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Specialized Business Incubators as a strategy for Small and Medium-sized Enterprises in the Industry 4.0 era – A systemic approach

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Abstract
The present research aims to get a holistic view of the characteristics of specialization in business incubators models. This paper centers on building a general framework by taking into account a holistic look at the features, profiles, advantages, and disadvantages of specialization in business incubators models. The strategy aims to impact mainly stakeholders by adopting business incubators strategies, especially to those tenant firms of the manufacturing sector related to emerging technologies such as Industry 4.0 technologies. Moreover, the framework is built based on the discussion of the leading representatives' heads of the specialization in the field of specialized business incubators' models. The strategy aims to reduce the current short-term death rate expectancy prevailing in the contemporary economic context by a robust business model for business incubation. Business incubators hold tenants into a hub with not only supportive facilities for the business without investing vital capital, which is not part of their core chain value but also harnessing the closer source of knowledge transfer and skilfully workforce-related on these technologies. Finally, remarks and recommendations are proposed for futures tenant companies' prospects, who wish to reduce the bankruptcy risk by boosting innovative goods and services with high technological development in a specific field of knowledge.

Keywords
Business Incubators, Specialization, Incubation Model, Management Units, Strategic establishment, Industry 4.0.

1. Introduction
Nowadays, poverty is one of the most significant issues in the world as well as one of the worst unwanted effects since it spread out unfortunate social scenarios that affect an appropriate development into society. The United Nations reported that there are 780 million people in poverty status. The National Council for the Evaluation of Social Development Policy, a Mexican agency that measures poverty among other social variables, indicates that 21.6 million people are living in extreme poverty, which represents 17.11% of the national population (CONEVAL, 2018). According to the World Bank (2020) for a Sustainable reduction of poverty, nations should create better employment conditions, and invest in health, education, nutrition, and sanitary conditions for people. Moreover, the network

creation of efficient social protection to ensure the most vulnerable group of people would be able to face crisis out. Although economic growth is crucial, its quality fountain would transform it into economic development that aims to get a sustainable strategy (WEF, 2018). In that way, emerging markets should promote capital streams to foreign investment (FMI, 2017), for reducing a global downturn risk (Thomson, 2017), which aims its activity to the 12 emerging technologies in the fourth industrial revolution. These are critical drivers for sustainable economic development, that not only will face technological aspects but also, they can pave the way to achieve sustainability (Sinha & Matharu, 2019). Such emerging technologies, listed below, involve a high specialization level (WEF, 2017).

- Additive manufacturing (3D printers)
- Advance materials and nanomaterials
- Artificial intelligence and robotics
- Biotechnology
- Energy capture, storage and transmission
- Blockchain and distributed ledge
- Geoengineering
- Internet of Things device technologies
- Neurotechnology
- New computing technologies
- Space technologies
- Virtual and augmented technologies

The Mexican economy did not grow, this is the GDP case in the period 2010-2015 since it maintained without any effect in absolute terms, a worsen human index development in the same period 0.88-0.82 and a total unbalance economy with a GINI index around .54 in the last period (Mendoza-del Villar et al., 2019). Although this economic performance is not close to the current context, it describes the economic trends of the Mexican economy. Furthermore, despite the growing employment trend, the same study presents a decoupling effect on the labor productivity index, which means that the current strategy is not working to tackle the Mexican social and economic context. Resulting in a worsen foreseen for both sustainable dimensions. Moreover, when such an approach deploys unemployment by the bankruptcy of the SMEs, which is the financial bedrock representing 99.8% of firms established. There is a high rate to close an SME before the fifth year, as mentioned by Mendoza-del Villar et al. (2019; 2020), the social component could strength the life expectancy.

Nevertheless, it is still far to make the firm's strategy more robust; likely aspects, as mentioned earlier, discourage the operational performance of the firm. Showing insights that the current approach adopted by SMEs neither tackles operational performance with technological devices such as I4.0 technologies nor fosters a robust source of employment. Besides the 12 emerging technologies considered to tackle poverty, its imminent implementation of the fourth industrial revolution, coined as Industry 4.0, as it involves techniques for the integration of horizontal and vertical firm's processes, additionally, the engineering to engineering that the life product cycle implies (Götz & Jankowska, 2017). Although Industry 4.0 is an excellent opportunity for all stakeholder's in the goods and services production, it also represents a threat to lagged economies in technology development (Rüßmann et al., 2015). Rüßmann (2015), as a pioneer of the I4.0, established related technologies that make possible such interconnection: horizontal and vertical integration, the Industrial Internet of Things (IIoT), Cybersecurity, the cloud, additive manufacturing, augmented reality, Big data analysis, autonomous robots, and simulation. There are in common 6 of 12 emerging economies with I4.0 technologies denoted in Table 1.

Table 1 Common Emerging and I4.0 technologies (* is not part of I4.0 listed, but it is an I4.0 technology)

Emerging technologies	**I4.0 technologies**
Additive manufacturing (3D printers)	Additive manufacturing
Artificial intelligence and robotics	Autonomous robots
Blockchain and distributed ledge	Blockchain*
Internet of Things device technologies	Industrial Internet of Things (IIoT)
New computing technologies	The cloud, Big Data analysis & Simulation
Virtual and augmented technologies	Augmented reality

One of the strategies for facing a weak starting for a business is business incubators. They commonly offer services that satisfy establishment requirements for new firms (Aerts et al., 2007; Grimaldi & Grandi, 2005; Vanderstraeten et al., 2016). Hence, business incubators would be a strategy that tackles the mortality rate of SMEs in the Mexican context. Besides, this entity could pave the way for the implementation of emerging technologies, thereby industry 4.0 technologies too. However, this sort of business incubator that aims to promote technology for tenants' firms is known as Specialized Business Incubator (SBI). Hitherto, there is neither an accepted definition of SBI nor a precise set of criteria that defines it (Schwartz & Hornych, 2010). Schwartz & Hornych (2010) established an SBI base on support elements and their selection criteria aligned just to one sector. Although their definition can be considered ambiguous, this topic often cited in the relevant literature of business incubators. Therefore, the present

research attempts to answer which are the support and selection criteria that define a specialized business incubator, boosting their benefits for SMEs tenants who want to harness technological potentials of the Industry 4.0. Such an approach is built based on a systemic literature review of the state of the art of specialized business incubators. Notwithstanding, the complexity that carries the specialized business incubators out suggests comprehending the problem situation from a holistic point of view. Due to its complex nature, the soft systems methodology devises a descriptive, prescriptive, and measurable analysis of the specialized business incubators' features (Aerts et al., 2007). The study is structured as follows: Section 2 presents the literature review of diversified and specialized business incubators. Part 3 depicts the state of the art of the latest postures of business incubators' features. Then, in section 4, it is mentioned methods and methodology followed to answer from the systemic point of view the criteria aforementioned. Next, section 5 results obtained presented and discussed with the different latest postures in part 6 regarding both sorts of business incubators. Finally, in section 7, the conclusion and final remarks are mentioned.

2. Literature Review

The literature review explains the methodology followed for establishing the theoretical bases in the framework proposal. It used for the first step in search of publications on the scientific browser Scopus. For the literature review, the keywords used in the search criteria were "business incubators" AND (specialized OR specialization). It was found in the period from 1985 to date 135 research articles related to specialized business incubators. Then, a bibliometric analysis of the research articles performed, with the use of VOSviewer software, focusing on keywords co-occurrence cluster maps. Among the main field of studies related to business incubators depicted in **Figure 1** are entrepreneurship as business area, technological areas where science parks highlights in this cluster keywords, risk management cluster, knowledge transfer, and performance. Besides, a detailed review of titles, keywords, and abstracts of the papers was done. This step identifies those critical pieces of researches that fulfill the research criteria. Then, the snowball techniques used to find relevant research papers identified by the principal heads of research related to this field of study, which not found in the initial search. Finally, it resulted in 17 relevant research papers compressing from 2002 to date. They discovered suitably, thereby a detailed revision of them is presented in this paper. Hence, in this section, they are aborded, taking into account that it would give useful insights into the framework development.

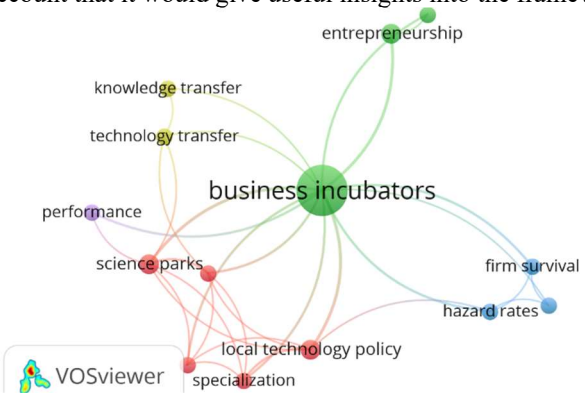

Figure 1 Bibliometric analysis of Business Incubators

Business incubators

The first business incubator born in 1959, Batavia New York in the USA, its concept was to create a business building for business support, about the procedure to become an independent firm tenant (Mancuso Business Development Group, 2020). Since then, it has been identified three business incubators generations. Bruneel (2012), in his study related to business incubators evolution, reported their differentiation, which is determined basically with the services that BI offered. The first generation comprehends from the '50s to '80s; during this time, it caught the international attention and started to spread out in the foreign market. BI offered shared office only space. Then, the second generation, it took the 90'd decade, it added the training support service. Finally, the third generation, which began in this millennium, is characterized by offering complement services of network access such as information and communication technologies network, professional network, and financial services (Bruneel et al., 2012).

According to these generations, the specialized business incubator is located in the third generation, because mainly the information and communication technologies get access to technological networks (Bruneel et al., 2012). On the one hand, the European Union reports that among more significant specialized sector are information technologies; it represents 75%; then, the e-business and business to business (B2B) is 59%; research & development (R&D), 52% of the specialized sector; and the financial one, 44% of the industry (Aerts et al., 2007; European, 2002).

On the other hand, sectors with less participation in sales are trade and distribution with 21% and agriculture with 10% (Aerts et al., 2007). Although these values might not make sense, sectors are interconnected.

Schwartz et al. (2008) reported that in Germany, in 2006, 19% of business incubators are specialized. Moreover, in a study held in Australia, it was identified five active business incubators with a focus in one sector, mostly related to technology business and two academic ones belong to the university. It is also mentioned that in Israel, there are some specialized business incubators (Rubin et al., 2015). Notwithstanding, in the Latin American context, it was found that exclusively in Mexico reports that there is one incubator business specialized in nanotechnologies. It is located in the Park of Research and Technological Innovation in Monterrey, Nuevo León state (Appelbaum et al., 2016).

Regarding the characteristics that the service relationship of diversified business incubators offers to tenants is determined by the type of collaboration between them, where the BI is represented by an administrator. This link aims to explore business support and the barriers that affect it (Rice, 2002), the significant successful drivers in university incubators (Somsuk & Laosirihongthong, 2014). By a qualitative analysis of the impact factors that influence business survival developed into a BI regarding innovation level, size and international trade activity (Mas-Verdú et al., 2015), the simulation of knowledge transfer service and networks efficiency (Zhao et al., 2017), the tenant's profile of the BI, those prospective tenants which are evaluated positively during the selection process and throughout the incubation process (Albort-Morant & Oghazi, 2016). Finally, the social capital located in the BI (Redondo & Camarero, 2019). On the one hand, it was found among relevant literature only two pieces of research about specialized business incubators. Both papers wrote by the same authors Schwartz, M., and Hornych (2008, 2010). Respectively, the first research settled the benefits and deficiencies of SBI, while in the second document, they proposed the internal network creation and stressed the links between academy-industry. On the other hand, although authors did not explicitly express a specialized business incubator, they aimed to close the gap between a diversified and specialized business incubator. Aerts et al. (2007) in his research titled "Critical role and screening practices of European business incubators" related the specialization in business incubators, they established that the survival rate is related to the selection process of tenant prospects among others characteristics. The specialty involves a set of variables that characterized incubators (Grimaldi & Grandi, 2005); such a feature is a source of competitive advantage against diversified incubators (Vanderstraeten et al., 2016). Barbero et al. (2014) matched the type of business incubator base on the innovation sort. Rubin et al. (2015) evidenced how, in Australia and Israel, the innovation source comes from a successful collaboration between the incubates and the incubator management. **Table 2** summarizes the main characteristics of specialized and diversified business incubators based on most cited researchers in this field.

Table 2 Specialized and diversified business incubators characteristics.

Characteristics	Diversified		Specialized	
	Author	Point	Author	Point
Sectorial	(Zhao et al., 2017)	BI performance improvement.	(Grimaldi & Grandi, 2005) (Rubin et al., 2015)	Scope delimited per-sector
			(Schwartz & Hornych, 2008)	Sectors should be complementary.
			(Aerts et al., 2007)	Competitive advantage development by focusing on one sector.
Selection	(Albort-Morant & Oghazi, 2016)	Features tenant's profile analysis: age, education, training, entrepreneurship background.	(Aerts et al., 2007)	Depends on a set of characteristics such as focus on determined sectors, innovation promote and venture capital.
	(Redondo & Camarero, 2019)	Social capital based on the trust level among tenants and incubator managers.	(Schwartz & Hornych, 2010)	Tenant's values evaluation reliability, honesty and loyalty.
External networks	(Somsuk & Laosirihongthong, 2014)	Strong relationship among suppliers for complementary resources.	(Vanderstraeten et al., 2016)	Promote cooperation between tenants and supplier's about central business areas.
			(Schwartz, 2013)	Network business are integrated with financial institutions and private and public research institutions.
			(Schwartz & Hornych, 2010)	Universities as a vehicle for technological independence.
	(Redondo & Camarero, 2019)	Access to external resources for tenants.	(Bruneel et al., 2012)	Specialized knowledge and resources acquisition.
			(Barbero et al., 2014)	High specialization level of technological innovation.
Survival rate	(Mas-Verdú et al., 2015)	Depends on business innovation.	(Aerts et al., 2007) (Schwartz, 2013)	Depends on selection process. Suggest survival studies.
Infrastructure	(Rice, 2002)	Promote the critical resources to tenants such as infrastructure.	(Schwartz & Hornych, 2008) (Schwartz, 2011)	Offer facilities and equipment specialized based on needs Specialization costly

3. Business incubators characteristics

This section aims to contextualize business incubators' characteristics according to the different focuses of the researcher's leaders in this field. First of all, although business incubators, as aforementioned, are mainly classified in were the innovation comes from (Barbero et al., 2014), there is also the specialization focus the type of innovation falls into diversified or specialized incubators (Schwartz & Hornych, 2008, 2010). **Table 2** shows the main characteristics of both business incubators found in the literature review. Therefore, this section aims to explain the main aspects of an incubator business framework regarding both focuses on a rich vision of a business incubator specialized for tackling the imminent arrival of Industry 4.0.

3.1. Diversified business incubators characteristics

Focus on a single sector

A single knowledge service leads to the optimal performance of a business incubator. It was reported by Zhao et al. (2017) by comparing it with a diversified offer of knowledge service. This study examined with the simulation to explore the knowledge transfer performance in terms of depth of knowledge, the width of experience, and knowledge networks for business incubators. The author concluded that depth and knowledge transfer are enablers for the development of the breadth of knowledge.

Selection

Characteristics analyzed in the relevant literature review section which improve the tenant's performance are related to the evaluation of the tenants' profiles in the selection process. Albort-Morant G. et al. (2016), in their study "How useful, are incubators for new entrepreneurs?" examined in this process: age, gender, education level, training level, experience, and family entrepreneurship background. On the one side, they concluded that gender did not make a significant difference in the profile's entrepreneurship. On the opposite side, those young profiles who gather high education levels, professional experience, and familiar entrepreneurship background found characteristics for getting an incubator's financial support.

External networks

Build robust external networks pave the way to get complement resources for the incubator's services. In this way, knowledge gaps are filling as well as improve suppliers' capabilities of those services (Somsuk & Laosirihongthong, 2014). External networks of business incubators offer services not only to incubators tenants but also to others like associations and other agents. Moreover, services supplied by external networks are not limited to regular services, transfer knowledge nature creates a knowledge space where the incubator manager strives the innovation capabilities among stakeholders by linking business opportunities. Therefore, social capital is a bridge for innovation between knowledge and efficient business for tenants into the business incubator hub in terms of the plan, implementation, and business management (Redondo & Camarero, 2019).

Survival rate

According to Mas-Verdú et al. (2015), the degree of business innovation, the firm's size, sector, and export activities impact the firm's survival rate into incubators. Mainly they report that the firm's size in combination with other variables is enough to condition for its survival. Thereby, firms established in incubators tend to be successful in terms of survival rate. Notwithstanding, those firms with these characteristics into incubators, in the manufacturing sector, have a higher survival grade (Mas-Verdú et al., 2015).

Infrastructure

The primary and critical purpose of business incubators is to supply service support in areas related to the management and development of infrastructure networks for new entrepreneurs or those who need them. Reasons are not limited to tangible assets, but also with intangible ones. For instance, the reliability with customers as an entrepreneur can harness such infrastructure. Otherwise, there would be a lack of credibility fort new firms that used to scarce it (Rice, 2002).

3.2. Specialized business incubators characteristics

Focus on a single sector

Specialized business incubators are focus on a single sector or a limited number of them (Aerts et al., 2007; Grimaldi & Grandi, 2005; Rubin et al., 2015), this characteristic gives an advantage (Aerts et al., 2007), while limited sectors should be complementary (Schwartz & Hornych, 2008). Therefore, the specialization characteristic, based on the advantage, is the backbone where innovation is the driver that boosts the firm's competitive advantage (Prahalad & Hamel, 1990). According to Porter (1996), innovation is not only what leads to differentiation among competitors, but also it is critical for a robust and sustainable development (Mendoza-del Villar et al., 2019; Porter & van del Linde, 1995). This differentiation is where competition does not focus on reducing the cost of goods and services. Conversely, this strategy focuses on how to create a competitive advantage by the specialization of those core activities that give

the firm a position in the market (Porter, 1996). Although the specialization has among these advantages, it can also be a drawback when the sector suffers a recession (Aerts et al., 2007).

Selection

In general terms, the tenant's survival depends on the selection process of a set of characteristics (Aerts et al., 2007). Tenant's selection has to be done based on the field of knowledge, as well as the background experience of the business incubator specialization. Among the characteristics of the selection process are trust, honesty, and loyalty of the incubator's tenants (Schwartz & Hornych, 2010). Such values are drivers for sharing knowledge among stakeholders (Mendoza-del Villar et al., 2020; Nonaka & Konno, 1998) to achieve an efficient innovation system (Adler, 2001; Mendoza-del Villar et al., 2020; Nonaka & Konno, 1998). In this way, by the analysis of cooperation and knowledge management, it will be possible to understand the tenant's needs for taking them into account in future candidates of the business incubator (Schwartz & Hornych, 2010).

External networks

As aforementioned, business incubators foster cooperation among stakeholders. Stakeholders like tenants, customers, specialized suppliers in core business areas (Vanderstraeten et al., 2016), financial institutions, and public and private research units (Schwartz, 2013). Links with universities depend on scientific knowledge and technology for the specialization level. With the purpose to boost innovation by knowledge and technology transfer (Schwartz & Hornych, 2010), the development of research and development agreements should build to develop specialized technological outputs (Barbero et al., 2014) through specialized knowledge and resources acquisition (Bruneel et al., 2012), mainly produced and supplied by external actors of the business incubators.

Survival rate

One of the main reasons that a tenant uses business incubators services is to reduce the risk of premature bankruptcy. Once tenants are ready to be independent and graduate from the business incubator, specialized business incubators mitigate this risk by the careful analysis and selection of the potential candidate tenants (Aerts et al., 2007). It is of utmost importance that in this step, strategy for large firms or competitive advantage for SMEs (Müller et al., 2018) is aligned with the sector's differentiation for sustainable development (Mendoza-del Villar et al., 2019). Hence, a lower risk of bankruptcy could be achieved. However, firms established into the business incubator present more chances to survive compared to those start-ups set up outside (Schwartz, 2013).

Infrastructure

The specialized business incubator has a differentiated advantage against diversified business incubators. It is because Specialized business incubators offer infrastructure and equipment according to tenants' needs (Schwartz & Hornych, 2008). Infrastructure as being specialized is significantly unaffordable in comparison with diversified business incubators (Schwartz, 2011) in particular for SMEs in the course of working with the latest industrial revolution technologies (Sanchez, 2019). This specialized infrastructure involves sophisticated equipment costly as it is related to the sector (Schwartz, 2011).

Specialized business incubator advantage

It has been explained before the advantages in each of the business incubator characteristics presented. Such features are infrastructure (Schwartz, 2011; Schwartz & Hornych, 2008), external network services (Barbero et al., 2014; Bruneel et al., 2012; Schwartz, 2013; Schwartz & Hornych, 2010; Vanderstraeten et al., 2016), tenant prospect selection (Aerts et al., 2007; Schwartz & Hornych, 2010), a better chance of survival (Aerts et al., 2007; Müller et al., 2018; Schwartz, 2013). Notwithstanding, these characteristics come from technological innovation (Barbero et al., 2014) of focusing on a single or limited number of sectors (Aerts et al., 2007; Grimaldi & Grandi, 2005; Rubin et al., 2015; Schwartz & Hornych, 2008). Therefore, as a business strategy for incubator managers (Schwartz & Hornych, 2008) is to take these characteristics for boosting specialized tenants aligned to the sector by offering specialized services. It will gain a competitive advantage to specialized tenants against those diversified ones (Vanderstraeten et al., 2016).

Specialized business incubator disadvantage

One of the variables that are not possible to control it is the market's behavior, in this way when there is a turmoil that affects a market's sector, it can be vulnerable to face the situation (Aerts et al., 2007). Therefore, these issues could systematically affect the industry, including stakeholders relationship in terms of the working environment (Schwartz & Hornych, 2008).

4. Methods and methodology

A systemic approach methodology with the social component is an appropriate proposal to deal with such complexity (Mendoza-del Villar et al., 2020). According to Flood and Jackson (1991), they classified the soft systems methodology as a complex problem with pluralist actors. On the one hand, a complex issue which has explained in the first section is presented with the social component and the unwanted outputs such as poverty, unemployment, and

its financial result, on the other hand, a pluralistic point of view is presented because there are different actor involved in the strategy for specialized business incubators. The soft systems methodology consists of 7 steps that split up in 2 systemic activities; the real-world system's activities, and the activities of the system thinking (Checkland, 1999; Reynolds & Holwell, 2010). The real world refers to those activities happening in the real world. It considers the first two steps related to acknowledge, explore, and define the problem situation. Then, having structured the problem situation, the activities of the system thinking world take place. Beginning with the root definition of the critical systems is expressed. The use of the conceptual models aims to propose a systemic solution, regarding an integral perspective of the relevant systems, where the holons customer (C), Actor (A), Transformation (T), cosmovision (W), the owner (O) and environment (E) are involved. Finally, the comparison of the proposed model in the real-world, the desirable, and affordable changes analysis and take action to improve the problem return to real-world activities as the latest steps.

Therefore, as part of the systems thinking world, the business incubator model is part of the methods to be employed. As mentioned before, a specialized business incubator is the proposed strategy to face the imminent arrival of the industry 4.0. Thereby, a model which best suits with the proposal is the general business incubators model developed by the European Commission (2002). As an overview of the incubator model, it consists of three phases, input resources for the incubation process to obtain innovative outputs. However, the purpose of the current research is to devise how the emerging technologies of the I4.0 can be the concept for the specialized business incubator. In section 3, there were identified the critical characteristics that a specialized business incubator should consider for the business model. Although **Figure 2** highlights such attributes in the business incubator model defined for specialization in the previous section, it is missing the sector specialization characteristic. Among the traits identified are found admission criteria as selection, physical space as infrastructure, networking as external networks, and aftercare as survival rate improvement.

5. Results

Soft systems methodology use to tackle the complicated situation, from the systemic approach of view, to get a strategy to implement emerging technologies related to the I4.0, minimizing the risk of SME's bankruptcy. For this phenomenon, it employed specialized business incubators, since it can be a strategy to face it. Moreover, the literature review depicted the context of specialized business incubators and the business incubators' characteristics. This section presents the root definition and how it can fit with the European conceptual model of business incubators (European, 2002). In this regard, the initial steps of the methodology were expressed throughout the introduction phase and, as mentioned before, the critical issues that bankruptcy and poverty involved as well as the imminent arrival of the fourth industrial revolution. Then, also, to identify the relevant systems in the business incubator model, it is necessary to highlight the characteristics of specialization defined in the literature review section. Table 3 denotes each of the holons CATWOE in the system in focus as well as the characteristics. These elements play a critical role in the root system for a specialized business incubator. Root systems are what make sense of the transformation from input elements to output elements as long as it is aligned and coordinated with the specialized business incubator strategy (Mendoza-del Villar et al., 2020).

Table 3 SBI holons and characteristics identification

Holon	Description	Sym	Holon	Description	Sym
Owners	Financial Institutions	**O**	Actors	SBI	**A**
	Government		Customers	Entrepreneurs	**C**
	Private		Sector	Focus on A Single Sector	***f***
	Universities		Criterion	Selection	***s***
Environment	Financial Support	**E**	Service	External Networks	***n***
	Technology Development			Infrastructure	***i***
	Human Resources		Goal	Survival Rate	***r***

Hence, the root definition of the relevant systems devised in the general framework (see **Figure 2**) It is fostered based on the business incubator model, where appropriate systems of a business incubator in conjunction with specialization characteristics transform inputs, such as human & financial resources, innovation, and pre-incubation to specialized graduate firms of the SBI. Likewise, they are supported by post-incubation, such as aftercare services. However, as a dynamic system, feedback should adjust inputs elements for continuous improvement of the system. Therefore, the root definition system is defined as the business transformation process of incubation units [T], with a particular focus on SME firms that are keen on implementing emerging technologies such as I4.0 technologies [C]. The strategy aligned in a sector or complementary one (f) since the initial or pre-incubation phase is the watershed

where specialized business incubation are selected (s) for offering properly services such as infrastructure (i) and knowledge network (n) are focus on the emerging market [E]. Where stakeholders [O] set the selection rules for incubation with private, public, or academical incubators managers [A], who is in charge of overview the proper function of the system, it is achieved by the business development with specialized tenants (C) selected (s) of the sector in focus, financial for funding and, technological suppliers actors for I4.0 technologies [A].

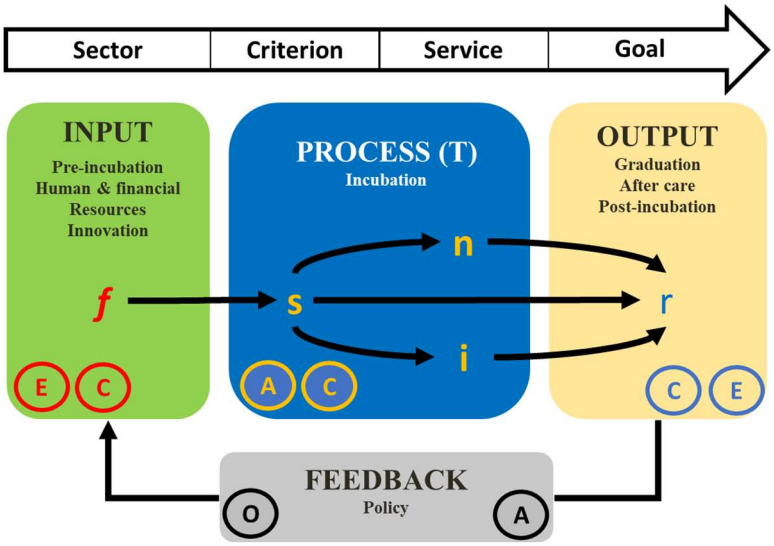

Figure 2 Specialized business incubator model

SBI of I4.0 emerging technologies related to technological infrastructure should focus on aligning their innovation capacity with the competitive advantage to get adequate operational performance. Thereby, by supporting innovation level, it would optimize input resources such as finance funding or knowledge transfer among actors. Conversely, incubators managers should help policymakers to develop regional policies to face contextual instability. Moreover, this context could discourage to the stakeholder and put on risk to take out vital fund capital and open a window for foreign competitors who domain a better position about innovation capability. Therefore, as an integrated general overview [W], the SBI manager should use domain-specific innovation capability in conjunction with ownerships to support tenants to face unstable context and assist the innovation policy development in reducing the risk of tenants or graduates bankruptcy (r).

6. Discussion

Along with the literature review and the result it has evidence that a lack of strategy aligned with stakeholders, characteristics, and elements involved in the specialized incubation procedure, the synergy effort would result insufficient. Hence, with the aim of a holistic proposal where not only it merges the pluralist context of relevant systems but also to clarify a sophisticated strategy by soft systems methodology employment (Flood & Jackson, 1991). This section discusses implications according to the critical root system described in the previous section. The discussion unfolds in two parts, one the one hand, an internal discussion that explains the internal implications of the framework. On the other hand, the external discussion depicts similarities and differences with relevant literature records of business incubators.

6.1. Internal discussion

First, the analysis of the initial phase is crucial, since the sector should be part of a wider strategy as a regional concept where the specialized business incubator establishes. Since specialization focuses in a sector as well as a complementary one, then, at least the sector in focus should be part of the comparative advantage of the region. The competitive advantage of nation analysis is the broadest approach to reduce unsustainable issues for sector development (Mendoza-del Villar et al., 2019). During this phase, input elements should be consistent with the incubation process. For instance, those prospective tenants who are in initial business model steps should regard the pre-incubation process and get a deeper analysis of their core business, and how it fits into the local supply chain. Likewise, knowledge management and financial institutions should have the capacity to boost the innovation capability. In this way, the incubator manager plays a crucial role overlooking the lifecycle of the business incubator

and gather stakeholders or external networks to strengthen weaknesses throughout the business incubator process. Seemingly, specialized infrastructure would be costly; however, it would be functional not only for a single actor, but it would also balance the relative meaning of cost. Because it seeks to be exploited by business incubator customers and technological communication links customers, actors, and owners of the system to get current feedback on strategical goals. One of the roles played by the incubator manager is to graduate tenants who are ready to take on hands their businesses. Nevertheless, they are still being part of the society where stakeholders are looking for a return on investment, so business incubation support by aftercare services as the post-incubation phase. Finally, the achievement of goals is in the general long-term is to maintain firms graduated alive and feedback the incubation process with the support of the owners and actors to balance on time the system by the policy development.

6.2. External discussion

Although researchers have studied business incubators, specialization little considered in their research, based on the characteristics identified for specialization, it is discussed the similarities and differences of what found in the literature review of the authors' proposal characteristics.

Focus on a single sector

It has mentioned that SBI focus on a single as how Grimaldi & Grandi (2005) and Rubin et al. (2015) proposed in their researches or as Schwartz & Hornych (2008) also included complementary sectors. Furthermore, knowledge limitation does not mean demeaning knowledge value. Conversely, Aerts et al. (2007) proposed the specialization where we regard it as differentiation which seeks to be in the edge of the knowledge, thus create a competitive scenario (Jacobs & Chase, 2021; Prahalad & Hamel, 1990), where tenants could harness with emerging technologies.

Selection

Among characteristics to be evaluated in the selection process of the SBI tenants are knowledge and background experience. Although they are part of diversified features as Albort-Morant & Oghazi (2016) pointed them out for the prospect selection, they have to fulfill with knowledge and experience of the specialized area. Therefore, candidate selection is of utmost importance in the sectorial project of the SBI process. Moreover, soft skills such as trust, honesty, and loyalty, proposed by Redondo & Camarero (2019) and Schwartz & Hornych (2010), they are as the bedrock to remove barriers for internal cooperation and promote venture capital innovation among stakeholders, actors, and customers. Aerts et al. (2007) suggested it with the innovative support of the incubator manager as to how a social champion with the role of trust (Hewes & Lyons, 2008), and foster a hub for the connection of I4.0 technologies among them.

External networks

External networks foster the cooperation of customers and suppliers (Vanderstraeten et al., 2016) and strengthen the relationship between complementary services suppliers (Somsuk & Laosirihongthong, 2014). For instance, Redondo & Camarero (2019) supported in their research external resources access to tenants, such as Bruneel et al. (2012) mentioned specialized knowledge and resources acquisition. Furthermore, such cooperation links foreign actors, likely Schwartz (2013) proposed financial institutions, as well as research institutions. Both institutions are necessary for innovation development to boost technology transfer and specialized knowledge (Barbero et al., 2014) like I4.0 technologies, where universities play a role as a vehicle for technological innovation (Schwartz & Hornych, 2010).

Survival rate

Due to the relevance of the results, the survival rate is a research opportunity is (Schwartz, 2013). Neither evidence in the literature that survival rate is an SBI characteristic, nor it is a source of competitive advantage against diversified incubators. Therefore, there are no studies that support the survival hypothesis of firms incubated by SBI. On the one hand, an improvement in the survival rate comes from secondary characteristics, for instance, Mas-Verdú et al. (2015) related it with business innovation, which it can come from competitive advantage such as a sustainable differentiation source in the core competence of the firm (Porter, 1996). On the other hand, Aerts et al. (2007) reported that survival rate dependence on an appropriate selection procedure.

Infrastructure

As one of the differentiation sources is the differentiation of the core competence of the locality, region, or even nation is the concept of the specialization of the business incubator itself. Furthermore, due to the significance of investment amount in facilities and technological equipment (Schwartz, 2011), the specialization concept should fit with the sector needs, such as Schwartz & Hornych (2008) suggested. Therefore, promotion of the critical infrastructure as a marketing strategy of the SBI to tenants (Rice, 2002) or new prospects would harness cost externalities.

7. Conclusion

Throughout the literature review analysis, we found empirical evidence of drivers related to specialized business incubators. Such characteristics were analyzed in both sorts of incubators, diversified, and specialized business incubators. Moreover, the found drivers characterize specialized business incubators were single or complementary sector focus, tenant selection, incubator's networks, infrastructure and technological facilities, and the rate survival as the result of the innovation capacity. Although they are relevant for a specialized business incubator model, it regards that the main characteristic that an SBI should fulfill is the focus in a single sector or a complementary one. Specialization is the result of high innovation capability level that pulls high specialization human resources, financial capital, and high technologies as described in the emerging technologies and I4.0. Otherwise, a lack of a purpose of the collective effort would present a diversified model of incubation. Seemingly, it can be the case of a comparative advantage absence too, where tenants can struggle without a sustainable differentiation. Furthermore, selection characteristic is essential once the incubation process starts since it would let the chosen tenants make use of infrastructure and network services. Hence, the core product and competence of the tenant should fit in the specialization concept of the business incubator. In this way, network actors play a critical role in covering the innovation needs of tenants as well as support the business incubator. Finally, there is no report in the literature that confirms the improvement of the rate of survival of graduate firms of specialized business incubators. Notwithstanding, innovation bridges both terms from the competitive advantage and sustainable differentiation. However, it is necessary to study this phenomenon with specialized business incubators, as well as how these characteristics shape the innovation with the services offered in the SBI. After all, it opens the gap knowledge for future research on this field.

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