intervention may include access to seed funding (Shetty et al., 2020) such as grants or crowdfunding. It can also involve accessing other financial resources (Brun, 2019; Mavi et al., 2019), including alternative forms of fundraising (Belitski & Boreiko, 2022), as well as in-kind financial support by stakeholders (Bacalan et al., 2019), and specific sponsored research (Markman et al., 2005).

Access to physical and digital infrastructure is an important form of resource support, and is the third most common intervention with 38 papers discussing it. This includes specifically physical infrastructure (Somsuk & Laosirihongthong, 2014), technical support and access to technologies (Pato & Teixeira, 2020), R&D facilities (Hillemane, 2020).

Monitoring of incubate activity as a form of intervention is discussed

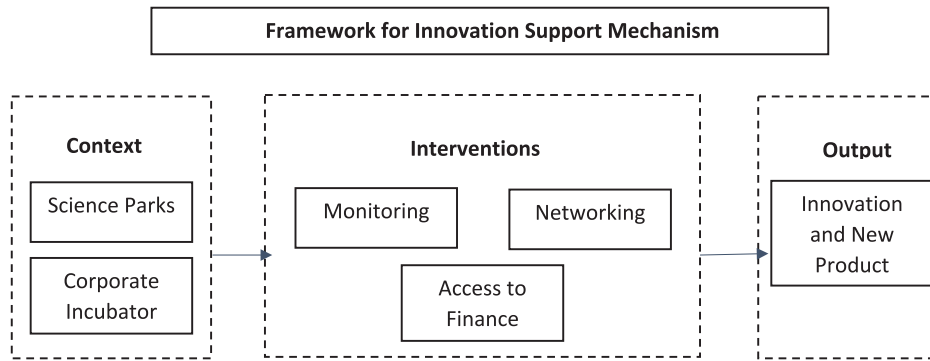


Fig. 4. Incubation Process Framework for Incubation Support Mechanism (Source: Authors).

in 26 papers. This includes the concise program of milestones (Bacalan et al., 2019), incubation management support (Yin & Luo, 2018), business assistance services (Hong & Lu, 2016), and administration support (Ratinho & Henriques, 2010).

Training and coaching services are an important part of capability and skills training, and are discussed in 25 papers in our sample. The coaching and training services include training in market development and entry (Franco et al., 2020), business skills training (Mavi et al., 2019), coaching (Bacalan et al., 2019), business plan workshops (Reyani et al., 2018), human resource management training (Reyani et al., 2018), commercialization of inventions (Clarysse et al., 2005), entrepreneurial training (Li et al., 2016; Blok et al., 2017), digital capabilities and skills training (Belitski & Liversage, 2019) and counselling services (Chan & Lau, 2005).

In addition to the above interventions, incubators monitor and continuously evaluate startups which require additional support and selection, with 15 papers discussing this subject. As resources in incubators are scarce and the proper selection of incubatees needs to maximize the use of available resources. These incubators have clear selection criteria based on various factors, that include the market characteristics of the startup product (Ssekiziyivu & Banyenzaki, 2021), owner’s attributes (Hackett, 2004), product characteristics, and financial potential (Iyortsuun, 2017).

Finally, another form of intervention involves providing legal services, and was discussed by 9 papers. These services include managing intellectual property (Bebegal-Mirabent et al., 2015), and providing IP protection and licensing for royalties (Markman et al., 2005).

The review of interventions within the incubation process is based on the type of service provided by an incubator and the depth and variety of each type of intervention. It is important to analyze the effect that the establishment of these services has on incubatee performance and their impact on the incubator, stakeholders (e.g. corporate or university

incubator), and region. This links the third literature stream on resources with the second literature stream on the impact of incubators which we identified. An important gap still exists in understanding the “why” to a particular intervention and the time when a specific intervention is required. It is important to know why incubator managers choose one service over another, how they decide on their portfolio of interventions, and how incubatees are selected and monitored.

### 5.3. Mechanisms

Mechanisms are key results of synthesizing research, providing a basic theory on why specific outcomes emerge (Denyer et al., 2008). Thus, mechanisms represent the purpose of the incubation or the key driver that influences the whole process of incubation. They are represented by the fourth literature stream: incubation performance and knowledge transfer. The process of incubation translates into the selected interventions and targeted outputs. In our sample of selected papers, we found four types of mechanisms that drive the business incubation process and affect its performance: innovation support; societal impact creation; entrepreneurial culture development; and commercialization and growth. The incubators that focus on innovation support complex innovation processes that often need more effort to develop and launch new products (Crişan et al., 2021). The key focus of these incubators is to support innovation and new product development. Connecting this with context and intervention, it was found that incubators such as science parks, corporate incubators, and private incubators apply various mechanisms of innovation support such as mentoring, access to finance, networking services, consultancy on intellectual property rights protection, and prototyping. Together, these mechanisms aim to promote new product development and innovation, and offer performance evaluation metrics (Corrocher et al., 2019). The whole incubation process driven by the innovation support mechanism

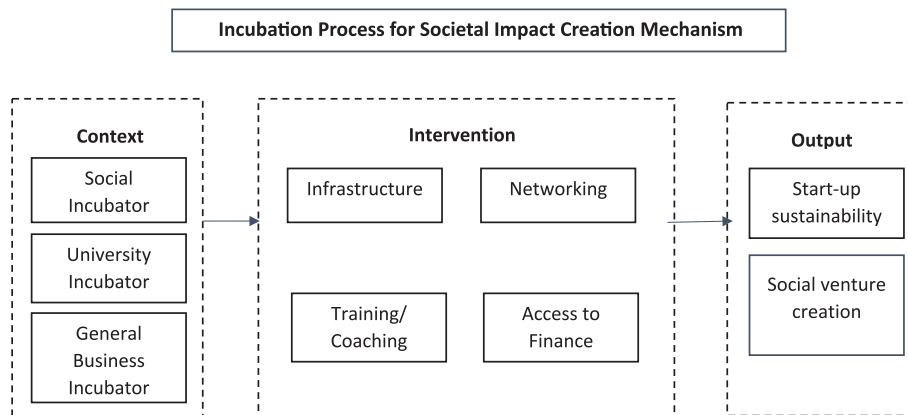


Fig. 5. Incubation Process Framework for Societal Impact Creation Mechanism (Source: Authors).

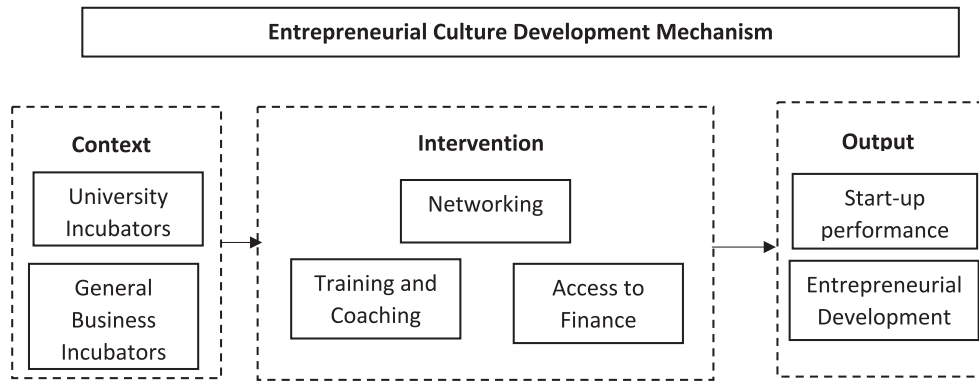


Fig. 6. Incubation Process Framework for Entrepreneurial Culture Development Mechanism (Source: Authors).

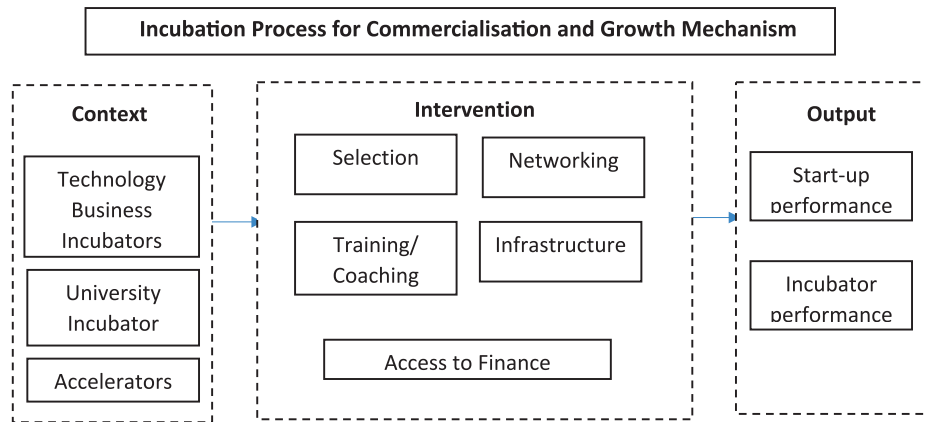


Fig. 7. Incubation Process Model Commercialisation and Growth Mechanism (Source: Authors).

is summarized in Fig. 4.

Other mechanisms applied in the incubation process target societal impact creation, which broadly means facilitating social and economic development (Somsuk & Laosirihongthong, 2014), and promoting activities for sustainable development (Ballering & Masurel, 2020). Socially oriented and university incubators broadly focus on this mechanism through major interventions, such as infrastructure support, networking support, and access to finance, training, and coaching. On the output side, they target results, such as social venture creation and the sustainability of startups. The incubation process driven by the societal impact creation mechanism is summarized in Fig. 5.

Fostering entrepreneurial culture development emerges as the third mechanism, and involves the development of entrepreneurial culture (Audretsch & Belitski, 2021a). University incubators and general business incubators primarily aim at nurturing entrepreneurial culture mechanisms through interventions, such as networking support and connecting to successful entrepreneurs, especially for the alumni and expert networks (Liow & Wong, 2021), and by enabling access to finance (Cánovas-Saiz et al., 2020), training, and coaching (Rathore & Agrawal, 2021). The outcomes they usually target through this mechanism include startup performance (Rathore & Agrawal, 2021) and entrepreneurial growth (Brenzitz & Zhang, 2019). The incubation process driven by the entrepreneurial culture development mechanism is summarized in Fig. 6.

Finally, the mechanism pushing the technology incubators and technology transfer offices at universities includes commercialisation and growth with a focus on R&D. This mechanism further unpacks the literature stream on knowledge commercialization and performance. The main interventions under this mechanism include the development of selection criteria for program entry, networking support and

Table 6  
Outcomes achieved by incubators as discussed in literature.

Outcomes	No. of Studies	Exemplary references
Entrepreneurial development	28	(Branstad & Saetre, 2016; Audretsch et al. 2015)
Innovation and new product development	15	(Corrocher et al., 2019; Mendes & Tahim, 2020)
Start-up performance	15	(Bacalan et al., 2019; Reyani et al., 2018)
Start-up sustainability/ survivability	8	(Bacalan et al., 2019; Ssekiziyivu & Banyenzaki, 2021)
Spin-off business/technology transfer	8	(Clarysse et al., 2005; Games et al., 2020)
Social venture creation	2	(Harima et al., 2019)

Source: Authors.

infrastructure support after entry, and training and coaching for knowledge appropriation and transfer. The outcomes targeted under this mechanism include startup performance (Iyortsuun, 2017) and incubator performance (Rathore & Agrawal, 2021). The incubation process driven by the commercialization and growth mechanism is summarized in Fig. 7.

5.4. Outcomes

The outcome in the CIMO analysis refers to the literature stream on the impact that emerges from the incubation process through specific mechanisms. The outcomes of the incubation process can be divided into six major dimensions, as presented in Table 6. The first outcome of the incubation process is entrepreneurial development, discussed in 28

papers, which is followed by innovation and new product development (15 papers), startup performance (15 papers), startup sustainability and survivability (8 papers), spinoff businesses (8 papers), and social venture creation (2 papers).

The development of entrepreneurs has been widely discussed in the literature from different dimensions, including the development of new businesses and entrepreneurs as a result of the incubation process (Theodoraki et al., 2020).

Studies that describe an incubator's impact as promoting innovation and new product development are based on the output measures and focus on the culture of learning, investment in creativity and innovation (Mendes & Tahim, 2020), the firm's innovative performance (Corrocher et al., 2019), R&D investment (Hillemane, 2020; Audretsch & Belitski, 2023b) and the impact of the entrepreneurial network on innovative performance (Soetanto & Jack, 2013).

Studies which discuss an increase in a startup performance as an incubator outcome focus on employment growth and new job creation (Bacalan et al., 2019; Breznitz & Zhang, 2019), growth orientation and profit growth (Bacalan et al., 2019; Iyortsuun, 2017), sales growth (Bacalan et al., 2019; Eveleens et al., 2017), return on assets and returns on investment (Reyani et al., 2018), access to entrepreneurial finance (Eveleens et al., 2017; Reyani et al., 2018), loan repayment capacity (Reyani et al., 2018), business expansion (Breznitz & Zhang, 2019; Reyani et al., 2018), and finally protecting innovation using patents (Corrocher et al., 2019; Belitski et al., 2020).

Start-up sustainability is an important outcome of the incubation process (Bacalan et al., 2019; Ssekiziyivu & Banyenzaki, 2021). These studies consider the business incubation process as a set of value-added services that enable the startup to survive and sustain itself through the initial challenges of newness. Along with startup sustainability, the issues of survivability come up and the ability of incubators to produce spinoffs businesses or technology transfer (Markman et al. 2005; Amoroso et al. 2019; Wright et al., 2019). These studies discuss the role of technology business incubators, university business incubators, and corporate incubators. The idea here is to identify the incubation process enabling factors that lead to the commercialization and growth of startups. There is still a paucity of studies focusing on the societal impact of business incubators, such as social venture creations, and solving societal issues (Harima et al., 2019).

The outcomes of the incubation process are closely connected to two literature streams: incubator impacts, and knowledge transfer and incubator performance. Most of the studies include quantitative cross-sectional studies relating the antecedents of the incubation process and incubation impact on incubatees, organizations, regions, and a country. A significant number of studies discuss the likelihood of survival and startup failure, exit strategies, and the development of new products by entrepreneurs.

## 6. Future research agenda

Research on the incubation process over the past three decades has consolidated and significantly improved our understanding of the kind of services and value added by the incubation process, and the mechanisms of startup support and growth (Campbell et al., 1985; Hackett & Dilts, 2004; Mas-Verdú et al., 2015; Albort-Morant & Ribeiro-Soriano, 2016). While prior literature reviews have focused on both business incubators and accelerators, our study examines the context, objectives, outcomes and mechanisms of the incubation process linking four key literature themes on incubator typology, impact and interventions, capabilities and resources and knowledge transfer and performance..

We started with a bibliometric analysis of studies on the subject under discussion in order to gain an overview of the trends and citations on the topic, followed by an in-depth review in the form of a CIMO analysis. This was to understand the context of studies and to identify and understand the different types of interventions introduced as part of the incubation process, including the outcomes that form the target of

the incubation process.

Finally, based on the systematic literature review and after identifying the four key literature streams, we were able to outline the future research agenda for advancing the topic under study. We followed the protocols laid for CIMO analysis by Denyer et al. (2008) and the impactful papers which demonstrated that literature reviews can be applied to different field of studies (Saura et al., 2021; Ferasso et al., 2020; Kraus et al., 2018; Martínez-Climent et al., 2018) to distinguish between the research agendas and develop future research directions drawing on the context, interventions, outcomes and mechanisms of the incubation process literature.

### 6.1. Context

The review of the literature has demonstrated that most studies describe the innovation process in a limited number of countries, mainly in the United States and Europe, with little research in developing and emerging economies. There is thus a paucity of cross-country and cross-regional comparative studies, which may be due to the ad hoc mechanisms applied by different countries. However, there is still much to learn from cross-country comparative studies by examining incubators of the same types. Thus, future research can focus more on the mechanisms which facilitate incubator performance and inputs, and should study which mechanisms and interventions work for different incubator types and across different contexts. More studies are needed describing the context and the mechanisms of the incubation process in developing countries where formal institutions are weak (Belitski et al., 2016; Chowdhury et al., 2019) and in regions affected by conflict, instability and uncertainty (Audretsch, Belitski & Cherkas, 2021; Belitski et al. 2022). Ad hoc mechanisms and policies to support start-up activity are also needed (Shetty et al., 2020). This is possible with more cross-country and multi-level studies. Thus, linking the broader national and macroeconomic factors with the incubation process will help us to better understand the regional and institutional impact.

An important dimension of context is the incubator type. Our research has demonstrated that various types of incubators have grown over time while other types have disappeared. In the extant literature, the incubation process is considered to follow the same structure and process for all incubator types, which undermines the important differences in the motivation and incentives, as well as industry differences and objective divergence for different incubator types. General and university business incubators were the most frequent types of incubators found in the literature review, while other types (such as virtual and social incubators) are still understudied and need to become part of future papers on incubator types. The emergence of specific industry-focused incubators is a new phenomenon (Stefko & Steffek, 2017) which requires further attention.

### 6.2. Interventions

Our literature review has demonstrated a significant heterogeneity in the value-added services offered by different types of incubators. Most studies either discussed the impact of these services on intended outcomes or the resources needed to provide the interventions. The process used by incubation founders and managers while designing these portfolio of interventions is ad hoc to a specific incubator type and is not yet fully understood. Future research may be needed to understand why some incubators offer standardized interventions while others believe in the customization of interventions. The differences in the design and delivery of these interventions are rarely discussed in the extant literature. For example, this relates to open innovation, living labs, design thinking, lean start-up training, which have not been studied as part of the incubation process. Moreover, our review has revealed that on rare cases interventions such as networking services, access to finance, and infrastructure support are linked to the availability of internal resources, capabilities and skills in the incubator, as well as training, coaching,



monitoring, and mentoring. There is potential to explore the diversity of interventions and certain specific interventions, such as monitoring and mentoring, training and access to equity resources to determine whether they are complementary or substitutes.

### 6.3. Mechanisms

Our systematic literature review demonstrated that the mechanisms used at business incubators is the most under-researched area of this field. This derives from the examination of different types of incubators, their portfolios of interventions, and differences in incubator and incubatee outcomes when different mechanisms for facilitating innovation, selection, mentoring, and networking coaching are applied. The underlying mechanism which guides the business model of each incubator type becomes what differentiates one type of incubator from another by the theme, industry, stakeholder, incubation process, and size. Future research will focus on comparing and contrasting these mechanisms for complementarity and suitability for each incubator type (Theodoraki et al., 2020). The empirical studies applied to better understand the impact of the mechanisms, their genesis and the functionality of the incubation process will become the subject of future research. Future research is also needed to underpin the theoretical foundations of the mechanisms developed and implemented within the incubation process, and to test the differences in the effect of these mechanisms for incubatees and non-incubatees.

### 6.4. Outcomes

The systematic literature review demonstrated that existing papers mainly focus on the analysis of the immediate and short-term outcomes of an incubation process, without paying attention to the long-term strategy. The impact of the incubation process should be studied over a longer time period using longitudinal data to project the long-term outcomes and understand the causality within the incubation process (Avey et al., 2008). Bergman and McMullen (2021) suggest a longitudinal, processual and experimental research of changes within the incubator and the impact on incubatees and the incubator–incubatee relationship. In addition to a major outcomes that have become a commonplace for research, such as incubatee success or failure, investigating softer outcomes could become a priority (Cope, 2011). This may include the development of an entrepreneurial mindset and skillset; experience of market entry; testing the product; developing a prototype; creating experiments; and validation tests. These elements have not yet entered in the avenue of incubator performance and outcomes. The value of incubation process outcomes could be perceived differently by incubator managers and startup teams.

Building on the four key literature streams, we listed the future research directions and new themes previously discussed in sections 4.2 and 4.3, which are also illustrated in Table A1 in the Appendix.

## 7. Conclusions

This systematic literature review of the incubation process provides empirical and theoretical research on the context, interventions, mechanisms and objectives behind the incubation process, and offers future research directions along the four literature streams.

We argue that “one size does not fit” all in the incubation process, and we outline the taxonomy of eight different types of business incubators. Furthermore, we were able to distinguish four different mechanisms used by incubators to facilitate incubator outcomes: innovation support; societal impact creation; entrepreneurial culture development; and commercialization and startup growth. Through our analysis, we identified essential conditions for incubators related to the context where they operate, as well as availability of resources, capabilities and skills which shape the final outcomes of the incubation process.

The results of the review suggest that different mechanisms shape both incubator type and business model. Moreover, the mechanisms guide the type of interventions needed to achieve certain outcomes. Interestingly, our review demonstrated that the genesis and dynamics of incubator growth, as well as the functionality of the incubation process, depend on the mechanisms applied at every stage of the incubation process.

As one of the policy implications, we suggest the creation of a more ad hoc (rather than generalized) mechanism of incubation support in order to cater for diverse incubator types and the varied needs of incubatees. Such a de-centralized and idiosyncratic structure might have a range of advantages, namely lower overhead costs, access to a broader network, and a reduction in cost of access to capital, as only a specific portfolio of finance and investors could be targeted. It was found that it is important for incubator managers to be as selective as possible with the mechanisms.

Other concerns (e.g., accessing finance, including alternative finance, culture of entrepreneurship within an incubator; availability of digital skills and support on website creation) in each subsector and incubator type can be specific. External stakeholders, such as investors, professional and industry associations, universities and large firms, commercial sponsors, and philanthropists, thus need to pay particular attention to supporting the needs of different incubators. They could choose such support by the type of incubator (e.g. corporate, university, technology, social, and so on).

Thus, the follow-up research will focus on understanding the overarching purpose and strategies that incubator managers can apply to secure financial support, and the activity of external stakeholders and their full participation in the incubation process. Financial support is required for all these activities, e.g., longer-term commitments from major funders for the sector, while current research on incubators is short-term based, including both the period of analysis and the outcomes. This limits the ability of incubator managers and scholars to analyse the long-term perspective and causality, as well as long-term returns on investments and R&D, which may limit the understanding what specific interventions and services are needed. While the creation of new approaches to income generation within incubators is required, is outside the scope of this analyses, and may become a future research direction.

One of the limitations of ongoing research remains the lack of understanding of complementarities between developed mechanisms and interventions in incubators and inter-dependence between different mechanisms and how they are selected by incubator managers.

While providing an overview of the incubator process frameworks following the CIMO approach, research still needs to further explore and refine what we know about the incubation process in terms of its connectedness to stakeholder theory, the resource-based view, and open innovation. These connections were not explicitly visualized and discussed within this study, and may become a topic for future research.

Another specific limitation was in evidence in the recent systematic literature reviews examining the impact of the incubation process on various performance indicators of incubators and incubatees. The first limitation is that research has been conducted broadly and across different research fields (Harper-Anderson & Lewis, 2018; Hughes et al., 2007; Shih & Aabo, 2019), with little or no evidence of a specific research design for the incubation process.

Importantly, our review identified several research gaps, including comparative and multi-level study stages, strategies related to the short- and long-term impact of mechanisms, and the application of those mechanisms. This review provides insights to incubator managers, investors, equity investors and policymakers to design their investment strategies and policies to support entrepreneurial activity in their regions. The precise relationship between context, interventions and outcomes in the form of different mechanisms will help them identify the most suitable framework to reach specific outcome of the incubation process.

**Table A1**  
Future research dimensions.

Themes	Future research questions
Incubator typology and entrepreneurship	<ol style="list-style-type: none"> <li>1. The role of different sectors/sectoral composition in science parks on the innovative activity of tenants</li> <li>2. How are social incubators or refugee incubators different from other incubators?</li> <li>3. Incubation process for virtual incubators</li> <li>4. Why one type of incubator creates a different value than the other type of incubator?</li> <li>5. Survival of firms supported by creative and cultural incubators</li> </ol>
Incubator impact and stakeholders	<ol style="list-style-type: none"> <li>1. Different dimensions of the economic value of science parks?</li> <li>2. The mediating role of policymakers on how firms perceive incubators' attributes and consequently its performance.</li> <li>3. Longitudinal study of the immediate and non-immediate impact of incubation</li> <li>4. Quantitative studies to test the incubation process frameworks presented in the study</li> <li>5. Cross-city and cross-country comparisons of impact of incubator programme designs</li> </ol>
Incubator resources, capabilities and technology	<ol style="list-style-type: none"> <li>1. Incubators support in establishing and managing the internationalization of startups</li> <li>2. Implications of the selection process and criteria on the incubator and incubate performance</li> <li>3. Effect of the size and heterogeneity of the pool of startups on accelerator performance</li> <li>4. Business interactions amongst different actors as a core unit of analysis to explore network resources</li> <li>5. Which type of incubator support is most effective (funding, mentoring, networking etc.), optimal length of tenancy, program duration and several other features of program</li> </ol>
Knowledge transfer and incubator performance	<ol style="list-style-type: none"> <li>1. Most relevant performance dimensions for startups</li> <li>2. The mediating role of national culture on the incubate performance</li> <li>3. Longitudinal, processual, and experimental examination of changes and its impact on the incubator and incubate relationship</li> <li>4. Impact of incubation process on soft outcomes such as entrepreneurial skills and experience inventory</li> <li>5. Potential of business incubation program for refugee entrepreneurial activities</li> </ol>

Source: Authors.

### CRedit authorship contribution statement

**Kanza Sohail:** Writing – original draft, Formal analysis, Data curation, Conceptualization. **Maksim Belitski:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Liza Castro Christiansen:** .

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix

See Table A1.

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