Methodology book for the development of regional innovation ecosystems

This document describes the METRIC (Measurement of Regional Innovation Capacity) measurement model and methodology for regional innovation ecosystems that have been developed in collaboration with Region Västerbotten.

region västerbotten

Co-funded by the European Union

Measuring Västerbotten's innovation capacity

Region Västerbotten works actively to constantly develop and strengthen the fantastic innovation ecosystem in the region, with the goal of promoting growth and creating favorable conditions for innovative ideas to develop. As part of this focus area, we have initiated the project Regional Innovation Management in Transition (RIO), where part of the project's purpose is to understand what the innovation ecosystem of the future should look like, what capabilities need to be available in the future and also to measure Västerbotten's innovation capacity and capacity so that we learn more about where we are strong and where we can improve. The methodology book we present here provides a structured guide for continued work, which we hope will inspire more regions to participate and contribute to the development of common measurement methods and increased understanding of innovation opportunities. The work is an ongoing process that will continue for several years to come and create good conditions for further growth. Our hope is that this updated method book will inspire and lead to more regions wanting to be involved in the work of developing measurement methods and that together we will become better at understanding our opportunities for development.

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Regional Development Director

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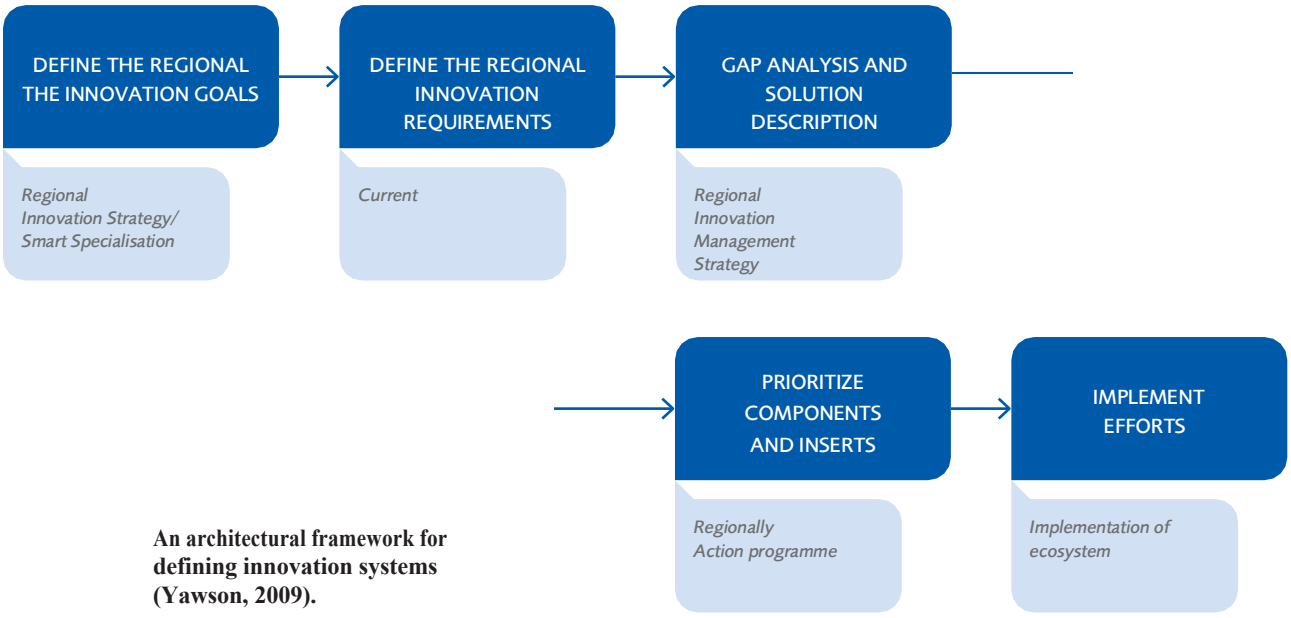
1 Introduction

This chapter intends to give the reader an overview of the perspectives that have been applied to its presentation and the ways in which they have been applied. The chapter should be seen as a short tour of method and perspective.

1.1 The purpose of a method book

The purpose of this methodology book is to describe the model for measuring innovation capacity that has been developed for Region Västerbotten in a number of iterations during the period 2018–2023. The work has been part of an EU-funded project "Regional Innovation Management" that Region Västerbotten has run. The document describes the process, the selection method, and the criteria that make up the selection for how regions' innovation support systems can look and develop.

By having an established framework, based on leading models in the field, regions get a much clearer, clearer and more accepted picture of the current state of the innovation ecosystem and can thus more effectively further develop and refine it (Oksanen, 2014). The development of an innovation ecosystem traditionally goes through five phases from strategic goal setting to execution.



An architectural framework for defining innovation systems (Yawson, 2009).

This document is the basis for a qualified approach for the second step, i.e. to have a start-up model as a basis for the current situation analysis and thus the regional innovation management strategy.

1.2 Why an innovation ecosystem?

1.2.1 What is an innovation ecosystem?

The concept of innovation ecosystems has emerged in the early 2000s to meet the demands of the new emerging knowledge-based economies. What used to be often called "innovation systems" grew in meaning and needed to take into account being more of dynamic, agile collaborative structures with a large dose of self-organization. Instead of establishing an innovation system as a linear process, it was realized that innovation can occur anywhere and needs to have multifaceted paths to grow stronger in a self-sustaining and dynamic way (Mercan, 2011; Skorodinskaya, 2017). These developments have also led to new approaches to innovation policies in many countries. An important factor for change from the traditional innovation systems is the realization that innovations do not have to come from research. The older models from the 1980s (Freeman, Lundvall, Nelson, et al.) and onwards were based on basic research creating new knowledge, applied research building on this knowledge and creating innovations, and from there development and commercialisation arose (Wessner, 2005). Nowadays, and with the advent of the Internet, distributed development, and open innovation, ideas can come from anywhere, putting the old model in the corner and broadening the perception of how an innovation system needs to be designed. An innovation system now needs to support both collaboration between the actors in the innovation system and co-creation with the end users of the innovation system. Hence the new perspective on innovation ecosystems. An innovation ecosystem could just as well be called a "collaborative innovation network". An eco-system is characterised by five principles (Tsujimoto, 2018):

1. An ecosystem analyzes its organic network based on both positive and negative aspects; competition, erosion, cannibalism, etc.
2. Each actor has different purposes, attributes, principles of decision-making. This helps to create dynamism in the system.
3. The analytical boundary of the ecosystem is at the product/service system. It is not limited to national borders, agreements and contracts, relationships or customers/suppliers. This applies not only to the design of the system, but also to the results it produces.
4. Ecosystem analysis requires continuous observation of the development of the product/service system.
5. Ecosystem analysis includes finding patterns of the system's growth or decline under specific conditions.

According to Etzkowitz and Klofsten, an innovation ecosystem undergoes four life cycles (Oksanen, 2014). The first is the start-up phase where a region discovers a need to establish a new economic base and where the ecosystem is slowly formalized, the second is the implementation phase where the infrastructure is put in place, the third life cycle is the consolidation stage where the foundation begins to settle and fine-tuning takes place, and the fourth cycle is

the self-propelled when the establishment is complete and stable growth is underway. This work aims to support both the first and third steps in Etzkowitz and Klofsten's model, where there is both a certain relaunch of the innovation ecosystem in Swedish regions, but where there is already a functioning – albeit not fully formalized – ecosystem in place. The goal is to map and subsequently optimize the innovation ecosystem to the extent possible.

1.2.2 The purpose of an innovation ecosystem

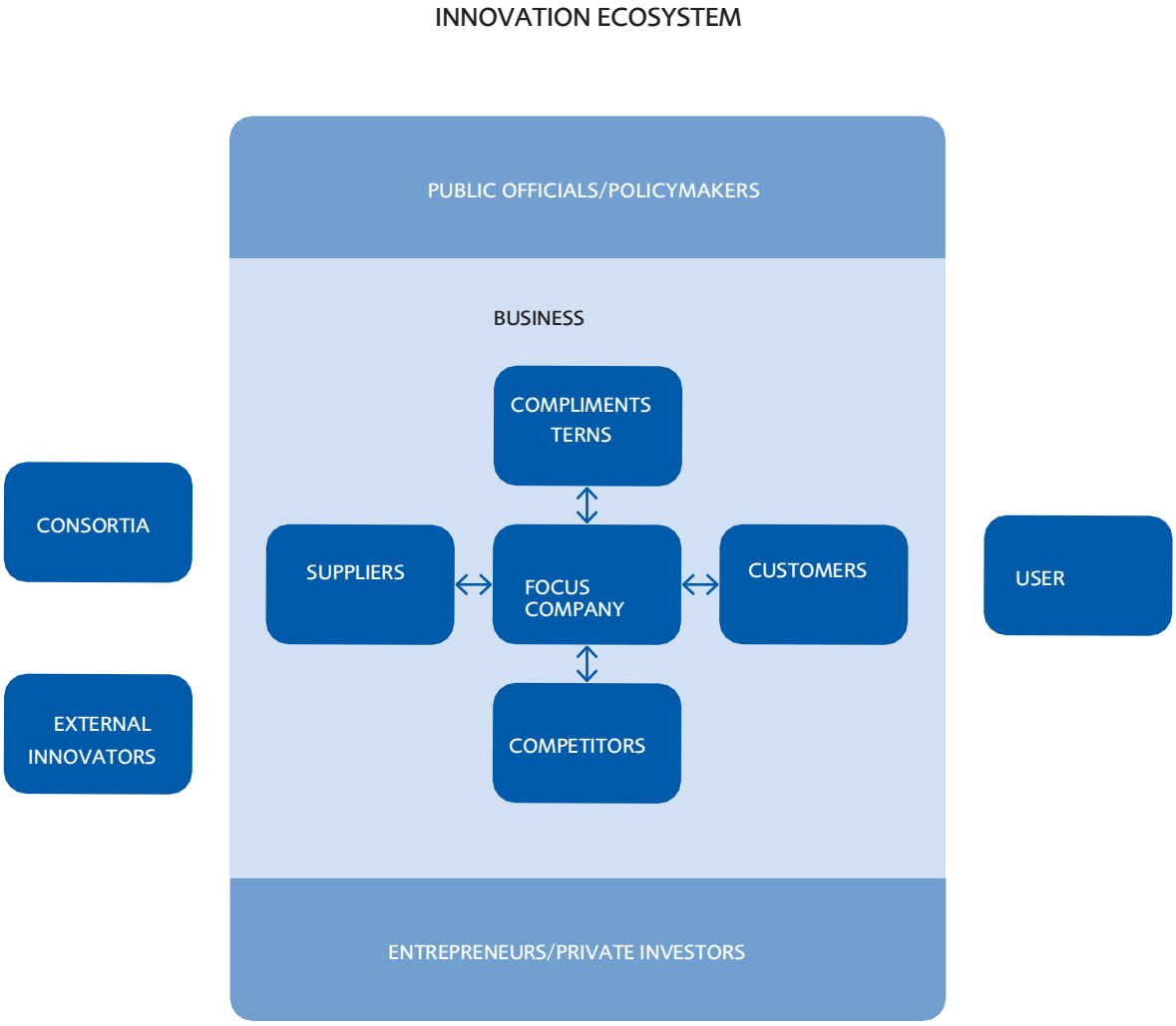
A region needs to have a well-developed innovation ecosystem in order to be nationally and internationally competitive. An innovation ecosystem assists in developing and supporting innovation capacity and entrepreneurship in the region with the assets, resources and skills needed to deliver innovations that can create added value for the region and thus increased quality of life and welfare. The US Council of Com- petitiveness (Feinson, 2003) and OECD (2010) describe a number of functions that an innovation ecosystem fulfils for the development of society.

- To create new knowledge.
- To support the search process's governance.
- To provide resources such as capital and knowledge.
- To facilitate the creation of positive external exchanges.
- To facilitate the formation of markets.
- To create and provide the market with human capital.
- To create and communicate technological opportunities.
- To create and disseminate innovations.
- To provide facilities, equipment and administrative support for incubation.
- To facilitate the regulation of technologies, materials and products in order to expand markets and facilitate market access.
- To create markets and convey market knowledge.
- To improve networking.
- To direct technological research, market research, and partner search.
- To facilitate the financing of innovations.
- To create an adapted labour market.
- To strengthen regional R&D.
- Strengthening regional innovation capacity.
- To stimulate innovation in SMEs.
- To work for entrepreneurship and new businesses.

In other words, it can be said by a good margin that the innovation ecosystem is extremely broad and comprehensive and closely integrated with a region's business community.

1.2.3 The innovation ecosystem to support regional business ecosystems

Organizations and companies do not function as isolated islands in a business ecosystem but become more and more dependent on ensuring a high-quality and well-aligned network of partners, suppliers, sales channels, etc. Companies need to find their position in their own business ecosystem and strengthen their contacts. A "business ecosystem" focuses on the company's perspective for value creation (Tsujimoto, 2018). The business ecosystem is the companies' equivalent to the value chain and the value network from an ecosystem perspective. The business ecosystem describes what the cooperation structures look like, while the value network describes what the refinement process looks like. In principle, you can say that the business ecosystem is the map that shows the conditions and the value network is the practical application of this ecosystem for individual organizations' specific value streams.



The relationship between innovation ecosystems and business ecosystems (from Tsujimoto, 2018).

A regional innovation ecosystem does not need to know what the different business ecosystems in the region look like, or understand the components of the different business ecosystems, but strives to create general conditions for the best - and many - business ecosystems possible.

In addition to bringing together the actors who will contribute to the innovation ecosystem, a healthy ecosystem also needs to have mechanisms to build relationships between the actors in the ecosystem (Jackson, 2015). The two most important components of relationship building are to create the right and timely access to skills, capital and other resources that can be acquired with the help of the capital. The most important task of the innovation ecosystem is therefore to optimise the conditions for these assets.

1.2.4 Purpose of an innovation ecosystem measurement model

A good and precise measurement model is the basis for developing a system. Once we know what measurable factors are important for the success of the system, we can measure them, set goals for what values they should have, determine activities to improve them, and measure the results of the improvements and the effects they produce. The OECD/Eurostat has developed a conceptual framework that assesses indicators as the core components that are measurable for success. When the indicators are mapped, we can see what performance the system actually has. This performance in the innovation ecosystem leads to the effects we want to get out of it.

OECD/Eurostat conceptual framework for policy-driven ecosystem development.

1.2.5 Innovation support schemes to support the innovation ecosystem

An innovation support system consists of actors who, with public funding, offer support to innovators, entrepreneurs and entrepreneurs (Norin, 2017). In a broader interpretation, we choose not to limit the actors in the innovation support system to those who have public funding, which we will clarify further in future chapters. An innovation support system normally covers the entire region and plays a central role in the development of and within the smart specialisation areas. However, not all indicators in an innovation ecosystem are within the responsibility or control of the regional innovation support system. Decisions as tax incentives for innovation initiatives lie at the national authority level; Many decisions on various forms of establishment of support activities are at the municipal level, and the establishment and development of many supporting commercial actors lies with the business community. In fact, most indicators in an innovation ecosystem are at a decision-making level that is indirect to the regional innovation support system or at least to the regional main actor. In addition, since the operational management of the innovation support system is at the level of officials in the region, the impact on the regional indicators is even indirect, as these decisions are usually (although not always) political. Therefore, it is essential how the governance model is designed.

1.2.6 Development of the regional innovation support system

In addition to the fact that there needs to be a regional innovation ecosystem in a region, there also needs to be a systematic way in which the innovation ecosystem is to be supported by the region. The first step to take is to initiate a process for the implementation of such an innovation support system (OECD, 2010). This does not describe the innovation support system itself, but the process of establishing and developing the innovation support system. There is already some form of existing innovation ecosystem in most regions and in the same way an associated innovation support system – albeit mapped, structured, and formalized. What needs to be put in place is a systematics of how the innovation ecosystem and the innovation support system works so that regions can design a governance and development model to improve the innovation support system in a structured and purposeful manner.

Initiate a regional dialogue on innovation

The first step means that the people responsible for the innovation ecosystem need to initiate a dialogue about the need for a developed and well-defined innovation ecosystem and then contribute to building up the conditions needed for the ecosystem as such, i.e. begin the work of working systematically with the innovation ecosystem. It is partly about creating the planning conditions for the establishment of the innovation ecosystem in the form of structures and connections, but it is also about building an environment and a culture in the long term that is conducive to creative thinking and creates the conditions for challenging what already exists and daring to think more radically. There are many activities to do here, and it is not a one-off event, but it will have to take place continuously throughout the future that the company intends to stimulate its innovation ecosystem.

The groundwork is about building up the structure for the long-term work for the regional system that will support the innovative development in the region. In practice, it is about the management of all elements that are part of a regional development strategy, and in particular those that focus on developing the innovation capacity in the region. To optimize an innovation ecosystem

essential components cannot be left out, everything from skills supply to internationalisation and research collaborations thus come into play.

An essential part of it all is that culture and climate become innovation-promoting. This is usually the case if there is an incentive structure that is permissive and accepts experiments, which in turn can be stimulated in many different ways. As a vital part of the system building, the cultural perspective needs to be worked on in particular to also create the mental and cognitive conditions in the region.

Regional current situation analysis of the innovation ecosystem

As a first step in developing the innovation ecosystem and its support systems, we need to explore where we are today. We do this by conducting a current situation analysis. An important part of this document is precisely to understand what we are going to measure, in which areas, which measurement points are relevant, and how we do the data collection. There are different ways and structures for how it should all be done, but the most important thing is that you have a well-thought-out model that is adapted to what you want to achieve. The main purpose of a current situation analysis is to get a situational picture of where you are relative to where you need to find yourself in the areas you have chosen. At this stage, it is important to have a very clear structure for which goals you are striving for (previous strategies), how to measure how you are relative to these goals (measurement model), and how this data should be collected so that it is accurate (measurement method).

Regional strategic innovation development work

The work on regional innovation development is no small matter. It is here that the prerequisites are concretised and the models are created. It is about coordinating the components of an RUS and understanding how they affect the innovation support system and the innovation ecosystem. Together with other regional strategies, the governance needs to be integrated so that it creates maximum support for the innovation ecosystem. Consequently, the content of the RUS and all sub-strategies need to be well synchronised and in line with the content of an RIS and an S3 if they exist.

This work describes the overall objective of the region's development and innovation work. As this is to be integrated, the coordination of all strategic areas needs to be coordinated and uniform. All indicators that are of relevance to the region's development are specified in the measurement model for the current situation analysis, and here the objectives for each area need to be documented. It also needs to be clearly stated which indicators fall within the framework of which strategic area, as well as which indicators within the different areas relate to each other and in what way. That way

there will be a coherent overall picture of the different components of the innovation ecosystem, what their objectives are, how they are interwoven, and finally who is responsible for their development according to the strategic goals set.

Forms of collaboration will also be coordinated, such as coordination structures with authorities, neighbouring regions, the region's municipalities, international partners, etc. It needs to be defined in what ways to collaborate, why they are doing it, and what the exchanges look like as a value for the strategic development of the regional innovation ecosystem. It also describes the internal work on innovation management for the region, i.e. how to work partly to become more innovative, but above all a governance model to drive the development of the innovation ecosystem, i.e. to fertilize the content of it.

Selection of priorities for innovation support

It is important to have support for making strategically important decisions, including policy and political ones, that are important for the innovation ecosystem. Now priorities need to be made that contribute to the implementation plan becoming a reality. This includes making decisions about personnel, resources and funding, which usually requires solid anchoring upwards in the organization.

Implementation/development of the regional innovation support system

Once the strategic planning has been completed, work will begin on the introduction of the internal work system and the development of the innovation support system for the innovation ecosystem. Now it is about implementing direct operational structures and measures to create conditions for the innovation ecosystem according to the plans that have been set in the strategic goals. This is a process that can take several years, but which always follows the direction that has been determined in the overall and coordinated strategic goals. These are activities that are included in the operational plans for the region's work during the years needed for the introduction of the system.

Continuous monitoring, evaluation, and development of the innovation ecosystem

As the innovation ecosystem and the innovation support system are put in place, the performance of the system also needs to be regularly evaluated. The normal procedure for doing this is to carry out new measurements according to the same model and method as the initial analysis of the current situation and to see how the values have developed after the previous measurement. It will also be visible how well the implemented initiatives have had an effect, and it will be visible which initiatives remain to be made or that need to be strengthened to provide a better effect. After new measurements, an analysis is made after which proposals are made for adjustments to ongoing and future initiatives. The new initiatives will then be decided so that they receive a competent mandate and then be included in future operational plans to ensure the necessary resources and implement the decided initiatives.

1.3 Structure of the method

This document consists of several parts, the first of which deals with what should be measured in a regional innovation ecosystem, i.e. what the refinement process looks like in the system, which components should be included in such a system, and to some extent which should not. The second part deals with how the measurement method should be done to ensure that we measure what the model intends to measure. And the third part is about the administration and governance of the whole thing, including follow-ups and revisions. Taken together, the different parts lead to the creation of controlled governance of the development of the innovation ecosystem.

1.3.1 Measurement model

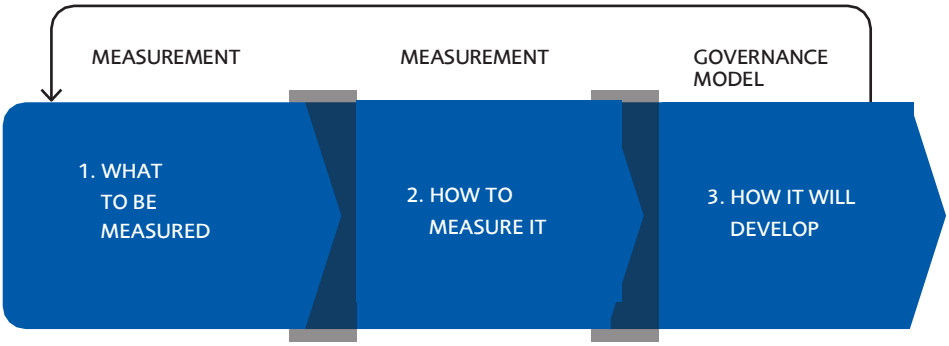
This is the first part that deals with what it is that is to be measured in an innovation ecosystem. It is intended to be a generic model that follows international principles and lessons learned and should therefore be applicable to any region, but at the same time be specifically adapted to Swedish conditions. Measuring quality and efficiency in an innovation ecosystem is very complicated, as it contains many interrelated factors that affect each other in difficult-to-diagnose ways, and are often specific to the area in question (Frenkel, 2014). This makes it relevant to review internationally proven models, other models for measuring regional innovation capacity, national measurement models for regions, and to find the specific measurement points that are particularly relevant to the Swedish context. Models change (improve) over time, but there are strong reasons to do a solid job to qualify your model as well as possible from the start, as it leads to minor revisions in the long run.

1.3.2 Measurement

The second part of this model describes the measurement method to be used, i.e. how the data collection itself is done. It takes into account which data sources can and should be used to provide relevant and up-to-date results, which in turn provide reliability for the survey. It is essential that the survey is current over time so that surveys between years give comparable results. It is therefore important to ensure that equivalent sources will also be available in the coming years. At the same time, it is important that the model is allowed to live and develop. Therefore, there will be a continuous need to make trade-offs between consistency and flexibility.

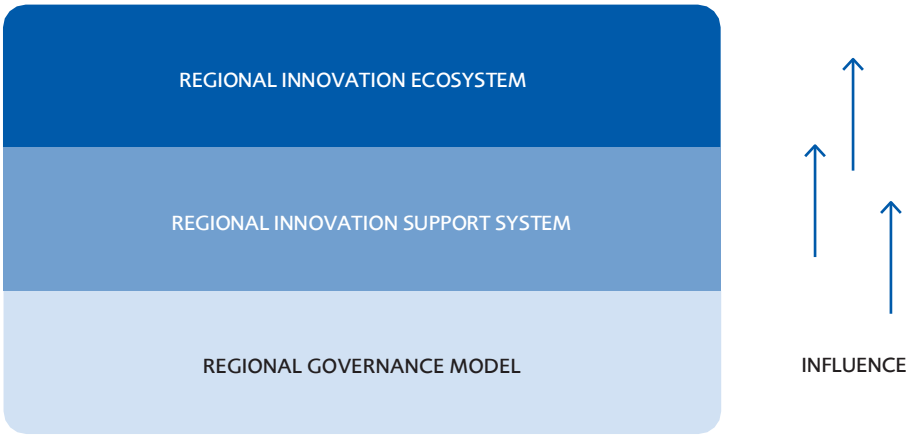
1.3.3 Governance model

Finally, the third part concerns the clarification of how the mapped innovation ecosystem is to be developed, what goals are to be achieved, what activities need to be carried out to achieve this, and what the management of it all should look like. This establishes the roles of responsibility that need to exist in order to manage, operate and develop the innovation ecosystem.



The relationship between the three parts of this document.

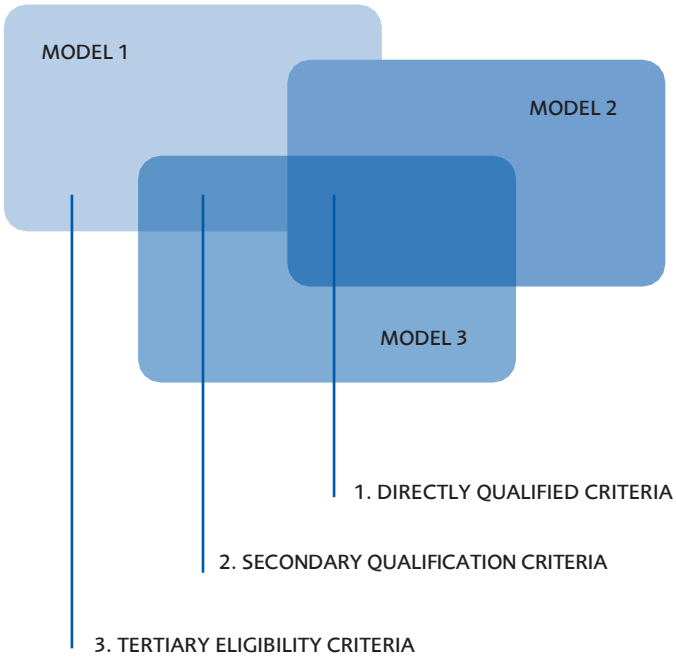
A region's governance model is directly linked to the innovation support system, which in turn is linked to the innovation ecosystem. In simple terms, you can say that the governance model is the region's tool for influencing the innovation support system, and the innovation support system is the tool that exists to influence the innovation ecosystem.



The relationship between ecosystems, support systems, and governance models.

1.3.4 Qualification of the content of the measurement model

The method that has been applied in this document based on the above has been to make a first step of data collection of the areas and measurement points (indicators) that the most accepted and credible measurements use. One of the purposes is to see how they have reasoned and through analysis find the reasons why different indicators are considered relevant. Another purpose is to see if there are differences between the different models and therefore supplement the understanding based on their different reasoning. This is to anchor the model in best practices. On top of this, a filter with a national and regional perspective is then added.



Description of the qualification of measurement criteria from different measurement methods.

However, it is not enough to look at which criteria are common to different methods, as many of them have different aspects to why they have made the choices they have. Therefore, secondary and tertiary criteria have also been evaluated and qualified there in relation to their relevance for measurements of Swedish regional innovation ecosystems. As a basis for

To define these criteria, we have compiled and analyzed a comprehensive number of international and national models for measuring innovation and entrepreneurial ecosystems, including:

- Global Innovation Index (INSEAD, Cornell University, WIPO)
- The Oslo Manual (OECD)
- Global Competitive Index (World Economic Forum)
- European/Regional Innovation Scoreboard (European Commission)
- The Regional Entrepreneurship and Development Index (European Commission)
- Entrepreneurship Indicators Programme (OECD-Eurostat)
- Aspen Entrepreneurial Ecosystem Diagnostics Toolkit (ANDE)
- GIZ Guide for Mapping the Entrepreneurial Ecosystem (GIZ)
- Kauffman Foundation Entrepreneurial Ecosystem Model (Kauffman Foundation)
- Global Entrepreneurship Monitor (GEM/Babson College)
- Indicators for the Swedish innovation strategy (Growth Analysis)
- Reglab's Innovation Index (Reglab)
- A Guide to Assessing Regional Development Resources (US Council of Competitiveness)

An analysis has also been made of all existing Swedish regional innovation strategies (RIS) and finally a review has been carried out in relation to the areas of other regional development strategies to find what is not covered, but should be covered, as well as what is already covered, but possibly should be covered by another area, such as regional digital agendas, smart specialisation strategies, etc. In the end, however, the important thing is that regional development and innovation strategies work in symbiosis and support each other.

1.4 Relationship with other strategic areas

A measurement of an innovation ecosystem has many related areas that it needs to take into account and take a position on. Innovation is not an isolated phenomenon, but takes place in constant symbiosis with the outside world. Therefore, it is important to be aware of roughly how the different areas relate to each other. It is important to understand that the underlying purpose of an innovation ecosystem is twofold, where the primary main purpose is to create increased added value for the region's citizens, users and companies, and the secondary main purpose is to be competitive relative to the outside world, but where both go hand in hand. The secular purpose supports the primary. As a whole, innovation – just like generic development – aims to make the region an even better place to live, work, and live in.

1.4.1 Regional Development Strategy (RUS)

A RUS is a comprehensive strategy for regional growth work in one or more counties. It is intended to serve as an extension of national strategies and as a basis for regional Structural Fund programmes. A RUS is established on the basis of the development conditions for sustainable regional growth that are defined. A RUS takes greater responsibility for the general development of a region and does not only look at innovation, but at development in general.

A regional development strategy should be the mother of the other regional strategies and ensure that there is coordination and logic between them. A RUS is usually only updated once per term of office, which means that the specific in-depth strategies can be more agile and thus in an adaptive way supplement the RUS with a more agile approach. Where RUS is responsible for coordination, the specialisation strategies are responsible for activities and application.

1.4.2 Regional Innovation Strategy (RIS)

A Regional Innovation Strategy is an in-depth approach to the RUS that justifies the innovation focus that is to be pursued in the region. Above all, it is a question of which main areas to focus on, such as research and development, but perhaps even more so which areas of activity to focus on - which is also smart specialisation. In many regions, it has been decided that smart specialisation will be broken out into a separate specialisation strategy, a so-called S3 (Smart Specialisation Strategy).

An RIS rarely goes into any details about how the current innovation ecosystem actually works or any details about how it should be developed and organised, but a traditional RIS describes at a fairly high strategic level where the focus should lie. The main priorities in an RIS are normally in the following areas (OECD, 2010):

- To develop regional R&D and innovation capacity.
- To stimulate innovation in small and medium-sized enterprises.
- To work for entrepreneurship and new businesses.
- Improving human capital for innovation.

A RIS normally provides an overview of the main actors in the regional innovation ecosystem, as well as a picture of how the regional innovation process is conceived at an overall level. This is how a Regional Innovation Strategy (RIS) and a Regional Innovation Management Strategy (RILS) complement each other, where RIS describes what is to be done and RILS describes how it is to be applied. An RIS describes the goals and a RILS describes how to work to achieve the goals. A Regional Innovation Management Strategy also takes into account the internal processes for the innovation support system's operational and strategic management and describes how these are to be managed with a governance model.

1.4.3 Smart Specialization Strategy (S3)

Smart specialisation is generally about the region investing in what it is good at, but even more so about what it can be best at. Above all, it is a question of strengthening regional competitiveness by preventing regions from cannibalising each other's specialist areas. Ultimately, it is about managing the conditions and potential for innovation and growth that already exist in the region, whether it is a traditional heritage or new opportunities. A further purpose of smart specialisation is also to enable regions with complementary areas of strength to collaborate and thus contribute to a more cohesive national innovation force.

S3 and RIS/RILS relate to each other in such a way that RIS/RILS provides broad expertise in innovation and innovation management, i.e. creates the general conditions for leading and quality assuring innovative development, while S3 provides cutting-edge expertise in the areas that are identified and ensures that innovations are developed. The methods come from innovation management, the focus areas come from specialisation. The connection between the two strategies is highly important, as it is vital that all functions in the innovation system cover the smart areas of specialisation that have been chosen to be prioritised.

However, smart specialisation is not only about innovations but also about continuous development, so for this reason this is an approach that may be worthy of being self-contained, albeit with naturally strong links to innovation.

1.4.4 Regional Digitalisation Strategy (RDS)

Just as the Regional Development Strategy is an extension of the Swedish Agency for Economic and Regional Growth's national investments in regional growth, RDA is an extension of the national (and also the European) Digital Agenda. The main purpose of an RDA is, just like that of a Regional Innovation Management Strategy, to support regional development and to create the conditions for innovation. Today, all areas are affected by the opportunities of digitalization, and digitalization can both serve as a platform for innovations and lead to digital innovations. In other words, the digital can, should and should function as infrastructure, content and results.

Digitalisation should, but does not have to, be directly linked to smart specialisation. However, there are strong reasons to ensure strong integration between RDA and the other strategies. For example, the Digital Agenda will focus on support for e-services. E-services themselves can be rudimentary, but in cases where they are innovative, the innovation support system is affected and needed. And in cases where e-services spin out of research on innovations in, for example, healthcare, RDA, S3, RUS and RILS all come into play.

1.4.5 Other specialisation strategies

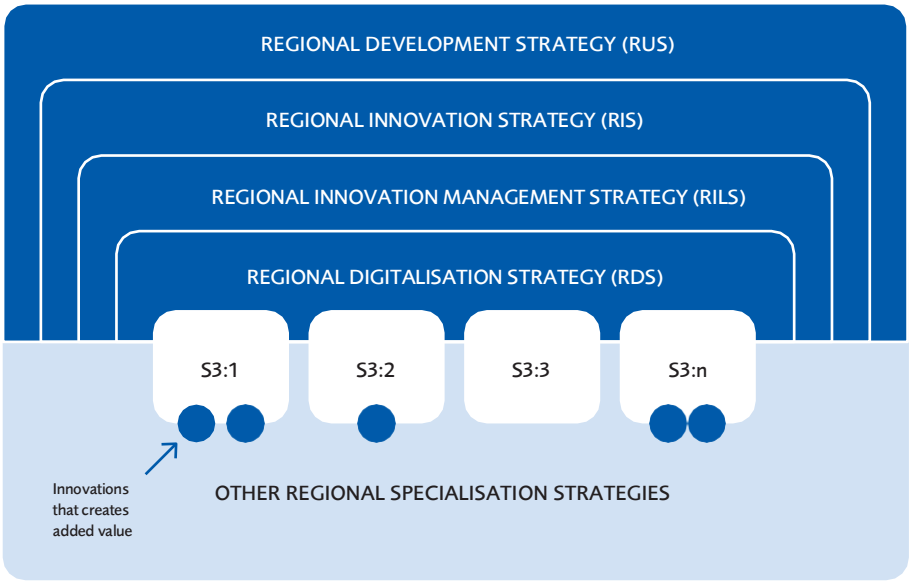
In addition to the above-mentioned specialisation strategies with the task of driving regional development, there are a number of other areas that also come into play. Not all regions have all of these, and may not need to have them, but there are every reason to consider whether these might be worth the extra effort.

a. Research and development strategy. How can we ensure, support and stimulate the necessary research and development in the region?
b. Investment strategy. How do we recruit capital and establishments to the region?
c. Skills supply strategy. How do we ensure long-term access to relevant labour and skills in the region? How should we work to attract talent nationally and internationally? How should we conduct our education strategy so that it secures our future skills supply needs?
d. Internationalisation strategy. How should we collaborate internationally to ensure collaboration with leading expertise? How should we work internationally to support the export of our results?
e. Place branding strategy. How should we build our national and international brand so that the experience of our region supports the other strategies?
f. Sustainability strategy. How can we ensure that the region's operations comply with the three sustainability dimensions of economic sustainability, environmental sustainability and social sustainability?

Many of these can be defined as sub-areas of the Regional Development Strategy and in such a case do not need to be treated as separate strategies. After all, the most important thing is that they are taken care of, so that they are measured and also developed. Many of them overlap with a Regional Innovation Management Strategy, at least in parts of their areas, so it needs to be determined whether they should be formulated as separate strategies or managed within the framework of the measurement of innovation capacity.

1.4.6 Summary

All of the above-mentioned strategies relate strongly to each other and have a great bearing on each other's results. In practice, all these strategies could be accommodated in one and the same strategy as different sections, but for reasons of focus and competence, it is wise to break out parts of them into your own strategies as long as they follow the same goals and patterns. Who should be broken out, to what extent and in what way should be decided early and the organisation that will develop, manage and follow up these should be strongly coordinated.



The relationship between the regional strategies from an innovation perspective.

Redundant work is also avoided as far as possible. Therefore, the responsibilities for the areas should be particularly clear. For example, research, investment and internationalisation are all important components of innovation management, so whether or not they should be included in innovation management work will be a key issue. It would be particularly unfortunate if several measurements were made in different strategic areas, but with different measurement methods, and different results were obtained for the same indicators. Then there will be uncertainty about what results should apply and what strategic efforts should be made to develop them. A cohesive perspective is critical.

It is recommended that each area of responsibility is clarified, the relationship between them, and that a strategically responsible role is appointed for each area. However, there needs to be a common strategy forum so that they function as a unit with several parts, not as different units.

1.5 Approach and perspective

The measurement of the capacity of an innovation ecosystem can be approached from many different perspectives. Here we discuss some of the perspectives we have chosen to clarify the approach chosen in this methodology book. One is about understanding how to create conditions (inputs) for an innovation ecosystem, what actual results (outputs) the system generates, and how these factors then correlate with each other so that you can improve the system, i.e. how different inputs jointly optimize the value of output. It is about how these are connected and can create value that provides synergies for each other. The first is the process perspective, which looks at how these functions contribute to value creation in the innovation process as they take place in phases. After all, an innovation process aims to gradually increase value through different phases with the support of various functions until an innovation creates maximum benefit realization. The second is the functional perspective, which looks at what functions are needed – e.g. research or capital.

The system can either be described from a "bottom-up" perspective where we start from the smallest components to show that they are also connected. It can also be described with a "top-down" approach to first give a picture of how things are connected and then delve into the components that form the basis for this. In this methodology book, we have chosen a combination where we examine both the innovation ecosystem top-down from a process perspective and bottom-up from a functional perspective, and then marry the two together in a logical structure.

1.5.1 The process perspective

A generic input and output perspective takes a "black box" approach to the components of the innovation ecosystem and classifies input as a collection of clustered functions that are more generally and generically added to the innovation ecosystem. The process and function perspectives try to supplement this by putting a certain refinement structure around them. The basis is the innovation process, i.e. the flow of processing through which functions create input to innovations and thus refine them into the value that ultimately generates output. It is the ratio between the value of inputs and the value of outputs that shows the efficiency of the innovation ecosystem (Frenkel, 2014).

1.5.2 The functional perspective

The functional perspective deals with them from a conceptual horizon and groups equal input, such as research functions (e.g. private, academia, institutes), business development functions, technology development functions, etc. This corresponds to the societal functions needed in a region to support the innovation ecosystem. The functions create the inputs that the innovation ecosystem needs to optimize processing. Often, the functions can be linked directly to different actors in the innovation ecosystem, but in order to keep the perspective clear, we focus more on function than on role in the first stage. We can then locate existing actors that correspond to the right function(s).

1.5.3 Measurement dialogue

The actual measurement of interconnected and (many times) qualitative data is relatively complex. It is not enough to just measure whether a function exists, for example, it is equally relevant to measure how good that function is and subsequently what effect this has on both the innovation ecosystem and its output. And since each point exists in a cohesive system, it would also be necessary to measure the effects of the different measurement points on each other in terms of both positive and negative synergies. However, we consider the latter to be too complicated for this model at this stage, but would like to warmly point out that it is an aspect to take into account for future models.

We can measure whether a certain function in the innovation support system exists (yes/no). We can measure the level of maturity of the market according to the best principles of the market (e.g. 0-5). For this function, we can measure whether it generates expected input to the innovation support system (yes/no). In the event of a "yes", we can measure the amount of input it generates to the innovation ecosystem in quantified numbers. Depending on the input, we can also (try) to measure the quality level of the input generated to the system. Finally, we need to try to estimate whether the input generated produces relevant refinement in the system, i.e. the result and effect. This is the most difficult part to measure, but also the one that gives the greatest correlational value relative to output. In the first pilot measurements that have been carried out, the focus has mainly been on obtaining the right forms of measured values.

All in all, this provides an overall picture of whether the right functions are in place and whether they provide the support for the system that they should. Only then will we begin to get a picture of how well the system works, where any weaknesses are found, whether it is possible to set new goals for the system's input based on the correlations, and develop action plans for how the functions should be developed to generate according to the set goals.

1.6 Boundaries

Synergies

This model will not take into account trying to calculate how different indicators may affect each other, as this becomes too complex. This is left to the analysis phase of the work. Exceptions are only made in cases where the synergies are very obvious and clear.

1.7 Definitions

Innovation ecosystem

The system of components and actors that together make up the region's innovative power by working together to create innovations that contribute to added value in the region.

Innovation support schemes

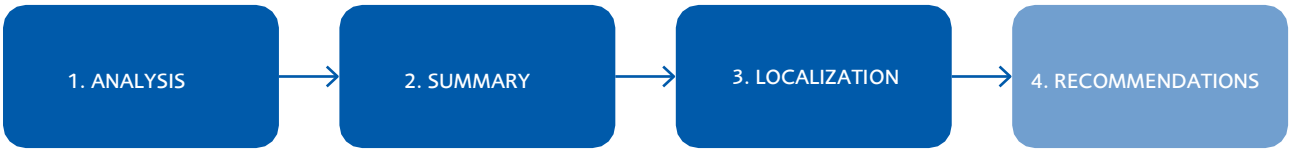
The system of functions that works to support and develop the innovation ecosystem through central coordination by a public party (the region). An innovation support system consists of actors who offer support to innovators, entrepreneurs and entrepreneurs.

2 The innovation ecosystem process

2.1 Process model analysis

2.1.1 Method

The basis for the process model analysis is the existing process models for innovation ecosystems that already exist in society. We have started from the models that have been developed, analysed these for common factors and qualified justifications, and extracted from there so-called "best practices" into a coordinated process model for regional innovation ecosystems. This generic model will then be integrated with any existing regional model for a combined accepted and regionalised process.



Method used to design a recommended process model for regional innovation ecosystems.

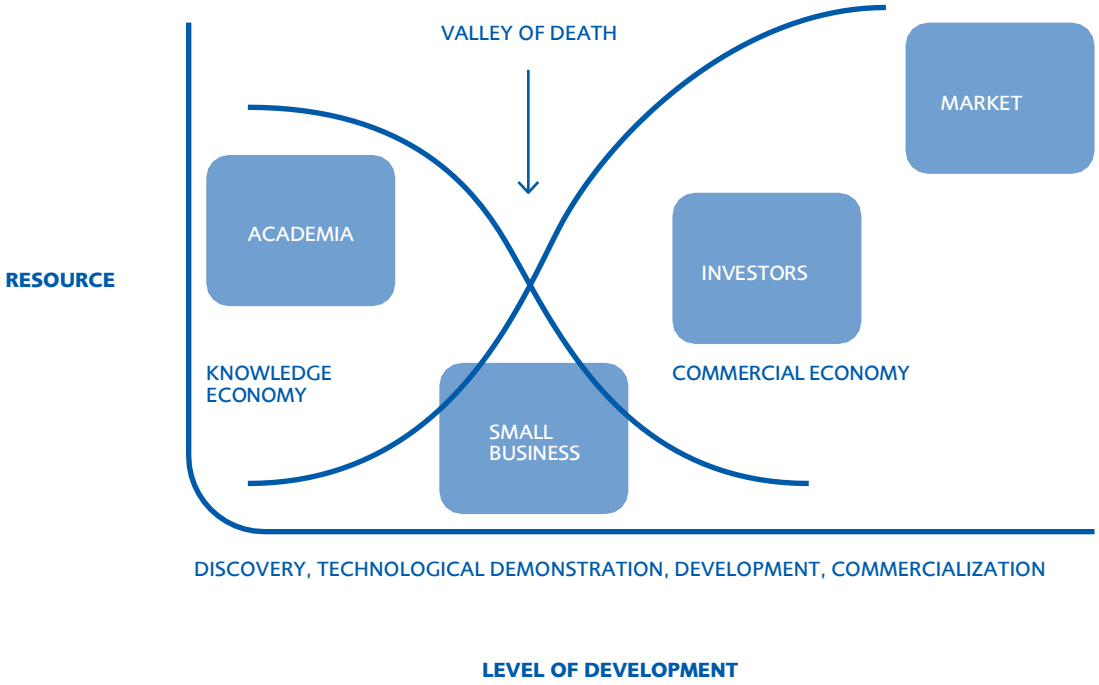
As a basis for the analysis, we have compiled the leading process models for innovation ecosystems, entrepreneurial ecosystems, innovation processes, and incubators. From these, the main common factors have been developed as a basis for a recommended approach for Swedish regions. These have been included in the analysis work:

- UK Cabinet Office – a framework for innovation in the public sector
- The "Champion model" – a framework for regional innovation ecosystems in Australia
- Conceptual Process Framework for Business Ecosystems (Botswana Open University)
- The Birds Innovation Process Model
- ISO 56002 – the standard for innovation management systems
- The entrepreneurial process
- Incubators' innovation process

2.1.2 The value stream of an innovation ecosystem

An innovation ecosystem does not consist of a singular and linear process, an ecosystem consists of a network of relationships, interactions, and subnetworks with different forms of pathways for different forms of desired outcomes (Yawson, 2009). So, while we are aware that an innovation ecosystem does not consist of a linear process, there will always be a set of generic steps that an innovation will need to pass in order to develop according to the best format. It is the overall process we are referring to here, in order to subsequently be able to map the functions needed for this development to take place in the best possible way. This, in turn, is to see what functions are needed in an innovation support system to provide the innovation ecosystem with the best possible conditions. Therefore, we retain the term "process model" here, as we refer to the main flows in value development in the innovation ecosystem.

As mentioned earlier, the critical components for the development of new innovations are competence and capital. These can take place in many different forms, which we do not delve into yet. But to understand when this asset is most critical, we need to understand the principles behind how innovations arise. The basis is to create new solutions for needs and make these commercially available with cutting-edge knowledge. The gap between the sequence in which new knowledge is created and in which it is developed and commercialized is usually referred to as The Valley of Death (Jackson, 2015).



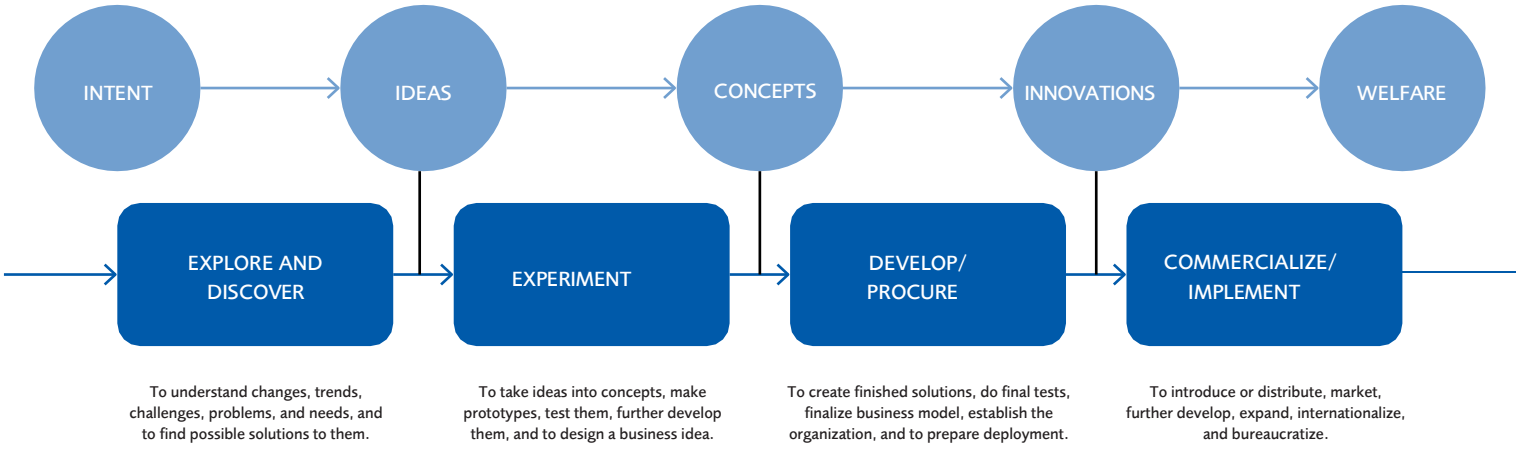
The Valley of Death in an innovation ecosystem according to Jackson (2015).

The challenge with Valley of Death is to get the knowledge economy and the commercialisation economy to meet. This is achieved by getting the knowledge economy in the form of research and knowledge creation to move more to the right and by getting the commercialisation economy in the form of development and commercialisation to move more to the left (see Figure 9). This provides a more favorable innovation process and it is with the innovation ecosystem as support that this is better possible. Without a good structure, technological innovations tend to get stuck in the failure of type 1 or type 2 (Frenkel, 2014) where type 1 is technological solutions that receive large funding, but which in fact should be phased out, and type 2 are technological solutions that should be developed, but are phased out due to lack of funding.

2.2 The innovation process in regions' innovation ecosystems

What we see in both the international and national process models is that even though there is a fairly large spread in the levels of detail, the pattern is the same in them. All of them are actually based on the basic innovation process to refine something new, from need to idea to finished solution to widespread dissemination. Therefore, we have chosen ISO's process model to be the basis for the recommended approach we choose to use as a base, as it has been developed over almost a decade by experts from more than 50 countries in collaboration and maintains the international and generic height needed for this type of model. It has then been supplemented with best practices from the most common factors from other regional and national models, the entrepreneurial process, and the incubator process.

We now take an in-depth look at the four phases of the innovation process and what each process step contains for elements that are relevant to the success of the innovation ecosystem. It should also be mentioned that although the model is drawn in a flow, it is by no means linear. Rather, it only indicates the direction of certain value development.

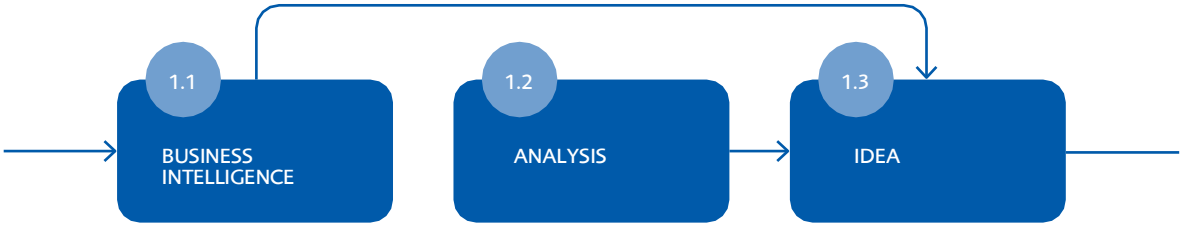


The innovation ecosystem process in regions.

In principle, these four phases always follow each other in one way or another, although the application of the practical processes in each phase may – and will – differ from time to time and circumstance. We are therefore now looking at different elements in each phase.

2.2.1 1. Explore and discover

The first phase is the most scattered, as there are an enormous number of different ways in which thoughts, ideas and needs can arise. In practice, the most important thing about the whole phase is to be able to find, manage and structure relevant information that shows what changes are taking place in the world around you and what challenges they entail that lead to opportunities. In practice, the exploration and discovery phase consists of two partly sequential sub-phases – on the one hand, to find changes, challenges, problems and needs, and on the other hand, to generate ideas for possible solutions to these challenges and needs.



The exploration and discovery phase

The first part of business intelligence is about understanding trends and changes in the world around us, how we think they will develop in the future, and how these will affect us and our contextual world and thus what innovations we see there is and will be a need for. It gives us an outside-in perspective on innovation. In practice, this is not so much a process step as it is an ongoing and continuous work where correct and up-to-date market information and market analysis are critical. Just like the other parallel part of needs analysis, where we also continuously try to understand the changes and needs of different target groups, which through an inside-out perspective gives us a picture of and insights into what types of innovations there is an existing need for. The first two elements provide an overview of needs and development and create the conditions for then finding solutions that can satisfy those needs in innovative ways.

It can all be summed up by looking at changes that lead to new problems and needs arising. We then make an analysis of what it is about the existing solution that causes problems to arise and the need is changing. We then try to gain insights into what the actual underlying need is. We add a picture of how the world around us is changing, how trends are developing and how the future can meet the underlying need in a more satisfactory way. It is these solutions that arise as ideas in the third step, idea management in discovery. And this can happen spontaneously as well as through systematized innovation work or as research.

In many parts of the phase, collaboration with other actors is needed, for example to conduct good business intelligence and future analysis, to interact with relevant needs owners and other stakeholders, and to generate ideas with diverse perspectives. It therefore makes sense to have connections with many potentially relevant actors before they may be needed and then have good collaborations when needed. On many ongoing occasions during this phase, it is also appropriate to have various forms of entrepreneurship and innovation training that give the idea creators more knowledge about how to drive innovation work forward.

1.1 Business intelligence

Business intelligence is about collecting information about the world around us from many sources to create a basis for analysis. Such information collection can consist of both secondary sources with access to studies that have already been carried out and primary sources, i.e. surveys carried out by the person themselves. Data collection is done by many different types of actors such as consulting companies, market research companies, and researchers at universities and colleges. The business intelligence (often also referred to as business intelligence or business intelligence) includes many elements, such as initially defining and mapping the business environment to be monitored, then identifying the sources to be monitored that have the most relevant value for the purpose of the business intelligence analysis, then processing the information that comes in, and then finally carrying out the analysis itself and compiling the results in a relevant way.

With the right understanding of the changes in the world around us, important conditions are created for innovation. Since change leads to new needs for change, innovation work is enormously facilitated when the right amounts of information are made available and analysed. There are many different 'worlds', lots of different data sources and data collection methods, and analysis can be done in many different ways, so that any support with market information that can be given in interpreting changes in the outside world is a good support for in the innovation ecosystem.

Since innovation is based on preceding the market's natural development and creating the solutions of the future, there is also a great need to be able to understand and interpret future developments. Evolution is about solutions naturally emerging as new steps, while innovation is about adding information and intelligence to precede evolution and create the solutions of the future today. In order to add information, we need the same type of information and data sources as in the analysis of the operating environment. However, we also need knowledgeable experts who have the ability to see how developments appear and we need methods to analyse and interpret future developments and understand how they will affect the intended environment. Access to good market information, knowledgeable experts, and good methods for future analysis are thus essential components in an innovation ecosystem in order to be able to ensure the quality of innovative thoughts, ideas and solutions.

1.2 Analysis

Needs analyses have great similarities in the process of external analysis, but mainly focus on a limited area, such as within an organization or a specific problem area within an industry. The first step is to define and map the problem area to be monitored, e.g. the labour market in an area. Next, identify the data sources to monitor that are most relevant to the purpose of the needs analysis. For example, it can be about statistics, support cases, complaints, etc. When a particular problem or need is discovered, it is processed and defined with what it is that is perceived as problematic. An analysis is then made, which is partly about defining which chains of causes have led to the problem having arisen and partly to describe the effects different problems can lead to.

With good mapping of what problems and needs exist, there is an excellent basis for the ways in which new innovations can solve the perceived problem. However, it is important that knowledge of identified needs and problems reaches relevant actors so that it is possible to come up with diversified and varied solutions to these problems. Therefore, it is essential to communicate in order to either spread the needs to many actors who can contribute perspectives or to invite some of many actors to contribute perspectives depending on how open you can or want to be with the needs and insights you find.

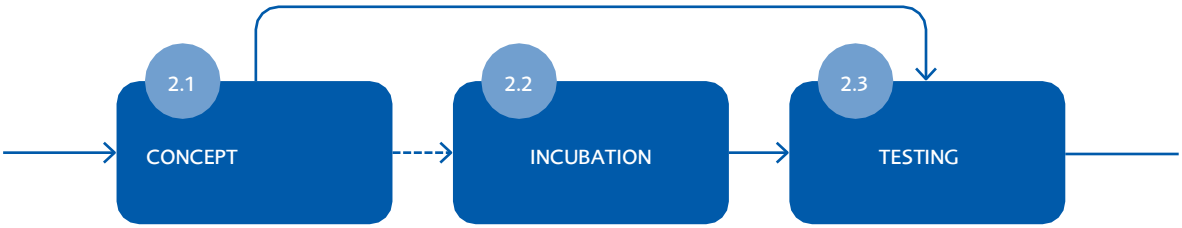
1.3 Idea management

Idea management consists of finding and managing possible solutions to found problems and needs. Ideas need to be generated, cultivated, managed, and managed in order for them to become a good embryo of something valuable. In order to create good conditions for idea generation and idea management, there needs to be access to good information, i.e. such as that which has been compiled in the previous steps, and diversification among those who will contribute with thoughts about the solutions. Good generation of possible ideas thus arises from having access to well-structured and well-analysed information so that the idea creation has the right conditions and that there is access to varied expertise in many different areas. Then, idea management consists of several steps itself, including the generation of ideas, the management of those ideas, the evaluation and merging of ideas, the validation of ideas, the elimination of ideas, the approval of ideas.

So in addition to this, there needs to be a methodology for the generation and management of ideas, including access to premises and materials, possible agreements (NDAs, etc.), relevant software, etc. that may be needed depending on the chosen approach to idea management. Together with relevant market information, industry knowledge, and business development skills, ideas must also be validated against the market for their feasibility and potential at an early stage. Unfeasible ideas should be stopped or updated early on so that they do not drain time and capital unnecessarily from enterprising innovators. In addition, the process is facilitated if initial risk management is carried out early on in order to quickly evaluate the potential consequences of the outcome for both the innovators and the target groups. It is usually at this stage that entrepreneurs turn to incubators for help in managing the process and support in how the idea can be taken further.

2.2.2 2. Experiment

Experimentation is about designing concrete solutions, reducing uncertainties by increasing the understanding of how solutions can work and be perceived, and thus reducing uncertainties about the possible outcome of the solutions and thus being able to better control the risks associated with innovation. This is done by iteratively developing and testing solutions from the small to something progressively larger and more elaborate. Experimentation is critical for innovation and is precisely where the valley of death is, i.e. if the technological demonstrations do not succeed, it can be the grave for good ideas as well.



The experimental phase

2.1 Concept development

Concept development is the next step in concretizing ideas. Here, the idea for a working concept is taken through an iterative number of steps. The concept is first developed 'conceptually', i.e. theoretically and in writing, then prototypes are made to be able to test the results and effects of the solution.

The first step is to further clarify the original idea and make it a more full-blooded concept. This includes making a complete description of the idea's functionality and application. Common ways to do this include using user scenarios – or "use cases" – that describe how the solution in question should actually work once it is available. These user scenarios provide a verbal visualization of the different situations in which the innovation is to be used and reflect both its use and its benefits in relation to existing solutions. Although the solution does not exist yet, these scenarios reflect what it is supposed to look like when it exists. These scenarios are supplemented with functional descriptions that supplement the scenarios with descriptions of how things work and in what way. And in addition to this, there are also specifications of any requirements that may need to be set for a new solution, such as special requirements for security, usability, adaptations, etc., or external requirements that are e.g. legal or regulatory.

The second step is to start prototyping the solution to create more clearly knowledge about how the design of the innovation should look and work. This requires technical expertise and some financial support. To be economically efficient, you usually start by initially making very simple prototypes with cheap materials such as

Can be put together quickly. Concepts such as "quick and dirty" and "low fidelity" are usually used to describe the principle. The aim is not to make too large investments in the early stages when it is still not clear how the innovation will be designed or if it will even be anything. Here, prototypes are now made of simple materials such as paper, cardboard, styrofoam, wood, etc. Digital solutions are made on paper, whiteboards, or in simple tools such as Powerpoint. These prototypes should then be able to be used for simple tests in the way described in the user scenarios.

The third step is to make more advanced prototypes. These should be able to reflect real use in the best possible way without the cost of developing a properly developed solution. These so-called "high fidelity" prototypes will be able to simulate the functionality of the innovations so well that tests can make the experience as similar to the real solution as possible. More real materials are now used here, although no actual functionality has been built. Final prototypes should normally be of such a simulation level that they can be presented to potential investors, financiers, or clients and be a sufficient basis for decisions on full financing.

It may also be that the concept is not based on developing something new, but can be based on using something new. Even then, the concept needs to be described so that it can be developed and applied. If it is a new business model for something that already exists, it still needs to be designed, worked through, and tested before it is introduced and put into use.

Competence in relevant technical areas is critical, as is competence in methodology for developing prototypes. Various forms of collaboration will therefore be relevant. Here, some venture capital is often also needed (mainly seed financing).

2.2 Incubation

Already early on, there is also a need to work on the business aspects. In parallel with concept development and testing, a value model needs to be developed. If you cannot demonstrate early on that there is benefit and value in a new solution, it will have challenges in obtaining funding. Many are prepared to invest in something that has the probability of being a market success, but few are prepared to invest in the opposite, therefore this needs to be calculated starting at an early stage.

But it is not only about the profitability of the individual solution, but also about issues such as ownership, organization, marketing, etc. A preliminary plan needs to be drawn up for the overall solution, including financing for development. If there isn't already a team behind the idea, you start putting this together. Most entrepreneurs or intrapreneurs do not have the skills themselves at all and need to surround themselves with excellent partners. Here you also need good advice and business support with large contact areas. It also requires good market information in order to be able to validate the development of the solution to the conditions in the market and for the business. For the parties involved, this is also a matter of priority whether this is the solution they should invest their time and investments in or one of the other solutions that are demanding available resources.

Somewhere here, the entrepreneur(s) need to decide what work effort to put in and whether they are ready to enter a startup full-time and leave a possible permanent employment.

In addition, the supply of capital is a crucial element in this phase, as it will be critical to have financing to pay for the development and production of new innovations. Contacts with financiers and capitalists are (can be) crucial for the future, and the results from concept development and business planning create a crucial basis for proving the market conditions for potential investors. First, capital is needed, but that capital can then be acquired other necessary resources, such as technical knowledge, technology, machinery, premises, licenses, etc.

2.3 Testing

Testing is not really a separate step from concept development seen from a sequential perspective, but tightly integrated and iterative. When the first simple prototypes have been developed, various types of tests are immediately carried out, especially user tests in the early stages to get input, feedback, and ideas for improvements at an early stage. Then new tests are carried out for each new and upgraded version of the solution that emerges.

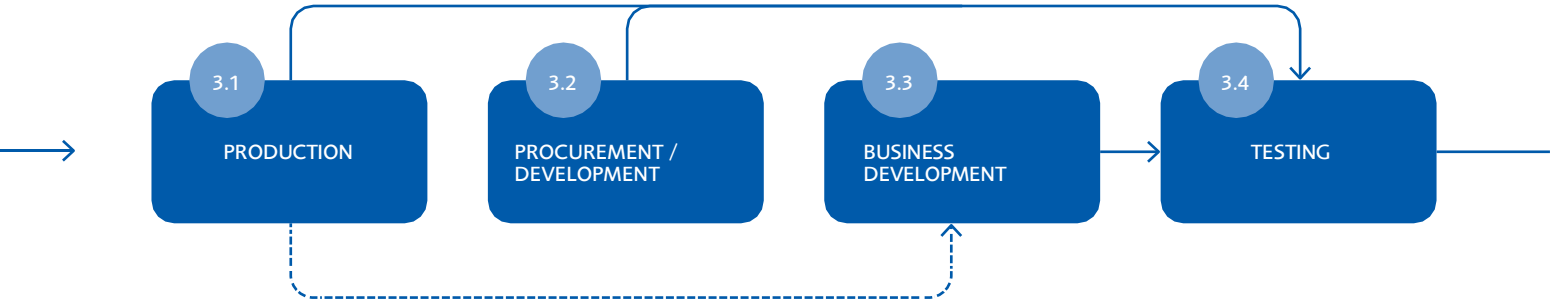
The first undergo very simple and quick tests and the choice of target group in user tests is not so careful. However, those who develop the solution are rarely also test subjects, but it is often people in its immediate vicinity who are allowed to participate, of course depending on what type of solution it is and how general functional it is.

Tests need both a measurement model that clearly states what is intended to be measured in the tests. There can be many different types of data you want to capture, such as how the solution works, how it could work, if you would like to use it, what you would consider paying for it, how you would consider paying, and so on. In addition, the tests then also need a measurement method that further the way or ways in which the information is intended to be obtained. The measurement method will ensure that we receive data and information that we can use when we further develop the solution between tests. Finally, the tests also need test subjects who match the target group that the solution is for. The accuracy of the selection increases as the solutions become more advanced and costly, but often need to be reasonably focused already in the early tests.

2.2.3 3. Develop or procure

When the concept is then fully developed, it needs to be completed for the market. Depending on how the development has taken place, it can look a little different. It can be an innovation that needs to be produced, be it a product or service. If this is the case, the conditions may be a little different if it is an innovation that is being developed within an organization or if it is an entrepreneur who wants to launch something on the open market. In the first case, there is often potential funding, structures and ownership in place. In the second case, when it is a contractor, most things usually need

be built from the ground up. This requires fairly proper business support with contacts and networks for it to be good and successful. It can be about finding new innovative technologies to import or license. If, on the other hand, it is not an innovation that is to be produced in any way, but about using and introducing an innovation, no production apparatus needs to be prepared in any way, but the developed concept still needs to be incorporated by acquiring the innovation(s). In addition, there is also the need to complete all the business aspects from business planning to organizational management, as well as to prepare the innovation for market launch or implementation. In addition, issues of intellectual property rights, related patents, legal protection, etc. need to be handled.



The development or procurement phase

3.1 Production

With the approved concept as a basis, the sharp solution will be made ready for production. This means that it needs to get its final design, which refers to functionality, color and shape, durability, etc. When any choices of materials, sizes, design, etc. are made and consideration has been given to what the users want and need, there is a basis for how the solution will be produced and how much it will cost.

In this context, production refers to all conceivable variants of manufacturing and execution that involve innovations being completed and made available to their target market. For the manufacture of products, it may be a matter of establishing a manufacturing process in premises intended for the purpose or establishing contact with manufacturing subcontractors who produce solutions. For digital solutions, it can be about programmers developing systems based on design and concept information. For services, it can be about getting training and application in the right way so that the solution can be used flawlessly at launch. As much of the physical production and manufacturing takes place in other countries, contacts become important. The same applies to the development of information technology digital solutions.

3.2 Procurement or development

In this phase, it is often between producing yourself or procuring. Already at the end of the concept phase, existing solutions have often been in place. Therefore, it is important to do a proper review of solutions to see how they match our intended solution and the needs that we have. It is important to find all possible solutions that then match the defined need and to set them against each other so that the most suitable solution is procured. Here, it is extremely important to have good channels for market knowledge, as not everything is published online. This may involve new patented technologies or new R&D solutions that have not yet been commercialised, in addition to what already exists and is available in the ordinary way.

3.3 Business development

In parallel with the completion of production or procurement, the launch economy needs to be completed, which requires a lot of planning. Launch and expansion may require large resources, which is why this planning needs to be completed in connection with the completion of the financial aspects of production or procurement. Innovations are by definition something new and entail certain risks when they are commercialized or introduced, therefore business planning is essential. The same applies to matters of a legal or intangible nature. Investors and financiers will require or expect that there are detailed plans and calculations for commercialization and growth. The work with capital supply is therefore an essential part of business development. Work is already beginning here to draw in the first customers so that sales are prepared and up and running when it is time for roll-out.

3.4 Testing

If a new solution has been produced, many tests will need to be done. On the one hand, technical tests to see whether the innovation works as intended, and on the other hand, various types of integration tests to see whether the innovation works as intended in the environment for which it is intended. Then there is usually a need to carry out final user and market tests to ensure that the solution you have developed or acquired is really ready for launch or implementation.

This type of testing is often handled in the form of pilots and can often require relatively extensive resources because there is often a lot at stake whether the whole thing will work after launch or not. In recurring innovation testing, it is not rare that you choose to set up a reusable structure for your testing, a so-called test bed. Such people normally need future-oriented technology to be able to reflect or simulate the cutting-edge environment in which the solution must be prepared to function.

2.2.4 4. Commercialize or implement

The final phase differs relatively much depending on whether it is an innovation that is to be commercialised or whether it is an innovation that is to be introduced into one's own business. Both alternatives are of great importance for the innovation ecosystem, since regional innovation power is both about creating commercialization and being innovative themselves, even though innovation ecosystem theory tends to focus primarily on the commercialization perspective.

The commercialization or implementation phase

Commercialization requires good networks and contacts in different regions and countries that can help create new sales and distribution channels. Both commercialisation and implementation of new innovations are usually initially launched on a small scale and gradually grow as the user base increases, the market matures, and turnover increases. Often it starts with the local and regional market and then expands nationally and then internationally, but it can just as easily be from a narrow, specialized market that then broadens. And in order for the local market to be a good breeding ground for innovations, it is of course assumed that they are good at implementing innovations. What in the commercialization phase is marketing is done internally with communication (and change management) to make employees aware that new innovations will benefit them. After that, the introduction takes place, which also just like a market launch, takes place in stages and is gradually expanded. Both elements are intended to create new added value and increased growth.

4.1 Marketing

Starting to bring innovation to market is a delicate task. Partly it is about creating knowledge and curiosity in the market for potential customers, and partly it is about establishing access to the innovation in the right channels. Depending on the form of innovation, it may need specific distribution channels, it may also need to establish itself in relevant retail chains, etc. This needs to be prepared and any contracts established. In addition, information needs to be disseminated and knowledge created about the innovation in order to initiate the market launch. Therefore, advertising and other marketing information towards relevant target groups needs to get started.

4.2 Rollout

In practice, a roll-out means an introduction to the market, i.e. a market launch and initiated market establishment. The roll-out needs to ensure that the innovation is made available on the market and that its use gets underway. This means starting sales, increasing production, and continuously expanding distribution and sales provided that the initial steps have gone well. Gradually, access to innovation is established and spread, and the market matures. This requires ample access to market contacts that can contribute to market launch and establishment, unless the business already has fully established market channels.

At the same time as innovation is established, it can always be expected that there may be initial problems and 'teething problems' with a new solution that you want to find and update at an early stage. Therefore, it is important to have systems that continuously monitor, measure, and evaluate how the innovation works and give the innovator the opportunity to make marketing or product adjustments as soon as possible.

4.3 Communication

When introducing innovations into your own business, the major challenge is to manage change and often places great demands on change management. If the testing in the previous phase has been successful, the technical integration of an innovation is not the problem, but it may lie in the fact that the employees and any other stakeholders do not see the value of the change we intend to implement. The cognitive reluctance to change is very common because employees appreciate feeling secure in the working methods, tools and methods they already have, which affects the entire organizational culture. But through good change management – which is usually based on good communication – you can reduce friction and facilitate the transformation.

4.4 Introduction

Communication can certainly also be seen as the early stage of implementation, but we have chosen to distinguish them here to further clarify the importance of communication and change management in the introduction of innovations. Of course, this continues throughout the implementation process, even as the new innovation is now introduced into the business. Depending on the solution and approach, innovations are often introduced to a limited extent first to evaluate the results and then gradually expanded to the rest of the business.

4.5 Growth

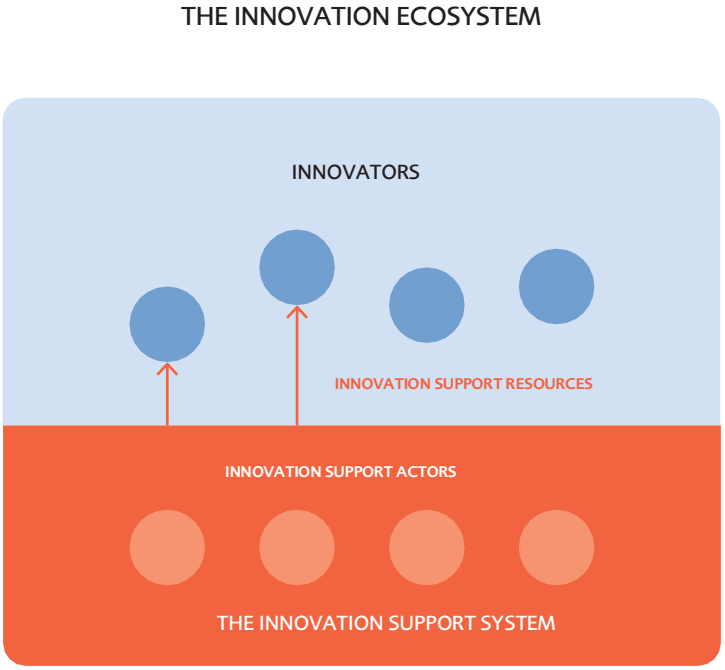
Once the innovation is rolled out and initially established, it is about increasing growth. In terms of the innovation adoption curve, it is about moving on through the "early adopters" phase and into the "early majority". In practice, this means getting beyond your first initial customer base and expanding to new geographies as well as new target groups by further developing your initial solution. At this stage, there is a strong focus on sales and all connections to national and international forums are welcome. Any technologies need to be further developed, including machines, robots, and IT systems so that increased production volumes can be handled. The organisation and operational management need to be updated and reorganised in order to be able to handle the new conditions with strengthened competence and developed responsibilities and procedures. The roll-out phase is thus taking place in several rounds to new markets where new channels will be established and new customer groups will be reached with market information.

3 Innovation support scheme for the innovation ecosystem

3.1 Purpose and function of the innovation support system

The term "innovation support scheme" refers to organised support for innovation, as well as support to actors working with innovation support. In order for the innovation ecosystem process to be implemented, resources are needed to support the implementation at each stage. The main resources, which we can deduce from the indicators in the innovation ecosystem process, are skills, capital, and networks, where networks can provide contacts that lead to skills and capital, and capital can acquire skills, but also other types of necessary assets. Such resources are held by different types of innovation-supporting actors that may have different characteristics in the innovation ecosystem process, so it is essential to provide a clear picture of which actors contribute in what way to creating value in the development of innovations. No single actor can cover all the needs of an innovation ecosystem in isolation, hence we speak of an innovation support system and analyze how the actors in the innovation support system add value to the innovation ecosystem process.

Such actors are those who assist innovators and innovative organisations with various forms of resources that facilitate the implementation and deployment of innovations. The innovation support actors are not the innovators in question, but have the main task of assisting them in various ways that directly or indirectly benefit themselves. They can be private or public, and regional, municipal and state-owned. With insights into the functions of the innovation support system's actors, the region can ensure the quality of the development process and specify precise efforts that the region can make to improve the innovation support system and thus the support for the innovation ecosystem.



The relationship between an innovation support system and innovation ecosystems.

3.2 Innovator roles in the innovation ecosystem

Innovators are the most critical raw material in an innovation ecosystem and they can come in slightly different forms.

Experts / professionals

Human capital is at the heart of an innovation ecosystem. Experts with specialist and technological expertise are therefore critical for innovation development. In most cases, these are the ones who create the innovations. Knowledge together with passion, determination, and courage to dare to take risks is central and the lack of the same can be catastrophic. Recruiting and developing experts and specialists are thus vital functions for a regional innovation ecosystem.

Startups

A startup is usually a company with current innovation as its primary business concept. Success is not self-evident and a startup is surrounded by great uncertainties. They are initially run by passionate entrepreneurs with limited capital and high hopes for the future. Due to their sparse size, they are flexible and adaptable to change, which increases the likelihood of success – especially when compared to large companies. And with "little to lose" by taking big risks to gain market share, they create the conditions to raise the level of innovation, increase creativity, and add healthy competition to an ecosystem.

Private companies

Innovation is not only done by entrepreneurs but also by existing companies. They can conduct applied research, develop new technologies, possess super-sharp talents, and often have the resources themselves to launch innovations. They often already have their own established networks within the innovation ecosystem with partnerships with other actors such as research institutions and development agencies.

3.3 Innovation-supporting actor roles

The literature shows a number of functions and roles that are innovation-supportive in an innovation ecosystem. However, there is a further need for a standardisation of the categorisation of these roles, and there are clear overlaps and similarities between several depending on the context in which they act. However, it gives a fairly good indication of what the actor picture looks like in the innovation support system. At the same time, we can state that there will be room to further refine and granulate the roles of the actors when we carry out a survey of the existing actors in future innovation support systems and adapt these to specific circumstances and the environment.

3.3.1 Research institutions

Researchers fulfil (at least) two functions in the innovation ecosystem, one of which is in the innovation support system – firstly, researchers act as knowledge creators where they build new knowledge that creates the conditions for innovations, which can be used by innovators, and secondly, they can function as knowledge creators and innovators when they wish. Researchers do not always choose to become entrepreneurs just because they have created new innovative knowledge in an area, but the opportunities are there and they have contributed to creating them. Different research institutions also fulfil different roles, with some focusing on long-term basic research and some applying more short-term market-oriented research. All levels are relevant to innovation work.

Research institutions often provide training based on the lessons learned from their research results, making them critical to the knowledge levels in a region. With higher levels of knowledge in different areas, the conditions for innovation in these areas increase significantly.

These usually consist of a number of types of main actors:

1. Universities and colleges. That conducts traditional basic research.
2. Government research institutes. Public industrial research institutes engaged in applied research.
3. Private non-profit research institutes. Private research institutes that work with applied research, usually in a specific industry or specialization.
4. Private research actors. Usually in-house or jointly owned by several private actors in the same industry.

3.3.2 Financiers

Financiers can enter different parts of the innovation process depending on their risk appetite and their capital strength. Their purpose is to provide capital for the resources needed to develop, commercialize, or accelerate innovations. Often, the financiers not only have capital but also knowledge, contacts, and experience to ensure that their investments go well. But in practice, this is another function of the innovation support system.

Business Angels

Business angels often play an important role in getting fast-growing small businesses to overcome the valley of death, i.e. the step from research and development to commercialization. They are often more risk-averse than traditional venture capitalists and often actively enter the companies with their own capital, board position, advice, contacts, and possibly channels for further financing. There are also business angel networks that bring together several private investors with available capital and match them with entrepreneurs.

Venture capitalists

Venture capitalists are mainly investors who invest in startups and growth companies with the purpose of

to jointly create a profitable business for all parties involved. Risk capitalists dare to invest in innovation and take some losses between turns, but can manage it thanks to good portfolio management in their investments. Their capital assets are usually significantly larger than those of business angels and provide financing in various ways, such as through company shares or special loans that are repaid only when the company enters profitability.

Incubators and accelerators

Incubators and accelerators play an important role in the overall innovation ecosystem through their supportive environment for startups and new business ideas. This typically means physical space for office work and interaction with peers in the same situation through shared assets. It usually also means access to technical and business advice from senior mentors who can help with questions about product development, financing, marketing, legal, manufacturing, etc. They often assist with networks to relevant contacts in such areas, such as manufacturers, distributors, financiers, etc. Not all incubators provide their own venture capital, but many primarily collaborate with various risk capitalists.

Investment companies

Investment companies manage large funds from a variety of sources, such as pension funds, with the aim of creating growth in their investments. Unlike venture capitalists, they are not as risk-averse in the early stages, but rather come in with large investments in more mature companies with an established market where they see that they can actively contribute to economic development. Unlike venture capitalists who prefer to enter as partial investors, investment companies prefer to buy 100% of the shares so that you get full control. Companies are also bought up that are not doing well, but where they see that new capital and new expertise can lift the business and make it profitable.

Development agencies

Development agencies work to stimulate and support innovators, often with seed capital in the early stages to test their ideas. They can be both private and public and often strive to find solutions in specific social or economic areas. Innovation competitions are often launched to meet specific areas of need, and some take on a role as venture capitalists, but with a special focus on startups that have come out of the start-up stage but are too small for the investment companies.

Crowdfunding

For almost a decade, there has also been the opportunity for innovators to apply for funding from the public for their projects. By posting their idea on a platform, an entrepreneur can manage to raise small funds, but from many investors, which can be summed up to all the capital needed. In return, investors are usually offered a share, some of the first copies of the innovation, or similar.

3.3.3 Government and authorities

The state and authorities play a major role in the conditions for innovation and entrepreneurship through policy, regulatory environment, tax incentives, research support, etc. They also play a major role in creating practical and communicative conditions for innovation, such as broadband, real estate, access to electricity, transport, etc.

In addition to the government, parliament and ministries, most of the innovation-creating conditions are created by government agencies, boards, and councils. These are:

1. Mission-oriented authorities. These are government agencies, boards, and agencies that may be responsible for areas such as research funding, business development, infrastructure, etc.
2. Research councils and foundations. These often define the focus that the research should have within their respective areas of responsibility and allocate grants accordingly. The councils are often linked to the areas of different authorities.

3.3.4 Civil society organisations (non-profit organisations)

These are often non-profit organizations that work to promote various societal functions. They are often counted as NGOs (non-governmental organizations) and are present at local, regional, national and international levels. They are often non-profit organizations with great public trust to speak up and drive development for their cause. They are formally counted as "idea-based sector" and which is mainly based on their legal form, which includes non-profit associations, religious communities, communities, foundations and funds, as well as limited liability companies with special profit distribution limitation (SVB). Thus, they can act as a strong proxy for their cause in an ecosystem and pursue development issues vis-à-vis authorities, for example.

3.3.5 Intermediates

Intermediaries play an essential role in an innovation ecosystem as their primary role is to connect organizations within the ecosystem and to contribute to the facilitation of ideas, technologies, and other resources to support commercialization and growth. In practice, they match need owners with resource owners. There are usually three different types of intermediaries: 1) intermediaries for problem solving - bringing together need owners with innovators, 2) intermediaries for technologies - bringing together technology developers (IP owners) with commercial actors, 3) intermediaries as network coordinators - bringing together different types of actors in the innovation ecosystem (Agogué, 2017). They are characterized by their "neutrality" in the innovation ecosystem as they do not represent any particular role but have the function of supporting the process. Often, they act as brokers between functions in the innovation ecosystem.

Science/business parks

These are environments where successful research and/or companies are placed in the same area to create the conditions for planned and spontaneous fertilization between the actors in the innovation ecosystem.

Incubators

Incubators have several roles in an innovation support system, both as intermediaries, as business support, and as coordinators of funding. Sometimes, for example, incubators do not have their own venture capital but act as intermediaries between entrepreneurs and investors, which ascribes multiple functions to them.

Technology transfer office

These are organizations that focus on helping technology developers find partners to commercialize their findings. These are often located at universities and research institutes to help technological researchers create meetings with commercial actors for their research results with the aim of jointly bringing these to the market. These technology transfer offices usually do not function as incubators, but as an extended contact point for IP owners to find the right partners.

Matchmaking Services

Online services that help to merge different actors in the innovation ecosystem with the right conditions at the right time. It can be to create meetings between entrepreneurs, to create meetings between problem holders and problem solvers, it can be to create meetings between idea bearers and developers, it can be to create meetings between entrepreneurs and producers, or it can be to create meetings between innovators and financiers. This is done through registration and addition of information on a digital platform, which then helps to create relevant contacts, as well as to facilitate the contact so that it feels safe for all actors.

Network Coordinators

Intermediaries such as network coordinators can also be temporary organizations, such as conferences, trade fairs, or pure network meetings. In an ecosystem, these aim to increase the conditions for creating useful meetings between actors in the innovation ecosystem that can lead to innovations and commercialisation of innovations.

Co-working spaces

Collaboration spaces are areas where many actors with diverse specialisations can sit in common areas and thus create conditions for spontaneous meetings and collaborations. Often, such spaces are designed to maximize the conditions for this particular type of networking.

4 Measurement model for regional innovation ecosystems

Based on the recommended process model for regions, as well as on indicators from international and national measurement models for entrepreneurial and innovation ecosystems, we have developed a model for measuring the capacity of the innovation ecosystem in a region. This model provides a degradable structure that takes into account all the areas that can be measured for a successful regional innovation ecosystem. The measurement model is based on the value development process and then looks at selected indicators, and then matches the two. The aim is to be able to more clearly determine which factors contribute to value development in what way and when. This gives us a clear picture of what initiatives are needed when, can compare it with what the existing innovation support system looks like, and then see how it can be developed in the best way. Here we describe the structural structure of the measurement model and the indicators (metrics) that are most relevant to provide valid results in the measurements.

Based on the dimensions, i.e. the highest level, for which functional areas we need to find measurement points, these have been defined down to a degree of concretization to functional areas (subdimensions) within which we need to measure the efficiency of the innovation ecosystem. In order to measure the effect of the subdimensions, we have then defined a number of indicators per subdimension. Here it is important to be able to identify and classify indicators that fit in and that can be used in a measurement model. According to the OECD, there are mainly three factors you need to consider when selecting your indicators.

1. Relevance. Will the metric show what we want it to show? Is the indicator relevant to the purpose of the innovation ecosystem and the reason why we measure it?
2. Precision. How accurate will the indicator give us the value we are aiming for? Is that exactly what we want or is it "approximately"?
3. Availability. Is it possible to get hold of data that is useful for the metric we want? Are there any existing data sources where we can find the values? Do we need to produce data ourselves and if so, is it possible?

For each indicator, we summarise below 1) the importance of the indicator for the innovation ecosystem and 2) the appropriate measure for the indicator.

4.1 Dimensions and indicators for measuring regional innovation ecosystems

As mentioned earlier, there are already a large number of different models for measuring the innovation capacity of countries and regions. We have conducted a thorough analysis that has resulted in a verified and adapted model that is adaptable to the needs of Swedish regions to develop their innovation ecosystem.

As discussed in the first chapter, the Council of Competitiveness (Feinson, 2003) and the OECD (2010) describe a number of functions that are essential in an innovation ecosystem for it to fulfill its higher purpose. **These are:**

- To create new knowledge.
- To support the search process's governance.
- To provide resources such as capital and knowledge.
- To facilitate the creation of positive external exchanges.
- To facilitate the formation of markets.
- To create and provide the market with human capital.
- To create an adapted labour market.
- To create and communicate technological opportunities.
- To create and disseminate innovations.
- To provide facilities, equipment and administrative support for incubation.
- To facilitate the regulation of technologies, materials and products in order to expand markets and facilitate market access.
- To create markets and convey market knowledge.
- To improve networking.
- To direct technological research, market research, and partner search.
- To facilitate the financing of innovations.
- To strengthen regional R&D.
- Strengthening regional innovation capacity.
- To stimulate innovation in SMEs.
- To work for entrepreneurship and new businesses.

We have these functions as a starting point for the measurement model. They are driving the areas an innovation ecosystem needs to cover. If you go through the overall literature, you see a number of dimensions that are key areas for measuring and developing an innovation ecosystem. All of these relate to Feinson's functions in different ways.

4.1.1 Technology

New technology is a foundation in the majority of successful innovations – and especially radical innovations. Therefore, an innovation ecosystem needs to have a systematic and structured approach to how to stimulate the development of and access to new technologies in different ways. Here, both systematics and infrastructure, but also regulations and policies play a role.

4.1.1.1 Logical focus

Acquisition of foreign technologies

It is possible to procure foreign technologies in four ways: to imitate foreign innovations, to attract foreign direct investment, to license foreign technologies, or to import foreign technologies. The innovation ecosystem has the opportunity to contribute with human and social capital to evaluate, select, implement, and modify foreign technologies. The most common is to import foreign technologies, either for resale or as components in their own products and services.

Development and improvement of technologies

Developing completely new technologies is often about research and development (R&D), which can be both private and public/academic. Formal R&D laboratories are often needed, with the whole purpose of carrying out experimental development. Often, the R&D functions of companies and research institutes fulfil such roles, which overlaps with our next dimension.

Use and dissemination of technologies

To ensure that developed and acquired technologies are of practical use, the innovation support system can support expertise in the use of the new technologies.

4.1.1.2 Indicators

- High-tech imports in the region.
- High-tech production in the region.
- The use of high-tech products and advanced digital tools in the region.

4.1.2 Research and development

Research and development aims to build up the regional knowledge base and to construct experimental innovations.

4.1.2.1 Logical focus

Investments in research and development

Public and private investment is directly crucial for the development of innovations. In the vast majority of cases, public investment in research and development is about contributing to new, non-proprietary innovations where the results can benefit many actors. Private investment is primarily about developing proprietary innovations that increase value for the intended target groups and promote the growth of the developing organisation. Public investment in research and development often produces results that private investment can build on.

Research and education

In academia, knowledge building is closely linked to education, which means that good applied research leads to stronger regional human capital. Research is basically aimed at creating new knowledge, and when new and certified knowledge is also allowed to become an integral part of human capital development, the region builds up as a stronger knowledge cluster.

Experimental development

Research for development can take many forms. The most common are private R&D in the research departments of companies, collaborations between research and industry, and academically driven experimental research, often at research institutes. The aim is always to find new technological solutions that do not already exist. Funding is usually provided directly by collaborating companies or by public research funds.

Patents and intellectual property

Granted patents are proof of successful technological innovations. Even if a patent in itself does not actually have to lead to successful success in the market, it is still an enabler for the same. A patent is a certificate that a technological solution that does not already exist has been developed, in addition to protecting the investment in developing the solution that has been made from infringement and plagiarism over a certain period of time.

4.1.2.2 Indicators

- Expenditure on own R&D in the region
- The amount of collaborations between universities, colleges, research institutes and regional companies.
- Research publications by researchers in the region.
- Number of professional researchers in the private sector in the region.
- The proportion of researchers who conduct research within the region's areas of strength.
- Number of newly graduated doctors at universities and colleges in the region.
- Number of students at universities and colleges in the region.
- The proportion of early startups that build their turnover on advanced technology.
- Number of current national patent applications from companies and individuals in the region.
- Number of current international patent applications from companies and individuals in the region.
- Number of current national trademark applications from companies in the region.

- Number of national design applications from companies and people in the region.
- The value of intellectual property licensing agreements for companies in the region.

4.1.3 Human capital

A foundation for being able to produce successful innovations is that there is leading expertise available. Where researchers build new knowledge, experts apply such knowledge. It can be about expertise in all kinds of areas from entrepreneurship and business acumen to technical excellence. In any case, for an innovation ecosystem to be successful, it is necessary that such expertise is available in all its forms. It is the human capital that stands for the creativity and ideas in an innovation ecosystem, so that all parts of the innovation process are creative, and leading skills a critical core component.

Since companies are always looking for talented human capital, good talent access also contributes to increased foreign direct investment in a region. If human capital exists, capital and technology are attracted.

4.1.3.1 Logical focus

Technical competence

To be able to create innovations, in most cases, advanced knowledge is required that is technical from both a business and technological perspective. It is important that a large part of the workforce is knowledge-intensive, that they assimilate knowledge, and that they apply it well.

High level of education

The higher the average level of education in a region, the higher the average level of competence for innovation. This is usually measured by, for example, seeing what proportion of the inhabitants have studied at a higher level.

Good quality of education

A high level of competence can not only be measured in how many years you have studied a programme, but is of course also dependent on the quality of the programmes provided. Logic says that high quality education leads to higher competence among those who have completed the education, since the whole purpose of an education is to raise the level of competence of those who study it. But the training content also needs to be relevant and applicable.

Talent attraction

Skills need to be available and thus both want to stay and want to move in. A region must therefore actively make itself attractive for qualified competence, which means both getting highly skilled residents to stay and not wanting to move to another location. And it also means active work to get skilled workers to want to move to the region to get a better life.

4.1.3.2 Indicators

- The number of knowledge-intensive workers in the region.
- Number of regional employees in the region's areas of strength.
- Technical or advanced skills development at companies in the region.
- Percentage of staff with qualified professional certifications at companies in the region.
- Percentage of inhabitants in the region who have a higher education degree.
- The proportion of the inhabitants of the region who have obtained a higher degree in the fields of STEM (science, technology, engineering, mathematics).

- The quality of education in post-secondary education in the region according to official evaluations.
- Accessibility to entrepreneurship education in the region.
- The difficulty of finding and contracting relevant skills to key roles in the region.

4.1.4 Entrepreneurial ability

Entrepreneurial ability is essential in an innovative region. It reflects whether there are driving forces, culture, willingness and courage to invest in innovation by taking the step to become an entrepreneur. It shows not only the will, but also the results of the efforts in terms of increased revenue streams and employment.

4.1.4.1 Logical focus

Renewal rate

The renewal rate shows whether entrepreneurship is increasing, i.e. whether the number of new enterprises is increasing and whether the number of new entrepreneurs is increasing. If entrepreneurs fail with their investments, they will close down, but many start new ones again and many others start new businesses. If entrepreneurship increases, the rate of renewal is high.

Growth rate

In addition to wanting more companies that provide opportunities for growth, they also want to see that growth works. We therefore look at whether companies are growing in their turnover and whether they are creating more jobs.

Innovation

In addition, both large and small organizations need to be able to demonstrate entrepreneurial ability, which can be measured in their ability to be innovative and work in a structured way with innovation work. Many times innovations emerge by pure chance, but in most cases they arise through a conscious systematic work.

4.1.4.2 Indicators

- Entrepreneurial activity (TEA) at an early stage
- Number of newly registered companies in the region.
- Number of new company bankruptcies in the region.
- Number of growth companies in the region based on employee growth.
- Number of growth companies in the region based on revenue growth.
- The level of systematics in innovation work among companies in the region.
- Involvement of users/customers in the development work of companies in the region.

4.1.5 Business support

Having a good idea for an innovation is not enough; A driven innovator also needs support in how to take the innovation further and create maximum conditions for it to become a market success. For this, there needs to be support and infrastructure that backs up the innovator when they need advice and access to contacts and resources.

4.1.5.1 Logical focus

The simplicity of starting and running a new business

Registering, starting, and running a new business can be an administrative hurdle that makes entrepreneurs shy away from starting. This threshold needs to be low and is an international measure of how authorities can make it easier for entrepreneurs in an innovation system.

Legal support and financial services

Almost all new companies need help to get through the administrative jungle. Important services that are needed when a new innovation is to be launched are partly legal

advice on e.g. intellectual property rights, contracts, contracts, etc. The company itself also needs to function, so they may need similar advice in terms of bookkeeping, tax planning, payroll, etc. This is something that can cost a lot of money, which a newly started company that does not yet have any operations or profitability may find difficult to handle.

Incubators and accelerators

Both aim to support the development of innovators' strategies and business models, with the big difference that incubators have as their primary driving force to help in the early stages, while accelerators have as their driving force to increase the pace of work that is already underway with a finished solution and existing customers. Both assist with senior business advice, contacts, and connections to capital and the market.

Growth and internationalisation

One of the most important parts of the innovation work is to create the broad impact and achieve growth. This is done as soon as an innovation is established and you can focus on growth. Of course, maximum growth is achieved if you succeed well with your internationalization. But for this to happen, you need help, contacts and networks. This applies to both entrepreneurs and established organisations, although the latter often acquire such expertise internally.

4.1.5.2 Indicators

- Number of regional companies admitted to regional incubators and accelerators.
- Number of companies that are profitable within five years of the start of the programme.
- Proportion of companies in the region participating in export cooperation initiatives.

4.1.6 Actors and linkages in the innovation ecosystem

Human capital is found within the ecosystem in the form of different roles that fulfil different functions in the system. These roles take place in the form of the actors in the innovation

The ecosystem and the system itself form the links that exist between these actors. The links aim to coordinate the right competencies at the right time to increase the speed, precision and quality of the innovations that the innovation ecosystem produces.

4.1.6.1 Logical focus

Actors

The actor map can differ significantly between different innovation ecosystems, but the OECD sees that the core of a system consists of five actor roles.

1. Public sector. Local, regional, national or international actors who have a key role in setting the policy direction.
2. Intermediates. That act as bridges between, for example, authorities and research or research and business.
3. Private companies. Includes privately funded R&D, as well as research institutes funded by the business community.
4. Universities and colleges. And other related institutions that provide the innovation ecosystem with key competencies and skills.
5. Other private and public organisations that play an important role in the innovation ecosystem, such as patent offices, incubators, training organisations, technology transfer offices, innovation consultants, etc.

The important thing in the innovation ecosystem is that all actors are represented, are qualified and committed to their work, and have clearly found their roles in it.

Connectors

The connections are the touchpoints that make the innovation ecosystem a system. The structure of the connections depends on the ways in which knowledge and assets flow within the innovation ecosystem. These connections can be both formal and informal, but the more loose connections that exist, the more established connections it can lead to, which in the long run strengthens the ecosystem.

Links in a regional innovation ecosystem naturally extend beyond the boundaries of the regional system. Of course, regional connections are the first priority, but for an innovation ecosystem to reach its full potential, national and international connections are also essential. Both to be able to access the right skills and partnerships, but also to be able to create good dissemination, growth and exports in the later phases of the innovation process.

Examples of connections are through industry associations, clusters, science parks, networking events, etc.

4.1.6.2 Indicators

- The amount of collaboration with intermediaries in the region.
- The composition of key players in the region's innovation ecosystem.
- Percentage of companies in the region that are members of regional, national, and international industry and network organizations.
- The number of jointly owned structures of companies in the region.
- Number of networking activities and events in the region.

4.1.7 Financial capital

Transforming ideas into innovative products and services and bringing them to larger markets requires resources, which in turn requires access to financial capital. While established companies can often fund their own innovation launches, it's usually difficult for the individual entrepreneur. Therefore, economic capital will be needed in the different phases of the innovation process, especially to get out of the Valley of Death. These can be venture capital companies, business angels, business loans, government loans, etc. The important thing is that there is available capital that is made useful in ways that benefit both the innovator and the investor.

4.1.7.1 Logical focus

Venture capital including business angels

Access to start-up or growth capital from commercial or public venture capital companies, private business angels, other private funds (FFF – Family, Friends, and Fools), or crowdfunding.

Loan

Access to loans for new innovations and start-up entrepreneurial companies with a stakeholder participation, which means minimal guarantees for relatively favourable agreements on interest and amortisation. The loans can come from banks, institutions, credit institutions, municipalities or the state, etc.

Contribution

Access to public investment in innovation. This can be innovation funding or research funding, for example. In principle, it is always a question of some form of application that needs to be made, and if it meets the requirements, the recipient can receive a certain amount of capital that is not subject to repayment.

4.1.7.2 Indicators

- Number of venture capital firms investing in the region
- The sum of venture capital investments in the region.
- Percentage of early-stage venture capital investments (so-called seed financing).
- Foreign-owned establishments in the region and number of employees.
- The sum of current innovation loans to regional small businesses.
- The ease of finding and utilising public grants for innovation work.

4.1.8 Infrastructure

Both the physical and the virtual infrastructure are essential to support regional innovation development. Good communications, stable broadband expansion, regular and structured freight facilities, etc. can be crucial for the success of an innovation in the larger markets. It also affects the willingness of human capital to operate in the region. A lack of housing or office space, for example, will definitely negatively affect both talent attraction and foreign direct investment.

4.1.8.1 Logical focus

Buildings and physical infrastructure

Fixed and physical infrastructure such as housing, offices, energy and electricity, water, etc.

Communication and transport

Telephony, roads, railways, ports, airports, etc. that are needed for the movement of products, capital, people, and other resources to and from a region.

Digital infrastructure

Broadband, mobile networks, their breadth and quality, as well as public digital services that the public and organizations can use.

4.1.8.2 Indicators

- Access to premises and offices in the region.
- Regional companies' perceived quality of road, rail and air connections in the region.
- Companies' access to high-speed broadband in the region.
- The availability of fast, stable mobile data speeds in the region.

4.1.9 Legal and regulatory environment

This includes factors that can be of crucial importance for the success of an innovation ecosystem. For example, it can be laws and regulations that govern what is allowed and what is not, it can also be tax control to facilitate the conditions for innovation, but it can also be about other types of regional political factors such as labour market policy measures, education strategies, etc. (Council of Commerce, 2005).

4.1.9.1 Logical focus

Taxes, tax policies and incentives for innovation and entrepreneurship

If the effective tax level is too high, it discourages incentives for entrepreneurship, research and development and reduces competitiveness with other regions. This can be facilitated through various tax breaks that companies can apply to benefit from investing in and investing in innovation.

Other public governance

Public innovation strategies and governance, development of innovation ecosystems and public support for entrepreneurship and innovation.

4.1.9.2 Indicators

- The sum of the amounts granted in tax incentives in the region for innovation and research in the region.
- The support of regional leadership for (regional strategies for) innovation.
- Satisfaction of regional enterprises with regional services and innovation programmes.
- Innovation-friendly procurements in the region.

4.1.10 Culture

The culture is fundamental to the entire region and reflects their willingness and intentions to be open to new things and innovations, as well as to dare to think in new ways and take calculated risks.

4.1.10.1 Logical focus

Culture of change

Innovation is about change and an innovation ecosystem needs to consist of a willingness to create change and change. It also includes a culture of daring to accept change and thus take risks. It is also about seeing and understanding changes that are taking place in the world around us in order to be able to predict future changes and needs as a basis for new innovative solutions.

Collaborative culture

An important cultural element is also the willingness and ability to collaborate across functions. There is a need for an openness that allows the sharing of thoughts, ideas and information and therefore requires a certain amount of courage.

Diversification

Another important cultural area is diversification. Innovation arises when people with different skills, experiences and backgrounds are given the opportunity to contribute with different perspectives on problems and needs. Therefore, there needs to be a receptivity to thoughts and input from people from other areas of expertise, gender, geographies, generations, and cultures.

4.1.10.2 Indicators

- Percentage of the population in the region who believe that the fear of failure prevents them from starting their own business.
- The openness to cross-functional collaborations at companies in the region.
- Labour immigration to knowledge-intensive professional roles in the region.
- The international diversification of researchers in the region

4.1.11 Markets

Innovations must be released into markets to create benefits and value for their target groups, and to be able to create growth and employment for their creators. This makes knowledge and access to markets a critical function for its success.

4.1.11.1 Logical focus

Market access

Access to the domestic market and channels to reach it. Also access to foreign markets and channels for reaching them, for example through export councils and chambers of commerce.

Access to market information

In order to qualify their innovations, innovators need to understand the market and its development well. This means that they need to have access to different forms of information about the market in large and small. Knowledge and familiarity with one's target market is particularly crucial, what categorises it, where it is located, etc. This is a critical basis for an innovation to have any impact.

4.1.11.2 Indicators

- Percentage of companies in the region that launch new product innovations that incorporate new technology.
- The size of sales of innovations (services and products) from companies in the region to customers in the national market.
- The size of sales of innovations (services and products) from companies in the region to customers in other countries' markets.
- Regional companies' market share in the national market for the region's areas of strength.

- Utilization of testbeds and demonstration environments.

4.2 Qualification of the indicators of the measurement model in the innovation ecosystem process

The indicators in the measurement model have been fitted into the innovation ecosystem process to reflect the ways in which they create value in the value development of innovations. Then it is clear when in the process different forms of venture capital, different forms of advisory services, different types of infrastructure, different forms of contact building, etc. contribute best to the development of innovation. Together, they provide an overall picture of how the innovation ecosystem process works and what factors matter. With the positioning of the indicators in the innovation ecosystem process, we can define which actor roles in the innovation support system are relevant to support the development of the indicators.

For reasons of space, we do not list all the indicators in each process step here, but it can be good to know that a solid such material exists.

5 Measurement methodology for regional innovation ecosystems

Here we describe the measurement method, i.e. measurement process that Region Västerbotten applies to collect the data needed for the innovation ecosystem and its development.

5.1 Challenges in measuring the ability of an innovation ecosystem

There are a number of challenges in defining the data sources that are relevant for measuring the capacity of the regional innovation ecosystem. One challenge is that some data is not public and may well even want to be kept secret by some actors. For example, companies may not want to publish their recipes for success for their innovation work because it may then be copied by their competitors. It is also difficult to measure how successful an innovation work is because of the time aspect. Innovations rarely become an overnight success but may need several years of growth before they reach good profitability (as we see in the innovation ecosystem process). This means that the innovation work that is being done today may not show how successful it is for several years. There is thus a delay effect for innovations that makes it extraordinarily difficult to link good innovation work with good innovation results. A further challenge is that there are different definitions of innovation. How do we actually define what is an innovation and what is just a "new" solution? Or should all new solutions – including improvements – be classified as innovations? There is also a challenge in that different factors (our "indicators") are of completely different classes. How do you compare the fact that there is good train transport with the region's cultural attitude to risk? How do you set values for these that are both comparable to each other and comparable to themselves over time? Some of the indicators show qualitative values and some show quantitative values, and these need to be able to be put on an equivalent scale in some way. A further challenge is the availability of relevant data sources. The indicators in the measurement system are based on the factors that are most relevant to successful performance in an innovation ecosystem; Where can we get data on these factors? In some cases, there are already existing surveys that are done with some regularity by different actors and there you can obtain good secondary data from these sources. In other cases, such sources are lacking, and you need to secure the data access yourself in order to be able to produce values that give a fair picture of the innovation ecosystem. A further challenge is the relative relevance between different data sources. Is it as important for the region's ability to innovate that there is political stability as that there is plenty of venture capital or that there is good business advice? Is a symbolic "five" in political stability worth as much as a "five" in access to good business advice, or is it really less important for entrepreneurs and companies to create innovations? Are the high-tech imports as important as access to key roles in the areas of advance or can it differ? A final challenge is the accuracy of the data sources used. When we use secondary data sources, data has not necessarily been collected with our indicators for purpose, so they may be close, but not exactly the results desired for this measurement. This may mean that it may need to be spliced in the interpretation of the available data, which of course risks impairing the reliability of the results. In our own surveys, there are also potential challenges, such as the response rate being low and we are not told what results those who refrain from answering have, etc. Own investigations also need to achieve a number of different goals.

groups because the indicators cover such a wide area. This adds to the complexity of the survey. In addition, due to the breadth of the question battery, questions would actually need to be asked of many different roles within responding organizations.

We have taken on several of these challenges with a proposed approach, but we also want to highlight that there will always be room for improvement because what we intend to measure is a very dynamic and varied body of data.

5.2 The use of data sources to measure the innovation ecosystem

There are many existing data sources available to determine the current value of the indicators at any given point in time. Important for external data sources is their regularity and their quality. Regularity is important as the measurement must be done at regular intervals to be able to reflect the intended development of the innovation ecosystem. In most cases, we need fresh data for the measurement to give us any value. Some surveys are only carried out about every three years and thus lose interest in measuring an ecosystem. Quality is important for obvious reasons as it is essential that validity and reliability are high so that we can be sure that what we intend to measure is measured and that it will be the same type of result every time we measure it. Recommended data sources are therefore initially those made by the responsible authorities and those who own the data, such as Statistics Sweden, the Swedish Agency for Economic and Regional Growth, PRV, the region's own sources, etc. Some relevant surveys are also already being carried out regionally by the region itself and, for example, the Federation of Swedish Entrepreneurs, chambers of commerce, and others. At the organisational level, there are also other relevant documents that may be of value, such as annual reports and other types of internal reports, but given that in 2021, according to Statistics Sweden, there were just over 43,000 workplaces in Västerbotten, it can be an enormously resource-intensive task to go through annual reports to obtain reasonably statistically valid results. When selecting companies to examine, the OECD recommends focusing on the UN's International Standard Industry Classification (ISIC) Rev 4 and the B-M industries, and choosing to ignore areas such as education, public administration, the healthcare sector, etc. However, regions can choose to include all industries to provide a more complete picture of the capabilities of the innovation ecosystem. The same applies to the size of companies and organisations where there are different conditions for innovation activities in large and small companies. Depending on the region's conditions, there may be reason to disregard, or at least minimize, the number of micro-enterprises with 0–1 employees, as many of them conduct passive business activities.

It is also often a challenge to add relevant metadata for the data sources used. In order to be able to carry out full-scale analyses, large amounts of supplementary data are needed, such as the fact that it is not enough to know how many companies work with innovation management, we also want to know in which industry you operate, how long you have existed, what growth has looked like over time, etc. With larger such datasets, we get a better basis for doing data analysis that can demonstrate causes, effects, similarities, good practices, etc. It also provides a significantly better basis for understanding the development over time between surveys and which factors correlate with new results.

5.3 Data sources for innovation ecosystem indicators

It is relevant to ensure that the sources available are secure and reliable. The data sources are normally primary or secondary where the primary sources are those where the region itself conducts surveys and measurements to collect data and the secondary ones are existing surveys conducted by other organizations.

Policies for secondary and primary data sources

The frequency of the surveys should be annual, depending on the complexity of the survey and the ease of accessing relevant data. The main purpose of carrying out the measurements is to provide updated information on the capacity of the innovation ecosystem and to follow up on the outcome of the region's efforts to develop the innovation ecosystem. Without follow-up, we cannot see whether the interventions are having the expected effect. The measurement itself should not go on for too long that the measurement results have time to become outdated. There will always be some latency effect, especially when many secondary data sources will be used. But the goal should be to reduce the delay as much as possible. To the extent that the data collection becomes complex and the timeliness of the data sources has too great a delay effect, consideration should be given to carrying out the measurement every two years instead.

When using secondary sources, it is important to evaluate the formulations and aims of existing studies so that what is measured in the secondary source is what is sought in one's own measurement. Phenomena such as homonyms or different interpretations of similar words can create confusion in the measurement results, especially between different industries. Questions in own measurements for primary data should be short and concise and avoid potential misinterpretations by respondents. Questions that specifically use the term "innovation" should therefore also be avoided, as it can often be interpreted in different ways by different stakeholders. It is better to use questions that focus more on working methods or the results of the work that can lead to innovation results. Since the own questions will in all likelihood be exclusively digital questionnaires, long explanatory texts for different concepts should be minimized and there is thus little space for explaining concepts and formulations, but short notes that clarify concepts are recommended. For the same reason, questions with several questions in the same sentence should also be avoided, so that the respondents do not really know which of the questions to answer.

5.4 The phases of an innovation ecosystem measurement

The measurements of the regional innovation ecosystem's capacity need to be carried out with a certain regularity so that there is room between the measurements to also have time to develop the capacity. The whole purpose of the measurements is to focus on the right activities that can increase innovation capacity in the region and in turn have positive effects on welfare in the region. With a high level of innovation and competitiveness comes good employment and quality of life. The measurements therefore need to be in step with the operational planning for each year so that the development efforts can be in line with the rest of the activities.

5.4.1 1. - Planning a measurement

In the first phase, the procedures to be implemented for the measurement of the innovation ecosystem are defined. The starting point is the measurement methodology for innovation ecosystem measurements specified in this document. In addition, there are the additional specifications on selection, question design, etc., which are specified by the region's project team for the measurements. With this as a basis, detailed planning is then carried out for each measurement. These are the main steps that are relevant in a measurement:

1. Determine the scope of the measurement. Normally, it should follow the scope defined in the measurement method.
2. Define expected outcomes. Determine the types of results expected from the measurement as a basis for which target groups and indicators are to be applied.
3. Define indicators. Define the overall issue and carry out a review of the indicators in the measurement and whether they are still current, whether they may need to be updated, whether they can be measured in alternative and improved ways, etc. Examine and update if necessary, any weighting criteria, etc.
4. Define audiences. Decide which areas, groups, organizations, roles, etc. are to be investigated, as well as which secondary surveys and data sources are to be included.
5. Define the data collection method. Carry out a review of the measurement method and whether there are updates in the method that can improve the measurement result through the planning should be done quickly, taking into account that most of the implementation should be predefined in the method, but as with all systems, the measurements follow a self-evaluation principle that means that they must be re-evaluated before each measurement. The basis is lessons learned from the most recent survey, as well as a new review to re-examine any weaknesses in previous surveys.

5.4.2 2. - Data collection

With the scope of the measurement defined, the actual measurement process begins. Depending on the availability of resources, the recommendations are usually to start with the secondary data sources to form an overall picture and then go into the primary data sources when it is clear which indicators need to be supplemented in order to provide a cohesive fair result. In practice, the two processes will be parallel, but this depends on the availability and quality of available secondary data sources.

1. Secondary data collection: Review all secondary data sources in the measurement model and verify their validity for the current measurement. Collect all relevant data and compile it in the measurement model's tools. At the same time, prepare the collection of primary data to evaluate whether additional data sources may need to be moved to the primary data measurement or whether new secondary data sources have been added that can replace primary data sources.

2. Primary data collection: regional survey. Since primary data collection is often more time- and resource-intensive, these surveys should primarily be carried out when secondary data are missing or are not sufficiently accurate. The basic model for conducting digital surveys with a representative sample of selected target groups, which have selected the planning phase. The wisest thing to do is to let the region's research experts take care of this or outsource it to an agency.

5.4.3 3. - Data analysis

The data analysis is fairly straightforward. Here it is exclusively about compiling and presenting data. When several measurements are carried out, the value of the measurements also increases as it is possible to see changes over time and how they can be related to different efforts made and their effects.

1. Data compilation. First, all data needs to be compiled in good formats so that it is clear to see what it looks like, what values it has, whether good or bad results are shown, and whether it can be compared with any previous values.
2. Analysis of actors and functions. Once we have the values for the various indicators, the essential work of understanding what lies behind the values begins. We then map the results of the measurement of the indicators and try to gain knowledge about what they are based on. If, for example, we get an answer that there are a certain number of risk capitalists , we want to know who they are, where they are, how they work, and above all the reason why they have established themselves here.
3. Visualization of the innovation ecosystem. With the measurement results and functional mapping ready, the innovation ecosystem needs to be visualised in a pedagogically and visually appealing way. The visualisation should provide a good overview of the innovation ecosystem's dimensions (and any sub-dimensions), indicators, values, and actors.
4. Compilation of hypotheses. Finally, a compilation of conclusions is made as to why the current situation is as it is, where forces are located, where areas for improvement are located, etc. This is important input for the later planning for the development of the system. This compilation will provide an overall picture of the current state of the innovation ecosystem.

5.4.4 4. - Data validation

Data validation is a short process that only aims to validate the results of the analysis and compilation with the support of visualization. The procedure is most effective in the form of a presentation and a workshop together with regional people who are informed, knowledgeable, and have influence in the region's innovation ecosystem. The easiest way to do this is to implement validation in three steps.

1. Written data validation. Relevant actors will receive a written summary that provides an overview of the results of the survey. This target group should preferably be larger than the participants who will participate in the upcoming workshop so that additional people also have an opportunity to take part in and give their views on the results.
2. Data validation workshop. The data validation workshop needs to have the most relevant actors, especially from the public sector, as participants and should go through the measurement's model, implementation, and results, followed by discussions. What is desired is reflections on the data received – whether they are correct or may need to be adjusted (this time or time in future times), thoughts about actors and functions, as well as feedback on the current situation and proposed hypotheses.

The results from the data validation will lead to an improved and anchored measurement.

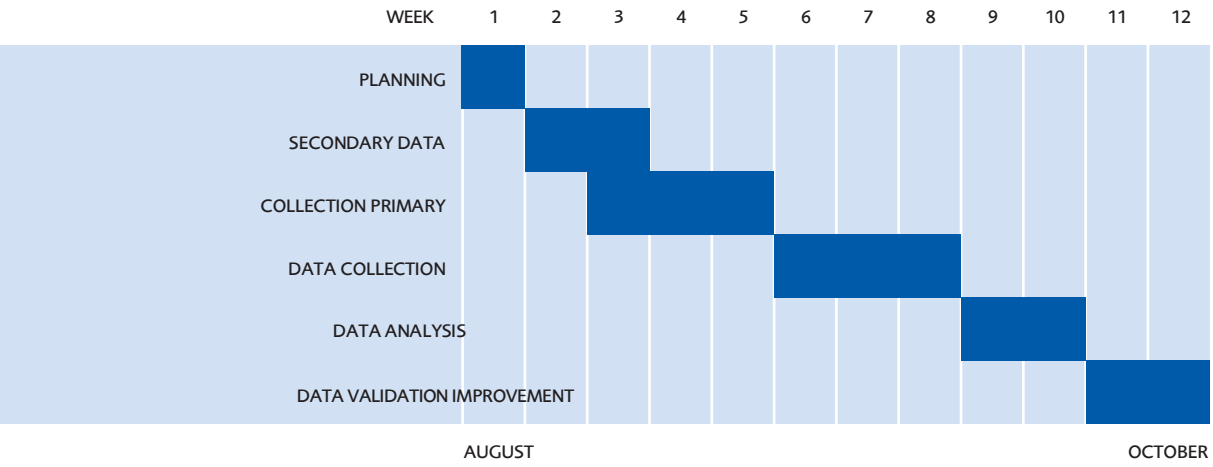
5.4.5 5. - Planning of improvement activities

This planning strives to set ambitions for how the values are to be raised (or decreased, where appropriate) together with concrete activities to do so, based on the current situation, as described in the survey carried out. But the overall phases are:

1. Analyze objectives for the innovation ecosystem. Review of the measurement results and the current state of affairs for setting ambitions for the innovation ecosystem. It is a matter of finding maximum, but still realistic, ambitions for each indicator that the region considers reasonable to achieve and at the same time highly developing for the region.
2. Define preliminary activities to achieve the goals. Once the goals are set, it needs to be looked at what types of activities may need to be done in order for the goals to be achieved, who should do this, as well as what resources and what time it may take. For example, it may be about new actor roles that need to be established or expanded, or political initiatives that need to be adjusted.
3. Prioritize set goals. It is important to take set goals and activities and prioritize the implementation of these so that the efforts have the most optimal effect possible. It may be necessary to establish decision-making criteria for how goals are to be prioritised for the development of the innovation ecosystem, which should be part of the region's governance model.
4. Plan for implementation. Then it is time to develop an implementation plan that allocates responsibilities and timing guidelines for each activity to be carried out in order to increase the indicator values. These activities need to be coordinated by the region's representatives to ensure that they take place as planned and achieve the results that have been set in the goals.

5.5 Schedule for measurement projects

An annual measurement of the innovation ecosystem needs to relate to the region's opportunities to be able to work on developing the system. Proposals and recommendations for measures therefore need to fit in with the region's annual operational planning. Since proposals for the coming financial year are usually planned around October-November, input needs to be ready to be presented by the end of October at the latest.



An example of an annual timetable for measuring a regional innovation ecosystem

Depending on the scope and availability of resources, we estimate that a complete measurement of the innovation ecosystem from planning to recommendations to activities takes about 12 weeks. This means that measurements of the regional innovation ecosystem need to begin early in the autumn in order to fit into the regional annual cycle. However, the exact times for implementation will need to be made during each spring.

However, it should be added that the more that is pre-specified in the measurement model, the faster the implementation will go. This means that if the preparations for the first measurement are really thorough, the measurement will be able to be carried out in 8-10 weeks. It is very likely that the measurements from years 2–3 will be able to be carried out in around 8 weeks.

Having a good system for the development of your innovation ecosystem to maximize welfare in your region is always a good idea!

6. References

Agogué, M., et al. (2017). *Explicating the role of innovation intermediaries in the "unknown": a contingency approach.* Journal of Strategy and Management, 10, (1), 19-39.

Agolla, J.E. (2013). *Public Sector Innovation Drivers: A Process Model.* J Soc Sci, 34(2): 165-176 (2013).

ANDE - Aspen Network of Development Entrepreneurs (2013). *Entrepreneurial Ecosystem Diagnostic Toolkit.* Retrieved 2019-08-02: https://www.aspeninstitute.org/ publications/entrepreneurial-ecosystem-diagnostic-toolkit/

Council of Competitiveness (2005). *Measuring regional innovation – A Guidebook for Conducting Regional Innovation Assessments.* Prepared for the U.S. Department of Commerce, Economic Development Administration.

Du Preez, N., Louw, L. & Essmann, H. (2014). *An Innovation Process Model for Improving Innovation Capability.* Journal of High Technology Management Research 17, 1-24.

European Commission (2014). REDI: *The Regional Entrepreneurship and Development Index – Measuring regional entrepreneurship.* European Union 2014.

EY (2017). *Public sector innovation: From ideas to actions.* Ernst & Young LLP.

Feinson, Stephen (2003). *National Innovation Systems Overview and Country Cases.* Knowledge flows and knowledge collectives: Understanding the role of science and technology policies in development. Volume 1: Knowledge flows, innovation and learning in developing countries, 13-38.

Frenkel, A. & Maital, S. (2014). *Mapping National Innovation Ecosystems: Foundations for Policy Consensus.* Edward Elgar Co.

GIZ (2018). *Guide for Mapping the Entrepreneurial Ecosystem.* Deutsche Gesellshaft für Internationale Zusammenarbeit.

Grancea, A. (2016). *Incubation processes – A multiple case study of Swedish business incubators. Master's degree project in knowledge-based entrepreurship.* University of Gothenburg, School of Business, Economics and Law.

Haines, Troy (2016). *Developing a Startup and Innovation Ecosystem in Regional Australia.* Technology Management Review June 2016, Volume 6, Issue 6.

Hollanders, H., Es-Sadki, N. & Merkelbach, I. (2019). *European Innovation Scoreboard 2019.* Part of the European Innovation Scoreboards (EIS) project for the European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. Publications Office of the European Union, 2019.

Jackson, Deborah (2015). *What is an innovation ecosystem?* National Science Foundation, Arlington, VA.

Kruger, M.E. (2004) *Creativity in the Entrepreneurship Domain.* Submitted in partial fulfillment of the requirements for the PhD in Entrepreneurship in the Faculty of Economic and Management Sciences at the University of Pretoria.

Lang, Nikolaus, et al. (2019). *The Emerging Art of Ecosystem Management.* Article on BCG.com, accessed 2019-03-06. (https://www.bcg.com/publications/2019/emerging- art-ecosystem-management.aspx)

Mercan, B. & Göktas, D. (2011). *Components of Innovation Ecosystems: A Cross-Country Study.* International Research Journal of Finance and Economics ISSN 1450-2887 Issue 76: 103-112 (2011).

Norin, Ellinor (2017). *Innovation strategies for smart collaboration.* Bachelor thesis in Political Science at Karlstad University.

OECD (2010). *Regional Innovation Strategies.* OECD Innovation Policy Handbook, available on the OECD Innovation Policy Platform: www.oecd.org/innovation/ policy platform

Oksanen, K. & Hautamäki, A. (2014). *Transforming regions into innovation ecosystems: A model for renewing local industrial structures.* The Innovation Journal: The Public Sector Innovation Journal, 19(2), 2014, article 5.

Smorodinskaya, N. et al. (2017). *Innovation Ecosystems vs. Innovation Systems in Terms of Collaboration and Co-creation of Value.* Proceedings of the 50th Hawaii International Conference on System Sciences.

Stangler, D. & Bell-Masterson, J. (2015). *Measuring an entrepreneurial ecosystem.* Kauffman Foundation Research Series on City, Metro, and Regional Entrepreneurship. Ewing Marion Kauffman Foundation.

Tsujimoto, M., et al (2018). *A review of the ecosystem concept – Towards coherent ecosystem design.* Technological Forecasting & Social Change 136 (2018) 49-58.

Yawson, R.M. (2009). *The Ecological System of Innovation: A New Architectural Framework for a Functional Evidence-Based Platform for Science and Innovation Policy.* The Future of Innovation Proceedings of the XXIV ISPIM 2009 Conference, Vienna, Austria, June 21-24, 2009.

Wessner, C.W. (2005). *Entrepreneurship and the Innovation Ecosystem Policy Lessons from the United States.* Springer Verlag.

This method book describes the measurement model and method METRIC (Measurement of Regional Innovation Capacity) that has been developed in Region Västerbotten to measure and develop regional innovation ecosystems as part of the regional development process. The result is the model "METRIC" which was originally developed for Swedish regions and then tested for international application with successful results. It contains a measurement model with an innovation ecosystem process that visualizes how value growth takes place in a regional innovation ecosystem from will to welfare to create regions that are better to live, work, and live in. It also includes a methodological model that includes a set of internationally anchored indicators to measure the innovation capacity in the region. Finally, it contains a governance model that links the measurement of the innovation ecosystem with a structure for its development. The methodology book provides a systematic approach to the development of regions' innovation ecosystems and welfare.

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Metric is also available in digital format:

region västerbotten

Co-funded by
the European Union