Science parks as key players in entrepreneurial ecosystems

R&D MANAGEMENT

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This study explores the crucial role of modern science parks in the creation, development, and management of entrepreneurial ecosystems. Thus, it has developed a conceptual framework for analysing the role that science parks could have in developing an entrepreneurial ecosystem. We interviewed several stakeholders in the entrepreneurial ecosystem oriented towards sustainable production. The study design comprises three levels of analysis: 27 nodes, 7 themes, and 3 aggregate dimensions. While a science park can play a key role in creating, developing, and managing an entrepreneurial ecosystem, we find that its success largely depends on the level of cooperation among the key stakeholders. This study provides new insights into (i) how we can better comprehend the emergence of linkages to develop entrepreneurial ecosystems and (ii) how science park managers and regional policymakers can better examine the role of key stakeholders in envisioning, configuring, and enabling regional entrepreneurial ecosystems. When studying science parks, it is important to use a holistic approach, focusing on the key players in the entrepreneurial ecosystem – science parks and their stakeholders – and knowing how and when to intervene.

1. Introduction

In the last 10 years, academics, managers, and policymakers have increasingly acknowledged the entrepreneurial character of regional innovation ecosystems (Stam, 2015). Such an ecosystem is built using several intermediary mechanisms or space-based organisations such as science parks and incubators, creating a vital nurturing environment to support new ventures. Comprehensive entrepreneurial ecosystems comprise individuals and organisations on different levels, with businesses, academia, and government playing prominent roles in their development. An entrepreneurial ecosystem is a conceptual framework aimed at nurturing economic development by promoting entrepreneurship through innovative start-ups and small business growth (Zacharakis et al., 2003; Feld, 2012; Spigel, 2017).

Researchers maintain that their special interest in linking entrepreneurial pursuits with the concept of ecosystems can be attributed to the following: *First*, system-oriented researchers have often overlooked the involvement of entrepreneurship in economic development (Acs et al., 2017). *Second*, the

systems thinking behind entrepreneurial ecosystems differ from other systems in that the discovery and exploitation of business opportunities is a major characteristic (Autio et al., 2018). *Third*, researchers have neglected the opportunity offered by such an ecosystem for promoting sustainable societal development (Volkmann et al., 2019). This study explores the growth of a newly established Swedish science park using the ideas and concepts underlying the development of entrepreneurial ecosystems. It investigates the park's role in terms of being a driving force within an ecosystem acting as a system manager. Historically, studies of science parks have emphasised their multiple roles (a) in knowledge and technology transfer (Quintas et al., 1992; Good et al., 2020), (b) as supporters of entrepreneurship and innovation for their tenants (Monck et al., 1988; Löfsten and Lindelöf, 2001, 2002), and (c) as network coordinators among stakeholders (Löfsten and Lindelöf, 2005). However, how science parks play an underlying role in innovation, creativity, and ecosystem growth remains unexplored, thus limiting our knowledge of this aspect (Piqué et al., 2019).

The current literature has focused on the evolution of science parks, not on factors explaining the role of a newly started science park and the role of regional stakeholders in developing an entrepreneurial ecosystem. A science park could be a key player in entrepreneurial ecosystems because it can combine internal and external stakeholders to foster entrepreneurship and innovation. Finding gaps in the literature to formulate research questions has previously been predominant (the so-called 'gap-spotting', Sandberg and Alvesson, 2011, p. 23). Against this background, the present study aims to explore the key role that science parks play in the creation and management of entrepreneurial ecosystems. In particular, the study explores (1) the managerial role of parks in the development of an entrepreneurial ecosystem; (2) the processes and sub-processes involved in their ongoing development; (3) the stakeholders and the important roles they play, and (4) new policies and practices that benefit science parks, their tenant firms, external businesses, and regional stakeholders during the innovation development phases within the ecosystem. Therefore, the research question is as follows: *How can science parks and stakeholders adopt policies and practices to improve levels of regional development and innovation?* In recent decades, however, efforts to professionalise science parks have broadened their mandates to include an emphasis on the development of their tenant firms and entrepreneurs, inculcating relations with key stakeholders for attracting the necessary resources (Phan et al., 2005; Bellavista and Sanz, 2009; Cadorin et al., 2017; Albahari et al., 2019).

In a nutshell, the study describes the emergence of a modern science park and its role in building and monitoring an entrepreneurial ecosystem. The selected case is Södertälje Science Park (SSP), established in 2016 to promote sustainable production. The impetus behind establishing the SSP included crucial events involving two large firms: Astra Zeneca and Saab Scania. The former closed one of its major research and development (R&D) services in 2012, and the latter was acquired by Volkswagen AG (VAG), 2 years later. Thousands of employees and many subcontractors were affected, critically impacting the health of the Swedish industry and its international trade. The main task of the new SSP was to create an entrepreneurial ecosystem so that further industrial downsizing could be prevented; value-creating trade with key stakeholders could be established and supported; and diversity could be maintained in an ecosystem comprising firms and organisations of differing sizes, degrees of maturity, and industrial sectors. Using a well-grounded case study, we have shown the importance of science parks in developing entrepreneurial ecosystems.

The rest of this paper is organised as follows: Section 2 provides the literature review; Section 3 describes the methods and data collection; Section 4 describes the empirical results; and Sections 5 and 6 present the findings and conclusions, respectively.

2. Literature review

2.1. Entrepreneurial ecosystems

The concept of an ecosystem as an appropriate conducive environment originated from earlier work on industrial districts (Becattini, 1979). It was extended further to include the science and technology parks literature (Saxenian, 1996). The ecosystems in which science parks operate usually support numerous organisations active in private, academic, public, and civil society sectors (Carayannis et al., 2018). Interest in science parks in developing ecosystems has been growing in general; their various forms in different parts of the world have attracted particular interest (Lecluyse et al., 2019). The idea that an environment must be suitable for fostering the innovation of new ideas and ventures and their development is reminiscent of Saxenian's (1996) study on Silicon Valley in California and Route 128 in Massachusetts.

Etzkowitz and Klofsten (2005) posit that ecosystem can develop gradually, over the long term, evolving from an existing knowledge base or can emerge as a completely new system that comprises an interplay between academic, public, and

private actors (Carayannis and Campbell, 2009). Isenberg (2011) proposed the concept of 'entrepreneurship ecosystems' to explain regional success building and underline how the unique characteristics of an ecosystem and success are related to preconditions such as good practices, early participation of the private business community, the inclusion of tradition and culture, and responsibility for organic growth. Several studies use the network approach, which includes collaboration with the environment, while some underline leadership or policy orientation (Habbershon, 2006; Teece, 2007; Shepherd and Patzelt, 2011; Van Der Borgh et al., 2012; Zahra and Nambisan, 2012; Ben Letaifa and Rabeau, 2013; Maia and Claro, 2013; Autio et al., 2014; Overholm, 2015; Zander et al., 2015; Granstrand and Holgersson, 2020). According to Stam and van de Ven (2021), the entrepreneurial ecosystem concept emerged in the 1980s. It was further developed in the 1990s as part of a gradual shift in entrepreneurship studies away from the trait-based entrepreneur-focused research to incorporate the broader community perspective that includes the role of social, cultural, and economic forces in the entrepreneurship process (Aldrich, 1990; Nijkamp, 2003; Steyaert and Katz, 2004; Shaikh and Levina, 2019; Beltagui et al., 2020).

The ecosystem approach emphasises the importance of spatial boundaries and describes the ecosystems by their economic activities (Acs et al., 2017). Audretsch and Belitski (2017) claim that this approach has been defined as 'a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship' (Stam, 2015, p. 1,765). For firms at the centre of platform-based ecosystems, Teece (2018) argues that dynamic capabilities can enable them to create value by building ecosystems and designing appropriate business models. Furthermore, some researchers have used a systems framework to study entrepreneurial ecosystems, developed matrices to measure their elements, and created an entrepreneurial ecosystem index to examine their quality (Stam and van de Ven, 2021). The prevalence of high-growth firms in a region was strongly related to the quality of the region's entrepreneurial ecosystem (Stam and van de Ven, 2021).

2.2. *Science parks, stakeholders, and entrepreneurial ecosystems*

There is widespread belief among policymakers that science parks are a significant resource that can contribute to an ecosystem of innovation and entrepreneurship (Lecluyse et al., 2019). The concept of linkage among universities, academic research, and firms is also central to the 'science park model' (Quintas et al., 1992; Albahari et al., 2019). Science parks are, therefore, important actors in entrepreneurial ecosystems because they establish a combination of stakeholder relationships among universities, firms, governmental agencies, incubators, and other parks (Albahari et al., 2019; Cadorin et al., 2021). The stakeholders' approach allows conceptualising the promotion of R&D and technology transfer through science park management, enabling several participants both from within and outside the park to influence the socio-economic processes in the region (Frooman, 1999; Maltseva, 2015). Using the concept of stakeholders first proposed by Freeman (1984) allows for formalising the approach to managing internal and external environments of a science park by segmenting its participants' relations. These relations were underlined as the most important asset that should govern the management and organisational aspects as the ultimate sources of wealth (Post et al., 2002).

Moore (1993, 1996) introduced the concept of business ecosystems involving the firm and its stakeholders. This allowed for improved knowledge of the importance of stakeholders for the science park facility (Rowley, 1997; Mian et al., 2021), leading to a model of resource relationships. In addition to the resource-sharing perspective, Hofmann and Giones (2019) discuss the distinctive aspect of innovation and entrepreneurial ecosystems, perhaps due to their market-driven characteristic, which means that even if stakeholders such as the government or public institutions play a role in it, it is mainly the private actors that drive the co-evolution of the value creation and capture core activities. Other approaches can also aid in the management of science parks' strategic stakeholders; one such example is the Savage et al.'s (1991) model, where the basis of the management matrix is the classification of stakeholders based on the determination of their potential to damage the organisation and its capacity to cooperate. The stakeholder theory must account for power, urgency, and legitimacy (Mitchell et al., 1997). Managers must know about entities in their environment that 'hold power' and intend to impose their will to influence policy.

The stakeholder approach of science park management has evolved over the years towards greater collaboration with park firms to not only identify development needs, but also ensure interactions with other actors in the entrepreneurial ecosystem who can offer science parks critical resources to attain

important objectives (Phan et al., 2005; Bellavista and Sanz, 2009; Albahari et al., 2019; Cadorin et al., 2021). This underlines a key advantage of science parks: offering services that firms internally find difficult to provide. Hence, collaboration with other stakeholders through networks with the departments of other educational and research entities aids in the subsequent exchange of knowledge and building strategic alliances, attracting talent, and discovering partners.

3. Methods and data

3.1. Background

This study investigates the case of SSP. It was motivated by the ongoing international research project on the role of science parks as intermediaries in knowledge-based regional development with a focus on issues related to the development of ecosystems. The project comprises a survey of 120 IASP[1] full members in 20 countries (Löfsten et al., 2020; Cadorin et al., 2021). This international sample of science parks, with contrasting characteristics and roles in their respective entrepreneurial ecosystem, is one of the starting points for this study. Based on our questionnaire, the factor analysis in Cadorin et al. (2021) revealed two significant stakeholders relevant for this study: government and university. Science parks are important actors in entrepreneurial ecosystems because they establish stakeholder relationships among universities, firms, government, incubators, and other science parks (Cadorin et al., 2021).

The formal relationships between knowledge creation between science parks and ecosystem stakeholders, such as research entities and universities and higher education institutes, have confirmed outside attraction (Löfsten et al., 2020). At the stakeholder level, the government has a role in obtaining funding for R&D, supporting technology transfer processes, promoting collaboration between localised firms and universities, and fostering innovation activities in the park (Cadorin et al., 2021). The analysis suggested that the collaboration between parks and their ecosystem stakeholders, represented by the government and nearby universities, has a positive effect on innovation and technology transfer in the park, which can positively affect an entrepreneurial ecosystem.

Unlike most other parks, the driving ambition behind the creation of SSP was to avert an economic disaster that was threatening the region. Its original mission was to establish, organise, and lead a new ecosystem specifically oriented towards developing companies emphasising promoting sustainable entrepreneurial development. An interesting constellation of actors has emerged within the ecosystem, including two large multinational companies with unique business orientations, smaller firms, public sector organisations, academic institutions, investors, and intermediary organisations. The numerous opportunities linked to the potential successful growth and development of SSP is another consideration that led to its selection as a case study. As an external partner in the international research project besides SSP, the International Helix Competence Centre facilitated interview access for information from the stakeholders. It provided secondary data for the present study.

3.2. A single case study

This study focuses on a single case and employs an in-depth study design and approach (Yin, 2003). Two main criteria directed the case selection process. First, we identified a unique case (Dubois and Gadde, 2002) by investigating, selecting, and verifying a single case from an ongoing international survey project on science parks (Cadorin et al., 2021). The second criterion was to find a newly established science park facility with a specific mission to help develop an entrepreneurial ecosystem.

Throughout the case selection process, meetings and workshops organised by the Helix Competence Centre were held with experts to assist and improve the methodology. Multiple sources were used for the data collection (Patton, 1999). Starting with the available secondary data, we collected the primary data through interviews with key informants, including SSP management representatives and key stakeholders. The chosen research design follows Yin's (2003) guidelines for qualitative investigations. The interview data were collected using mainly 'how' questions (see Table A3 in appendix), which revealed the characteristics of SSP enabling it to foster an ecosystem. We developed a case study protocol that laid out the questions and described the field procedures.

The established partnership between SSP and the Helix Centre helped select key informants. An initial list of approximately 40 respondents led to a netlist of 20 potential respondents, and finally to 15 high-quality interviews. We selected the final list based on questions addressed during the interviews, mutual understanding of the research questions, and perceived richness of the obtained data. Respondents were judged to carry the necessary operative and strategic information of the evolving ecosystem, as they were all part of the management teams of their respective organisations. During the data collection process, a saturation approach was

used (Hennink et al., 2017, p. 591). Initially, five interviews were conducted with ecosystem actors judged to be the most central ones, as they are part of the management team of the key founders of the Science Park. Thereafter, the interviews continued with additional respondents until the marginal benefit of conducting additional interviews was judged to be very low.

Although SSP is a single case, our research allowed us to develop theoretical concepts and propositions from the in-depth empirical evidence gathered at the SSP. Although aware of the possible shortcomings of considering only one case – which carries potential risks, such as the lack of external validity of the results – this is an accepted approach in social sciences. Flyvbjerg (2006, p. 242) notes a citation from Kuhn (1987): 'A discipline without many thoroughly executed case studies is a discipline without systematic production of exemplars, and a discipline without exemplars is an ineffective one. He asserts that a greater number of good case studies could help remedy this situation'.

We collected qualitative data through semi-structured interviews, supplemented with a literature review on entrepreneurial ecosystems and regional environmental factors impacting science parks. The interviews were face-to-face or *via* conference calls (due to the Covid-19). Each interview lasted between 60 and 90 min (See Tables A1 and A2 in Appendix). The questions were sent to the key informants in advance and sought to explore (See Table A3 in appendix): (i) the place of the organisation in the SSP ecosystem (history, role, agenda, key individuals, processes initiators, and drivers), (ii) general ecosystem interactions (key stakeholders, types of interactions, benefits, what does and does not work), and (iii) specific ecosystem interactions (as a member of co-creation groups responsible for developing the ecosystem).

We organised workshops (in Södertälje and Linköping) with SSP members and key stakeholders in the ecosystem, where we presented the status of the ongoing international research project. We were given the necessary data access to key informants and received feedback on the results of the present study. These gave us valuable insights alongside the earlier theoretical studies on science parks (Alvesson and Sandberg, 2021). We summarised all data in a written report, allowing the respondents to validate the findings. Secondary sources –internal reports, newsletters, website information, application forms, and marketing videos – supplemented our primary data collection. All data were stored according to Yin (2003) in a case study database to enable possibilities to go back and check the data.

3.3. Analysing the case study data

We analysed the interview data following Gioia et al.'s (2013) methodology. Transcripts of all interviews and interview notes were coded into nodes and then themes using NVivo. The first step of the analysis was to code the interviews without unnecessarily deviating from the exact words used by the informants. This enabled researchers to comprehensively grasp the viewpoint being conveyed by the informants and avoid distractions created by their own biases. The first coding of the interviews yielded 138 nodes, a high number due to the effort made to adhere to the original formulations of the interviewees. At this stage, the nodes were formulated in complete sentences, summarising the arguments of the informants with as little deviation from the original intention as possible so that they could be designated as first-order concepts per Gioia et al. (2013). However, this considerable number had to be reduced, so we undertook a second round of coding, reducing the number of nodes to 27. Although not part of Gioia et al.'s (2013) methodology, this was necessary to pursue the analysis. We aggregated similar nodes and defined a consensual term for each node, closely reflecting interviewees' views.

The second step was to find common themes among the nodes. It was important to begin with the first-order concepts and not the interview guide to identifying these themes as the Gioia methodology is an inductive approach. The challenge was to integrate one node into more than one theme. This was addressed by making a judgement call and choosing the theme that most closely corresponded with the node while verifying that the themes were balanced.

The last step was to determine the dimensions of analysis for the themes. We began by aggregating themes into distinct dimensions. These can be linked together to allow for the proper structuring of data, which can be visualised in figures. This order may be chronological or linked to different scales of observation. In the case of SSP, it was a mix of both: the present state of the science park, the current place of the science park in the ecosystem, and the potential development of the science park in the ecosystem.

Figure 1 illustrates the progression from first-order concepts to second-order themes and, finally the aggregate dimensions (Gioia et al., 2013), on which we built our understanding of the driving factors behind the role of science parks in entrepreneurial ecosystems. The data analysis process allowed us to identify many themes and compare how they are related to the existing literature and to one another (Strauss and Corbin, 1998). When a theme did not occur consistently or when there was too much

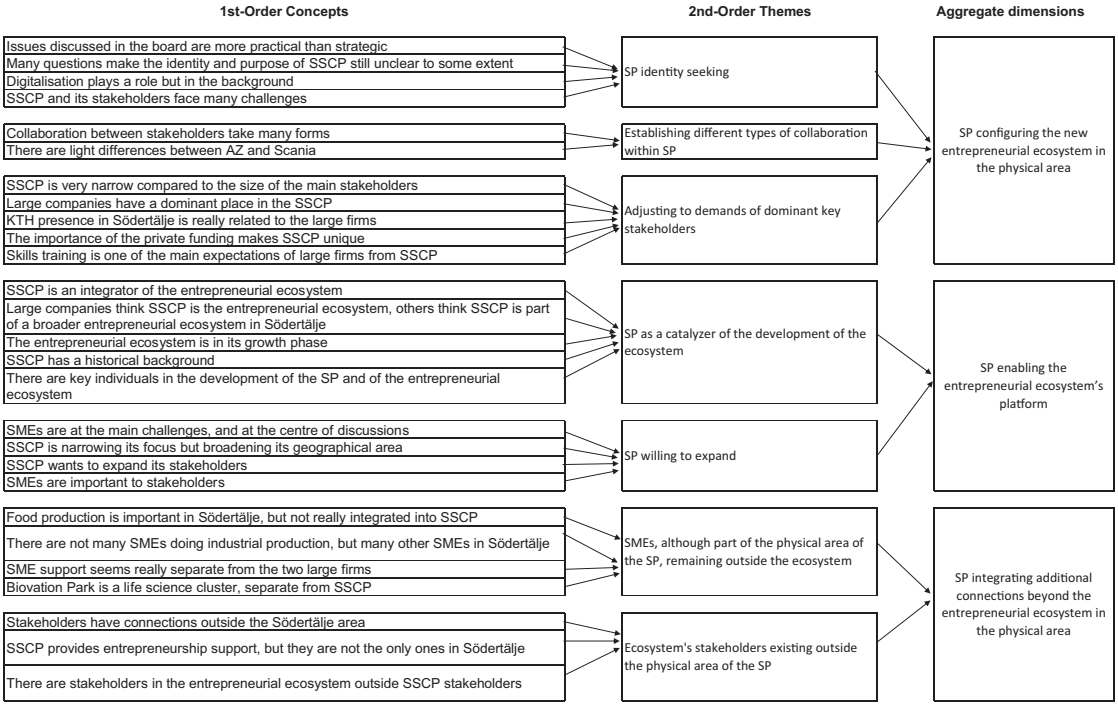

Figure 1. Data structure. SP = Science Park.

overlap, we merged or removed the theme in an iterative process. Table A4 in the appendix illustrates the quotes supplementing the aggregated dimensions and the framework.

4. Empirical findings

Through its historical background, the SSP has shaped the entrepreneurial ecosystem in the physical area of Södertälje. Its current configuration and identity-seeking process make it the catalyser of the entrepreneurial ecosystem. At the same time, its willingness to expand leads it to integrate additional connections, both within the same physical area through SMEs or beyond.

4.1. Science park configuring the new entrepreneurial ecosystem in the physical area

Since its inception, SSP has been run by the same board of directors comprising representatives from the municipality of Södertälje city, KTH, Scania and AstraZeneca, which together own a 50% share of SSP, with Scania's CEO serving as the head of the board. Thus, these firms play a dominant role in SSP's governance as well as in its operations. Like many other regional landmarks, science parks are most likely to be publicly funded, as regional authorities often employ them as tools to support regional economic development. Therefore, Södertälje municipality owns a significant proportion of the park shares, although it is not the major owner. However, 'When the park needs more funding, there are high expectations that the municipality will chip in' (Interviewee 1).

Although KTH is an academic institution that has played an important role in SSD's development, it does not have any financial stake. Its presence is central in that the co-location of SSD near an institution of higher education was an important consideration for public authorities to encourage the project. On the one hand, the main advantages for KTH from the SSD include the closeness and its interactions with businesses in Södertälje and with the two multinational companies, 'to create interactive education (learning) with Scania and AstraZeneca' (Interviewee 5); on the other hand, Scania and AstraZeneca mainly count on KTH for skills development. However, regarding R&D partnerships, they do not necessarily prioritise collaborations with KTH: 'SSP is very important for Scania to develop new skills and test new ideas, especially in innovative production. Regarding R&D partnerships, Scania and AstraZeneca have numerous other options for collaboration' (Interviewee 4).

Three things are noticeable when it comes to stakeholders' collaborations. First, although they do take many forms, they are quite classical in style, as they mainly consist of meetings and partnerships through

projects. However, stakeholders rarely share human resources or buildings (between SSP and KTH) or facilitate interactions (between Scania's researchers and KTH staff). Second, despite their similarities at first sight, Scania and AstraZeneca do not have similar patterns of collaboration. For instance, Scania has a long tradition of collaborating with universities, whereas AstraZeneca is known for collaborating in-house or with start-ups and spin-offs. 'AstraZeneca does not have the same muscle as does Scania in Södertälje in terms of budget and experience of collaborating with academia and other research networks. The networks of AstraZeneca are mainly in-house' (Interviewee 6). Third, most of the collaborations between stakeholders occur beyond the scope of SSP, despite SSP being a catalyst for some collaborations, including those that are not necessarily linked to its focus: 'The science park is a real catalyst; it enables better dialogue with the municipality. It is a meeting point where people can join forces on issues including those external to the SSP; for example, the highway bridge here in Södertälje' (Interviewee 4).

However, the most important collaboration involving all stakeholders occurs within SSP during board meetings when three main agenda items are often discussed: finances of the park, management of buildings and facilities, and organisation of the Science Week. As surprising as it might seem, the strategy does not take precedence during board meetings. Additionally, informants from multinational companies have expressed the difficulty applying what they gleaned from these board meetings to their respective companies. They report that having just two representatives from the companies is inadequate and that their other employees are not involved in SSP's activities, apart from some special events such as the Science Week. 'We have more to do to sell the concept of SSP internally; we are only two persons to be really involved in SSP from our company, and we have some other persons involved as lecturers at KTH. Most people do not get to know the importance of SSP' (Interviewee 6). A similar situation is observed in the municipality, where decisions taken during the board meetings are difficult to communicate to the organisation members. To solve this problem, the circulation of a newsletter is being implemented. As for as the management of SSP, the size of the management team is quite small, although it has been growing since its inception in 2016 from a staff of 1 to 9 persons in 2020.

SSP's small size, young age, and the type of its governance, where the main issues discussed in the board meetings, are more operational than strategic, indicating that SSP is still searching for its identity. However, some issues have been addressed since its inception (cf. Germain-Alamartine and Moghadam-Saman, 2020), such as narrowing the focus of the park from three themes to one. The following question emerged several times during the interviews: 'What is the SSP board running?' (Interviewee 2). Another uncertainty is related to the involvement of SSP in different projects: What role should it play? Should it only assist in funding applications or also get involved in conducting the projects? 'We struggle to find out our role' (Interviewee 3). 'To start a collaboration, is it more natural to turn to SSP or to KTH?' (Interviewee 6). Another one relates to the geographical expansion of SSP: should it strengthen the collaborations within the science park as it is today or include more stakeholders from Södertälje or beyond? 'How can we interact with Scania and Astra Zeneca? They are so strong and have so much going on; how can they benefit from the science park?'; 'How can we motivate more companies to start?' (Interviewee 5).

The science park should be a meeting place where people can get involved through the support of informal ties and interactions. 'How do we have offerings for small and medium-sized enterprises (SMEs) to be a part of the science park without being in Södertälje?' (Interviewee 7). As the science park is still looking to define its identity 4 years after its creation, it seems that it needs to revise its current configuration in accordance with its environment.

4.2. Science park enabling the entrepreneurial ecosystem's platform

SSP has a strong historical background linked to the roles that key individuals have been playing in its creation and development. Most of these individuals are still active and serve as members of the SSP board. 'I have connections and contacts. I bring them to the science park more often than they show me around' (Interviewee 2). The success of the park has had many positive knock-on effects for its surrounding community and for the image of Södertälje as an attractive city where one can come to live or work: 'SSP shows every young person in Södertälje that they can work in these companies and choose KTH […] people in Södertälje are citizens and they are proud of the science park' (Interviewee 1). SSP has for some years become central to the economic as well as social life of the city, with the opening of the northern part of the city, which was previously a closed area belonging to AstraZeneca, and the occurrence of the Science Week every January, bringing together many types of populations, students, companies, and citizens.

These elements might be the ones that are the most visible to the man in the street. However, SSP's aim goes beyond this: first, it aims to support entrepreneurship and skill development in sustainable production. 'The mission of the SSP is to provide high-quality sustainable production; to create the seedbeds for start-ups and small companies, and to invite other actors to learn from what we know' (Interviewee 1). The skill development part seems to be quite well implemented within the KTH campus, Södertälje, and is well understood by companies, particularly the two largest ones. However, entrepreneurship support seems to be more slowly developed.

The diversity of answers to whether SSP is the entrepreneurial ecosystem in Södertälje or whether it belongs to a broader entrepreneurial ecosystem in the region is surprising. Because we attempted to define an entrepreneurial ecosystem more clearly through a stakeholder approach, we purposefully did not provide any definition of an entrepreneurial ecosystem to the interviewees. Instead, we let them explain to us what they thought of it. For Scania and KTH, the SSP is the entrepreneurial ecosystem in Södertälje, which is interesting considering the dominant roles they have been playing in the park. Indeed, for informants from KTH, the KTH-Scania relationship is the basis of the ecosystem in Södertälje: 'We really need to grasp the distinction between SSP and the KTH environment or ecosystem' (Interviewee 2). For others (AstraZeneca, the municipality, and the intermediary organisation Coompanion), SSP is part of a broader entrepreneurial ecosystem. Here it is interesting to note that the latter organisations are more used to working with start-ups and entrepreneurs.

All stakeholders are thus not on the same wavelength regarding what the entrepreneurial ecosystem in Södertälje is. Some stakeholders report that 'the entrepreneurial ecosystem is still in its infancy' (Interviewee 2) and needs to be further developed ('it is important to be patient. SSP needs support and investment' (Interviewee 6)) by including more SMEs in the park. Informants from SSP mention that it plays the role of a manager for the entrepreneurial ecosystem. However, they recognise that they 'are trying to build the glue between the organisations' (Interviewee 3) to hold the stakeholders together.

This glue may be its area of specialisation. In the beginning, SSP had three themes: production management, production logistics, and strategic maintenance. Recently, it narrowed them down to one only: sustainable production. It also aims to become a 'national node of expertise' in this area; a feasibility survey is being conducted by the Swedish national innovation agency (VINNOVA) (Interviewee 4; Interviewee 7). This will allow the expansion of its geographical influence, which might portray a desire to position its identity on its focus rather than on its localisation, thus detaching itself from the strong expectations of the municipality, while still bringing positive side effects to Södertälje. Of course, the name of SSP might change accordingly, which will solve some questions raised in the previous section: 'If the AB becomes a national node in sustainable production, it will have to be differently named' (Interviewee 7). This may influence expansion; SSP wants to expand the scope of its stakeholders, for example, by collaborating with some research institutes (e.g., RISE: Research Institutes of Sweden), governmental entrepreneurship support organisations and high-tech clusters (Kista Science City). However, the actual implementation has not been decided or communicated yet; in particular, a potential change in the composition of the board to include more stakeholders is a matter that has never been raised in the interviews.

A very particular type of stakeholders of prime interest for SSP belongs to the category of SMEs, which are considered important by the current park stakeholders. Large companies in particular find that proximity to SMEs is beneficial to gain flexibility: 'We need to be close to SMEs to get new ideas, to be more fast-moving, and to conduct hands-on activities' (Interviewee 4); 'We are quite heavy companies; we need to gain new insights, new ways of thinking' (Interviewee 6). SMEs are important to Södertälje as a city for the variety and reduction of risk in its economy. To KTH, SMEs are also important to receive and transfer knowledge. Additionally, to SSP, they are also important as one of its main missions to support entrepreneurship. However, the population of SMEs is always heterogeneous and therefore difficult to target. They represent a real challenge to SSP: Where can it find or attract relevant SMEs to support? How can it provide the right entrepreneurship support to them? The main challenge facing start-ups is providing support to help them evolve from a business idea to the concrete implementation of production. This is exactly what SSP would like to address, for example, through the FrontRunners project for sustainable innovation. However, there are not many start-ups or entrepreneurs whose activity revolves around sustainable production in Södertälje; most of them are attracted by Gothenburg or Stockholm, with some even finding it easier or more interesting to start their production abroad.

In summary, SSP sees itself as a manager and 'integrator' of the entrepreneurial ecosystem (Interviewee 7), although this is not fully recognised by other stakeholders yet. Still in search of a well-defined identity, it explores ways to expand its influence over

new stakeholders and new geographical areas while sharpening its focus on sustainable production.

4.3. Science park integrating additional connections beyond the entrepreneurial ecosystem in the physical area

Stakeholders are dealing with entrepreneurship and entrepreneurship support in Södertälje outside SSP. SSP is not the only organisation providing entrepreneurship support in Södertälje; there are other actors, including Coompanion and the municipality, that provide such support. Coompanion specialises in support of social entrepreneurs, while the municipality supports all kinds of entrepreneurs. Other organisations in Södertälje represent potential stakeholders for SSP, but they are not integrated yet – apart, perhaps, from their participation in the Science Week.

Besides SSP stakeholders and the stakeholders around SSP, some projects have connections outside Södertälje, which SSP could use to expand its geographical influence. Two large operations, for instance, also have connections outside Södertälje through external collaborations. In terms of R&D, the Helix Competence Centre is based at Linköping University and is a key stakeholder for both Scania and AstraZeneca. Another example is the Matlust project, a 5-million-euro EU project on the sustainable food industry, led by the municipality of Södertälje. It has its office in the SSP building, but it is not officially part of the SSP, although it focuses on sustainable food production. Some stakeholders of the Matlust project are from outside Södertälje, for example, the University of Uppsala, which offers specialisation programmes in agricultural sciences.

Depending on the informants' organisations, we obtained different pictures of the SMEs' scene in Södertälje. For some interviewees – from Scania, AstraZeneca, KTH, and SSP – there are not enough start-ups to even create an incubator. 'Uppsala innovation centre was present in Södertälje for 7–8 years, but then left in 2019 because they had no more work to do there' (Interviewee 7). Other interviewees – from the municipality, Biovation Park, and Coompanion – have so many clients that it is difficult to support them all. 'In terms of the number of customers, we have reached our ceiling now; we do not have the resources to support more entrepreneurs' (Interviewee 8). Here, again, it is interesting to note that we find almost the same split among stakeholders as earlier regarding whether SSP is an entrepreneurial ecosystem or whether it belongs to a broader entrepreneurial ecosystem.

However, we can distinguish different profiles of start-ups and SMEs depending on their area of activity. Södertälje has a long tradition of food production and is especially renowned for organic food production in Sweden, with the famous company Saltå Kvarn in the Järna district. As mentioned earlier, the municipality also plays a leading role in the Matlust project. Besides, Södertälje hosts many SMEs in life sciences, because of the closure of the R&D site of AstraZeneca, in the so-called 'Biovation Park'.

Finally, Coompanion estimates that there are so many social entrepreneurs in Södertälje that they have reached their capacity threshold in terms of social entrepreneurship support. Overall, there are many start-ups and SMEs in Södertälje that exist outside of SSP, which can affirm two things: first, that SSP is part of a broader entrepreneurial ecosystem in Södertälje; second, that there are many more SMEs in the area than some stakeholders are aware of. Now, regarding SSP's expansion, the issues at hand include determining whether some of these SMEs can align with SSP's focus on sustainable production, and whether they would be interested in locating themselves in SSP, and how SSP can support them.

5. Discussion

5.1. SSP as a key player in the entrepreneurial ecosystem

SSP is part of a broader entrepreneurial ecosystem in Södertälje. However, it represents its most visible part due to the dominant presence of the two large manufacturers: Scania and AstraZeneca. The rest of the entrepreneurial ecosystem consists mainly of the numerous heterogeneous SMEs in the area, representing three main sectors: food production, life sciences, and social entrepreneurship. Then there are governmental organisations supporting R&D and entrepreneurship. Thus, there is a room for SSP to expand its scope of stakeholders in the Södertälje area and use their external relations to expand its geographical scope of influence, in addition to creating new collaborations with partners outside the Södertälje area to consequently drive its development. Based on our empirical findings, Figure 2 shows the proposed framework for SSP as a key player in the entrepreneurial ecosystem. The second column illustrates the connections where SSP is central in the ecosystem under construction. The third column shows that there are two main potential paths for its future development: ecosystem stakeholders and SMEs outside SSP.

Our empirical data are derived from a series of interviews with stakeholders in the entrepreneurial

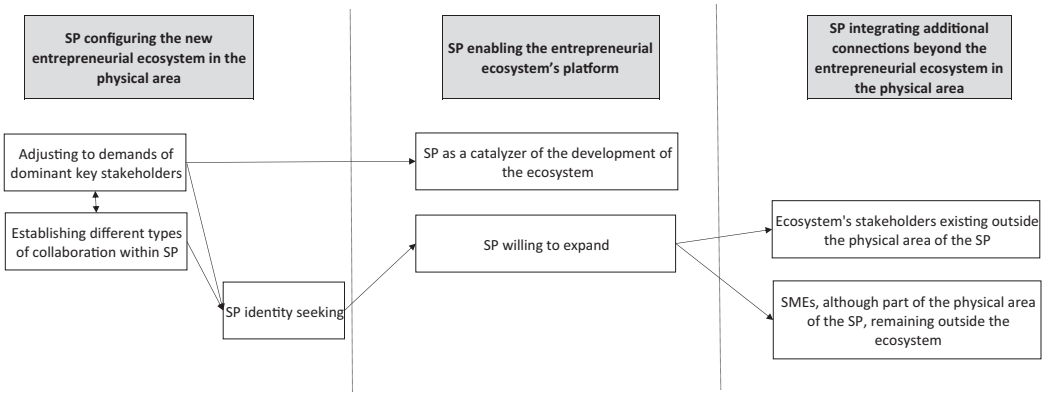

Figure 2. Conceptual framework – Science Park as a key player in an entrepreneurial ecosystem. SP = Science Park.

ecosystem oriented towards sustainable production. The stakeholder approach of science park management has evolved towards greater collaboration with localised firms to ensure interactions with stakeholders in the entrepreneurial ecosystem who can offer critical resources (Bellavista and Sanz, 2009; Cadorin et al., 2021). Recent studies (Albahari et al., 2019) have analysed science parks, university and industry relations, and other stakeholders in the innovation or entrepreneurial ecosystem context. One important conclusion is that the performance of the university-industry interactions and innovation dynamics depends on how the universities integrate with the local ecosystem. Recent interest in entrepreneurial ecosystems among academic researchers is driven by its popularity with policymakers and entrepreneurs; it is, however, part of a larger trend in entrepreneurship studies.

In our view, SSP plays a central role in shaping and developing the entrepreneurial ecosystem, with its technology firms Scania and AstraZeneca, KTH, and governmental organisations supporting R&D and entrepreneurship. Second, we add to the literature a framework for potential science park development as a key player in the entrepreneurial ecosystem. SSP will have to develop the regional platform with the ecosystem stakeholders and SMEs outside the park, acting as a driver of the entrepreneurial ecosystem in Södertälje. Additionally, we provide an analysis of the nexus between science parks and entrepreneurial ecosystems by observing that the former can serve not only as a key player, but also as a manager and driver to expand the external networks, thereby helping to consolidate the emergence of a dynamic entrepreneurial ecosystem.

5.2. Implications

Although entrepreneurial ecosystems command increasing attention from policymakers, academics, and practitioners, the phenomenon remains under-theorised (Autio et al., 2018). The conceptual similarities and differences of entrepreneurial ecosystems relative to 'knowledge clusters', 'regional systems of innovation', and 'innovative milieus' remain unclear. We endeavoured to contribute to the distinction through the present case study and associated literature review. Stakeholder theory is grounded on organisational decision-making processes to ensure the stakeholders' interests (Smith et al., 2013) and the effect stakeholders can have on performance (Kusyk and Lozano, 2007). Entrepreneurial ecosystems highlight the interconnected nature of the ecosystems' components (Brown and Mason, 2017; Purbasari et al., 2020). The entrepreneurial system in Södertälje can be seen as a large organisation, where the different components are the stakeholders. The collaborative efforts of different stakeholders can help develop new firms within the entrepreneurial ecosystem. In the Södertälje case, it can also try to expand by looking both within its geographical area (SMEs in the food sector in Södertälje) or beyond it: big players who are linked to current members of the science park, but in other regions.

In the case of Södertälje, the region has strong automotive and advanced manufacturing sectors and a concentration of research universities. SSP is still trying to find its identity (this has been obvious since its establishment) in terms of its geographical boundary (aim to expand regionally and nationally), focus (now sustainable production), activities (project promotion, Science Week, etc.), and new memberships (SMEs). Support for SMEs thus seems disconnected from the involvement and operations of the large manufacturers, which is paradoxical with the main purpose of seeking entrepreneurship support for SSP to offset the dominance of large companies in the park. This can lead us to think that there is currently a real bias from within SSP, which may be related to the dominant presence of AstraZeneca and Saab Scania.

One crucial dimension is the maturity of the entrepreneurial ecosystem because firms in different development stages also need different kinds of support, and every entrepreneurial ecosystem is special. This implies that different entrepreneurial ecosystems need different approaches, customisable to local circumstances (Hospers et al., 2008). Isenberg (2012) sees the possibility of 'tipping points' when ecosystems become self-sustaining. The main function of science parks for creating and developing an entrepreneurial ecosystem with firms is to create relationships both inside and outside the parks and their surrounding regions to support the ecosystem. Local governments might contribute to better conditions for the appearance of entrepreneurial ecosystems through investment policies and other similar strategies, but it is doubtful that policy can systematically create entrepreneurial ecosystems because policy approaches need to evolve and entrepreneurial ecosystems are complex and dynamic.

6. Conclusions

This study enhances our understanding of the role played by science parks. It provides new insights into (i) how we can better comprehend the emergence of linkages to develop entrepreneurial ecosystems and (ii) how science park managers and regional policymakers can better examine the role of key stakeholders in envisioning, configuring, and enabling regional entrepreneurial ecosystems. However, the presence of dominant actor(s) in the science park and/or the region may impact the development trajectory. A case in point is the perceived bias from within the SSP that may be related to the dominant presence of the large industrial groups in the Södertälje area. This study shows that science parks can significantly contribute to stimulating and organising the development and coordination of stakeholders in an entrepreneurial ecosystem. However, the success of the park will depend on several regional characteristics, the development of an entrepreneurial and innovative culture in the ecosystem, and cooperation between the key stakeholders.

Our proposed framework and analysis of SSP and its stakeholders may not be replicated in all situations because the fit and development opportunities depend on a host of factors, including the science park, the regional characteristics including the dominant actors, and the presence of an entrepreneurial culture. The framework explores the development in mainly two ways: through the integration of regional stakeholders within the science park ecosystem and the inclusion of SMEs outside it. As stated in the study, it is questionable whether policymakers can systematically create efficient entrepreneurial ecosystems because they are unique, complex, and dynamic. However, the policies need to take a holistic approach, focusing on the key players in the entrepreneurial ecosystem – science parks and their key stakeholders – and knowing how and when to intervene.

As in most research studies, this study has several limitations. It is a single case study and each ecosystem with its specific context possesses unique characteristics and individual challenges. There are also problems with definitions, and many phenomena are under-theorised. Given the explorative nature of this work, we chose an in-depth case study approach to research and analyse the contribution of a science park as a key player in the development of an entrepreneurial ecosystem. The data sources consist of several interviews with key informants from different stakeholders, including academia, firms, municipalities, and the science park, to study the phenomenon coherently. However, the study relies on a qualitative analysis as there was no quantitative performance data available for the Södertälje case at the time of this study.

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Data availability statement

This manuscript has not been published or presented elsewhere in part or in entirety and is not under consideration by another journal. All study participants provided informed consent, and the study design was approved by the appropriate ethics review board. We have read and understood your journal's policies, and we believe that neither the manuscript nor the study violates any of these. There are no conflicts of interest to declare.

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Note

[1] International Association of Science Parks and Areas of Innovation.

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APPENDIX

Table A1. List of interviews conducted in 2020

Organisation	Name	Date of interview	Duration
Södertälje Kommun	Interviewee 1	2020-05-18	50 min
KTH	Interviewee 2	2020-05-18	55 min
SSCP	Interviewee 3	2020-05-25	1 hr 05 min
Scania	Interviewee 4	2020-05-26	50 min
KTH	Interviewee 5	2020-05-26	1 hr
AstraZeneca	Interviewee 6	2020-06-02	55 min
SSCP	Interviewee 7	2020-06-02	1 hr
Coompanion	Interviewee 8	2020-06-11	40 min

Table A2. List of interviews conducted in 2017–2018

Organisation	Name	Date of interview	Duration
KTH	Interviewee 9	2017-10-02	1 hr
SSCP	Interviewee 10	2017-10-02	1 hr 30 min
Scania	Interviewee 11	2017-10-03	40 min
Noviga Research	Interviewee 12	2017-10-04	40 min
KTH	Interviewee 13	2017-10-05	30 min
Acturum Biovation	Interviewee 14	2017-10-10	40 min
Södertälje Kommun – Matlust project	Interviewee 15	2018-01-23	1 hr 27 min
AstraZeneca	Interviewee 16	2018-01-23	1 hr

Table A3. Semi-structured interview guide

1. The interviewee's organisation in Södertälje:
   a History
   b Role
   c Agenda
   d Key individuals: (1) who is driving the processes; (2) who is making the initiatives
2. The organisation's interactions in Södertälje and around:
   a Stakeholders
   b Types of interactions
3. The organisation's viewpoint on the science park:
   a Mission and objectives of SSP
   b Benefits for the organisation
   c Opinion on what is working and what is not working
   d Opinion on what is potentially lacking
4. The organisation's viewpoint on the entrepreneurial ecosystem in Södertälje:
   a Feeling that SSP is integrated in a broader entrepreneurial ecosystem? How?
   b Are there any co-creation groups (between the stakeholders/organisations) in the development of the ecosystem?
   c Stakeholders
   d Activities (see tables below)
   e The role of digitalisation in the entrepreneurial ecosystem

Table A4. Table of quotes supplementing the conceptual framework. SP = Science Park

SP configuring the new entrepreneurial ecosystem in the physical area		SP enabling the entrepreneurial ecosystem's platform		SP integrating additional connections beyond the entrepreneurial ecosystem in the physical area	
Quote	Corresponding 2nd order theme	Quote	Corresponding 2nd order theme	Quote	Corresponding 2nd order theme
'The science park shows every young person in Södertälje that they can work in these companies and choose KTH […] people in Södertälje are citizens and they are proud of the science park' (Interviewee 1, 18/05/2020)	Adjusting to demands of dominant key stakeholders	'I have the connections and contacts. I bring them more to the science park than vice versa' (Interviewee 2, 18/05/2020)	SP as a catalyzer of the development of the ecosystem	'Uppsala innovation centre was present in Södertälje for 7-8 years, but they left in 2019 because they had no more work to do there' (Interviewee 7, 02/06/2020)	Ecosystem's stakeholders existing outside the physical area of the SP
'We really need to grasp the distinction between SSCP AB and the KTH-SP environment or ecosystem' (Interviewee 2, 18/05/2020)	SP identity seeking	'The science park is a fairy tale out of something unfortunate' (Interviewee 1, 18/05/2020).	SP as a catalyzer of the development of the ecosystem	'In terms of number of customers, we have reached our ceiling now, we do not have the resources to support more entrepreneurs' (Interviewee 8, 11/06/2020)	SMEs, although part of the physical area of the SP, remaining outside the ecosystem
KTH's main expectations from the science park are the closeness and interactions with businesses in Södertälje, and in particular with the two multinational companies, 'to create interactive education with Scania and AstraZeneca' (Interviewee 5, 26/05/2020)	Adjusting to demands of dominant key stakeholders	'The missions of the SP are: to provide high quality in sustainable production; to create the beds for other actors and companies; and to invite others to learn from what we know' (Interviewee 1, 18/05/2020).	SP willing to expand its geographical covering	'We are starting collaborations with Kista Science City because of the people knowing each other' (Interviewee 3, 25/05/2020)	Ecosystem's stakeholders existing outside the physical area of the SP
'The science park should be a meeting place that could be involved in this through the support of informal ties and interactions' (Interviewee 3, 25/05/2020)	Establishing different types of collaboration within SP	'The science park is a real catalyst; it enabled a better dialogue with the municipality. It is a meeting point to join forces on issues including outside the science park; for example, the highway bridge here in Södertälje' (Interviewee 4, 26/05/2020)	SP as a catalyzer of the development of the ecosystem	'We are lacking connections with Stockholm, where we could find a lot of expert advice; and from where we could attract companies, as Stockholm can be too crowded, too busy, too noisy' (Interviewee 8, 11/06/2020)	Ecosystem's stakeholders existing outside the physical area of the SP
'We have more to do to sell the concept of SSCP internally: we are the only two persons to be really involved in SSCP from AstraZeneca, and we have some other persons involved as lecturers at KTH. But most people don't really get the importance of SSCP' (Interviewee 6, 02/06/2020)	Adjusting to demands of dominant key stakeholders	'Some do report that "the entrepreneurial ecosystem is still in its infancy"' (Interviewee 2, 18/05/2020)	SP as a catalyzer of the development of the ecosystem	'SSCP must attract more SMEs, because there are not enough actors in sustainable production right now, with mainly only two companies' (Interviewee 8, 11/06/2020)	SMEs, although part of the physical area of the SP, remaining outside the ecosystem

Table A4. (Continued)

SP configuring the new entrepreneurial ecosystem in the physical area		SP enabling the entrepreneurial ecosystem's platform		SP integrating additional connections beyond the entrepreneurial ecosystem in the physical area	
Quote	Corresponding 2nd order theme	Quote	Corresponding 2nd order theme	Quote	Corresponding 2nd order theme
'What is the SSCP board running? The AB or the whole area?' (Interviewee 2, 18/05/2020)	SP identity seeking	'It is important to be patient. SSCP needs support and investment.' (Interviewee 6, 02/06/2020)	SP as a catalyzer of the development of the ecosystem	'We could get inspiration from AstraZeneca's Venture Hub in Gothenburg, where a cross-learning between different organisations is happening, through the use of AstraZeneca's empty facilities by start-ups, easing the access to experts in the company' (Interviewee 6, 02/06/2020)	Ecosystem's stakeholders existing outside the physical area of the SP
'We struggle to find our role' (Interviewee 3, 25/05/2020)	SP identity seeking	'Informants from the science park itself actually assess that SSCP plays the role of an integrator of the entrepreneurial ecosystem, although they recognise that they "are trying to build the glue between the organisations" to hold the stakeholders together' (Interviewee 3, 25/05/2020)	SP as a catalyzer of the development of the ecosystem	'Current discussions in the SSCP board deal with the possibility to involve more actors: RISE (Research Institutes of Sweden), and more representatives of the start-up scene, investors, consultancy firms, to enlarge the multitude of actors in the environment' (Interviewee 5, 26/05/2020)	Ecosystem's stakeholders existing outside the physical area of the SP
'To start a collaboration, is it more natural to turn to SSCP or to KTH?' (Interviewee 6, 02/06/2020)	Establishing different types of collaboration within SP	'And it has the aim of becoming a "national node of expertise" in this area - a feasibility survey is actually being conducted by the Swedish national innovation agency (Vinnova)' (Interviewee 4, 26/05/2020; Interviewee 7, 02/06/2020)	SP willing to expand its geographical covering		
'How do we have offerings for SMEs to be a part of the SP without being in Södertälje?' (Interviewee 7, 02/06/2020)	Establishing different types of collaboration within SP	'If the AB becomes a national node in sustainable production, it will be totally differently named' (Interviewee 7, 02/06/2020).	SP willing to expand its geographical covering		
		'We need to have SMEs closeby to get new ideas, to be more fast-moving, and to conduct hands-on activities' (Interviewee 4, 26/05/2020)	SP willing to expand its geographical covering		
		We are quite heavy companies, we need to get new insights, new thinking' (Interviewee 6, 02/06/2020)	SP willing to expand its geographical covering		
		'In summary, the science park sees itself as "an integrator" in the entrepreneurial ecosystem' (Interviewee 7, 02/06/2020)	SP as a catalyzer of the development of the ecosystem		