



Understanding Regional Transformation Processes – New Instruments for Regional Strategy Development

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1 The Importance of Regional Economic and Innovation Strategies

Technological convergence and digital transformation increasingly influence regions and their competitiveness. Today's existing industry structures are subject to change, sector boundaries are blurring and new fields of innovation with growth potential are emerging. Due to the dynamics and complexity of these transformation processes, it is often difficult for regional decision-makers to identify, prioritise and address them with appropriate measures in good time. But precisely these transformation processes are of considerable importance due to their expected impact on the region and the actors from business and science operating there (Foray et al. 2018).

So how can this process of change be organised in a targeted and future-oriented way with the involvement of regional stakeholders?

Early knowledge of these structure-changing transformation processes is fundamental for regional economic and innovation policy in order to use limited resources efficiently within the framework of regional strategy processes and thus create adequate framework conditions for business and research with the help of concrete measures. When it comes to recognising these change processes, aligning them with existing regional potentials and implementing them in line with trends and needs, the following questions, among others, need to be examined:

- ▶ What future technological fields are the players in a region investing in?
- ▶ How high are the investments made in the area of certain future technologies and topics in a region?
- ▶ Which regional actors are particularly active here („innovation champions“)?
- ▶ Who are the key strategic players, such as research institutions, large companies or hidden champions, with whom the regionally based innovation players cooperate? Are they predominantly located inside or outside the region?
- ▶ How well is a region positioned in relation to others on important issues of the future?

- ▶ What are the emerging future strengths and unique selling points of a region?
- ▶ Which supra-regional technological and social trends can have an impact on future regional structures?
- ▶ How can the relevant regional stakeholders from business, science and research be integrated into a joint strategy process?

In order to find answers to these central, albeit not trivial questions, different tools must be applied. Conventional location analyses usually make use of freely accessible structural data and studies in order to take regional strengths and trends into account within the framework of strategy development. However, since such data represent a snapshot of the recent past and are based on traditional industries, future transformation processes within regional economic structures cannot be adequately mapped. Further data sources with a prospective character and corresponding analysis components are necessary, which must be meaningfully aggregated in order to be able to make reliable statements about the future regional innovation potential and to implement the appropriate economic and innovation policy instruments on this basis.

Cities, districts, metropolitan regions or federal states have different economic and innovation policy opportunities and needs. The analysis tools or the way in which actors are involved also vary in terms of data availability and meaningfulness. In the following, different prototypical building blocks of process are presented as examples that have already been applied in different contexts. They complement one another but can also be implemented modularly depending on regional requirements and questions. In any case, the elements should be guided by the following two strands of strategy building:

1. A data-based **analysis** as a rational basis for the strategy process (top-down)
2. A **synthesis** of the analysis results in line with needs and potential through active participation of regional experts and intermediaries of the regional innovation system (bottom-up)

2 Approach: The iit Toolbox for Regional Strategy Development

2.1 Methodical structure in two phases

The methodological approach applied to strategy formation for regions is divided into two main phases: In the first phase, the status of the regional innovation landscape and its future development potential is analytically recorded and processed from different perspectives. In addition to an analysis of publicly funded research and development projects (R&D projects) to identify topics and actors, the iit uses a number of other data-based methods that allow prospective statements on thematic fields of strength. Both publicly accessible and proprietary data sources are used and merged. This combinatorial approach of integrating different analysis components and thus different perspectives enables a valid and precise picture of the innovation landscape in the region to be considered.

Finally, the results of the analysis are intelligently merged and used in Phase 2, the synthesis, to derive regional innovation and future fields. Within the framework of a bottom-up-ori-

ented process, regional experts and innovation intermediaries further develop these analytic data in line with requirements. Especially the context knowledge about existing entrepreneurial resources and skills in a region is otherwise only insufficiently reflected in the quantitative data collected. The involvement of experts with region-specific knowledge in the predefined fields of strength is therefore essential in order to complement the solid data basis and ultimately to install appropriate economic policy instruments (Foray et al. 2018)

The holistic strategy approach with its individual building blocks is illustrated in figure 1. The blocks are explained in more detail below.

It should be mentioned at this point that not all the instruments presented below were developed by the iit alone. Practical experience shows, however, that using one single instrument is rarely sufficient to obtain the appropriate information. Therefore, the holistic multi-method approach and the intelligent linking of different instruments are important.

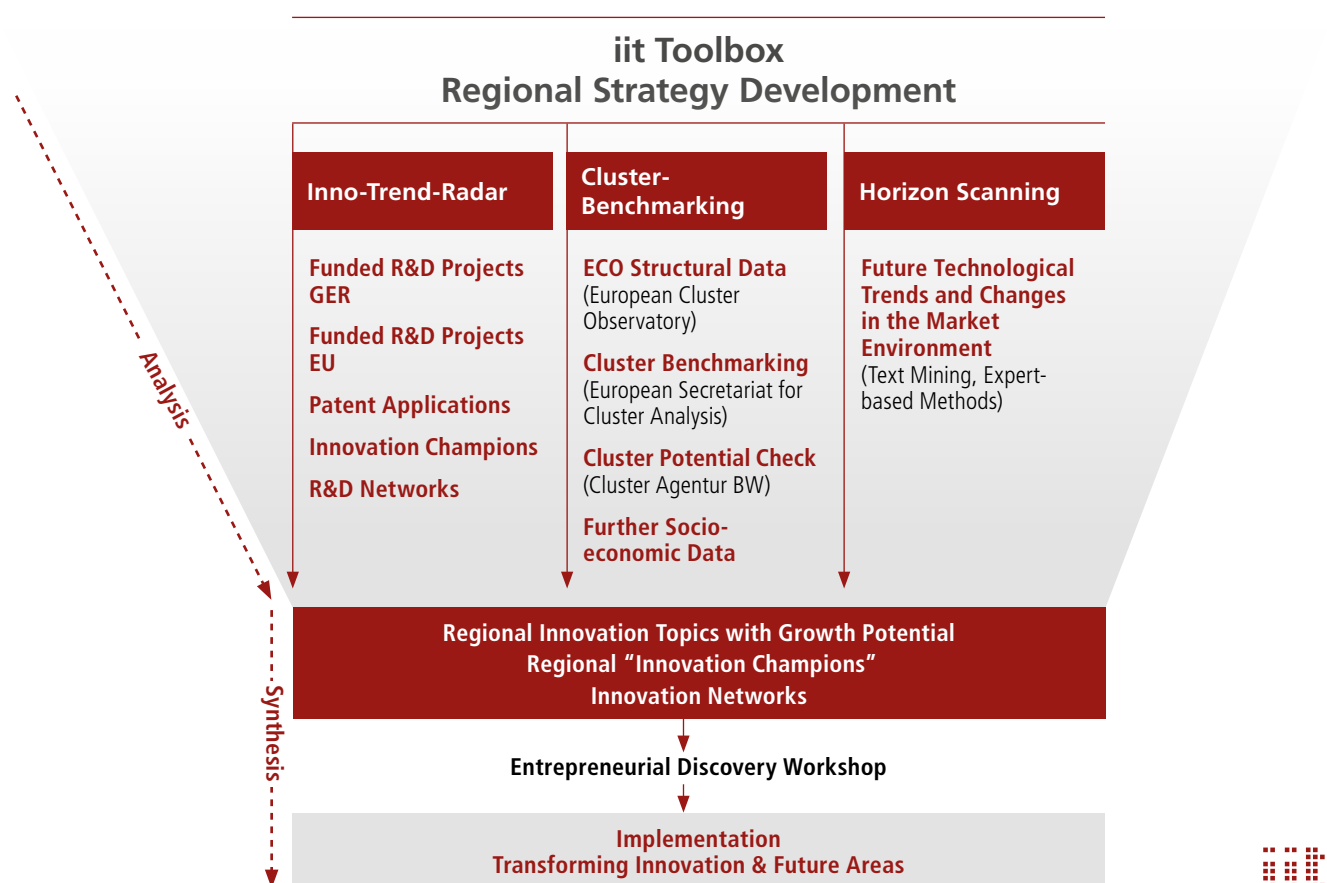


Figure 1: Multi-method approach to develop a regional innovation strategy

2.2 Phase 1: Analysis of the regional innovation landscape

2.2.1 Inno Trend Radar

Intention and objectives

Through innovative products, technologies and services, market and technology leadership can be achieved representing the growth and innovation potential of tomorrow – especially when regional economic structures and the framework conditions for research, education and innovation are favourable. Where actors in the field of applied research are particularly active, particularly high growth and innovation potential can be expected in the future.

If a critical mass of actors in a region is concentrating on similar topics in their areas of research, development and innovation, it becomes apparent that these actors will continue to represent the thematic priorities of a region in the future. The Inno Trend Radar takes advantage of this fact and identifies such regional innovation and product trends at an early stage by analysing public investments in research, development and innovation.

This allows more in-depth statements to be made on the relevance of specific innovation topics and responsible actors, thus providing clear indications of the region's future economic

priorities. These are subsequently compared with the current fields of competence and strengths of the respective region.

The Inno Trend Radar evaluates the different data and merges them in the end, including the following components:

- ▶ Analysis of federally funded R&D projects
- ▶ Analysis of EU-funded R&D projects
- ▶ Analysis of national patent applications
- ▶ Identification of regional "innovation champions"
- ▶ Network analysis: regional and supra-regional R&D cooperations



Absolute Rating (Critical Mass)

- Funding volumes of thematic funding priorities
- Subdivision by actor group: industry – science / research – other actors
- Top 10 R&D stakeholders: companies and science / research institutions

Relative Rating (Regional USP)

- R&D Excellence Index: Comparison with macro level
- Identification and in-depth analysis of top funding priorities
 - Top R&D actors: companies and science / research institutions
 - Specific topics within the funding priorities
 - Regional Benchmarking (R&D Excellence Index) through map visualization



Figure 2: Methodological procedure for the analysis of German federally funded R&D projects

Analysis of federally funded R&D projects

On the federal level, data from the German federal funding catalogue (FÖKAT) on more than 200,000 recently completed and currently running applied R&D funding projects are included in the analysis. The federal funding programmes examined include the funding programmes of the German Federal Ministry for Economic Affairs and Energy (BMWi), the Ministry of Education and Research (BMBF), the Ministry for Environment, Nature Conservation and Nuclear Safety (BMU), the Ministry of Transport and Digital Infrastructure (BMVI) and the Ministry of Justice and Consumer Protection (BMJV). The projects considered here belong to applied research and development, in the context of which companies cooperate closely with science.

Companies involved in these R&D projects finance more than 50% of these activities themselves, so that it becomes clear in which specific fields companies are currently willing to invest in.

The Inno Trend Radar can be used to identify innovation topics, players and investment sums. Among other things, it also provides answers to important questions such as: What are the specific strengths and unique selling points of the region? Who

are the key strategic actors – research institutions and enterprises – in research and development?

In order to clarify the question of the relative strength of a region in a certain thematic area, the R&D Excellence Index is created. This measures the per capita funding amount of the corresponding region in the subject area in comparison to a higher-level spatial unit, e.g. Germany (DE=1.00) or a federal state such as Baden-Württemberg (BW=1.00). If the region reaches a value of >1.00 in this thematic field, a comparatively high R&D activity takes place here. The starting position for future growth and innovation potential in this area can therefore be regarded as favourable. These results can be clearly presented in the form of R&D Excellence Maps, as illustrated in figure 3.

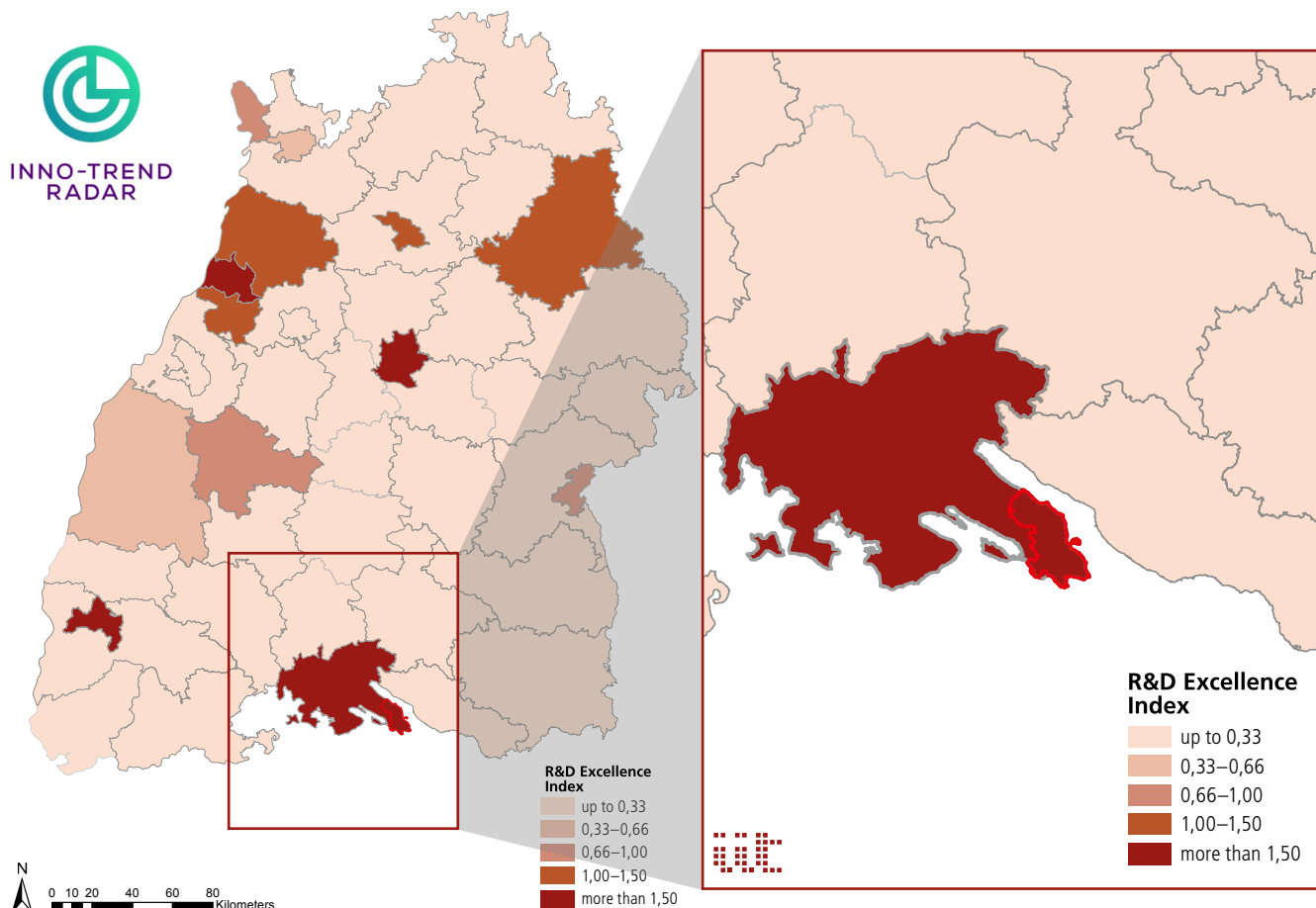


Figure 3: Example of a map showing the R&D Excellence Index (BW=1.00) in the field of renewable energies and photovoltaics

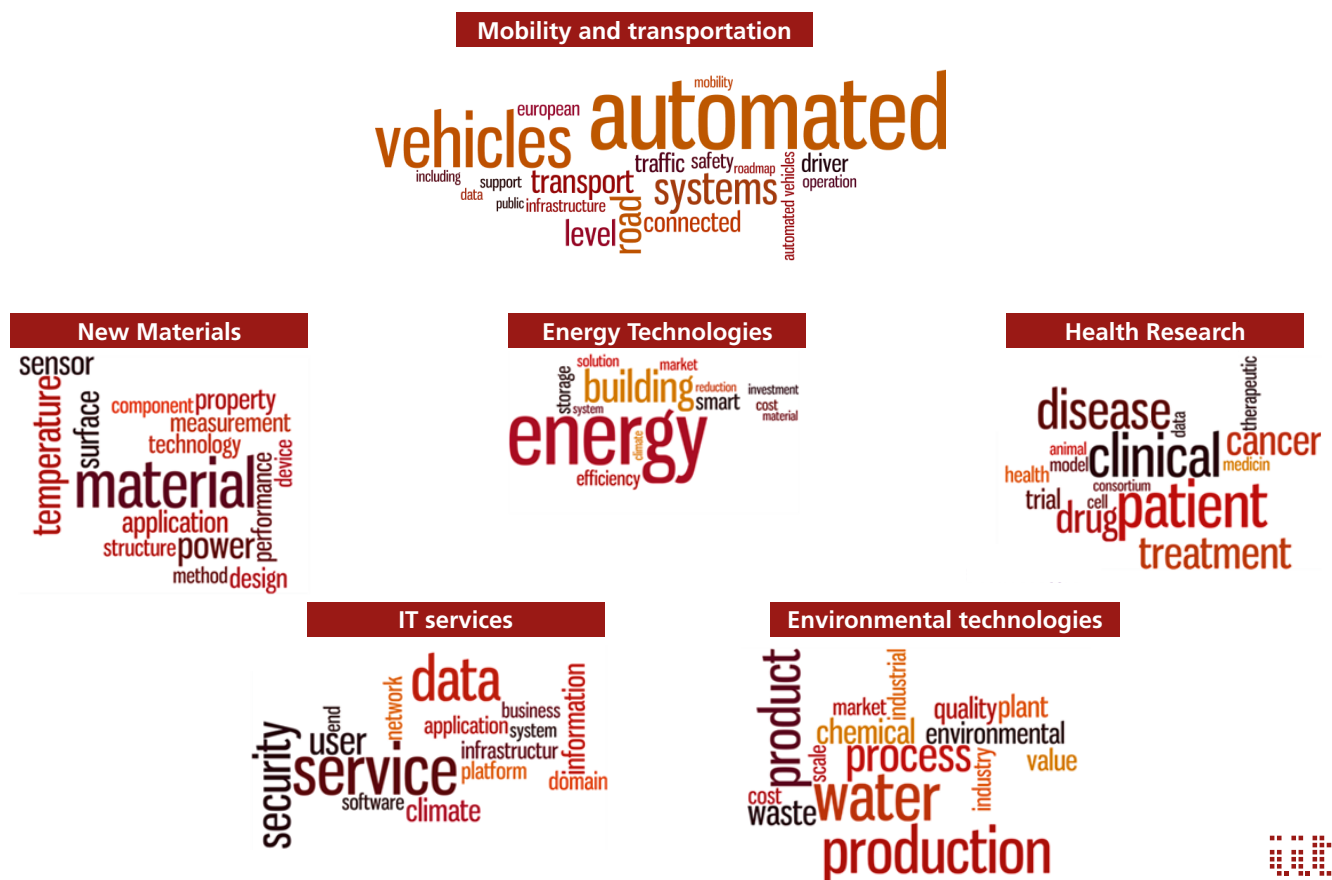


Figure 4: Result of the analysis of the technological priorities of actors of a region in Germany in Horizon 2020 and EU's Seventh Framework Programme for Research (FP7) (illustration: iit)

Analysis of EU-funded R&D projects

The European Union CORDIS dataset includes detailed information on research projects at European level. With the information available for projects in the Horizon 2020 programme and also in the corresponding predecessor programmes, such as project partners, funding volume and project description, it is possible to analyse which technological topics are dealt with in a region and which actors are involved or in charge. For this purpose, automated text mining will be carried out, whereby the technological focal points of the projects with regional participation can be evaluated dynamically. This procedure is called cluster analysis. With the method used, it is possible to read out the entire project description for each individual innovation project and cluster it methodically.

The result of such an evaluation is presented in figure 4. In this case, the project descriptions of more than 1,000 individual projects were automatically read out and clustered thematically. In addition, the driving regional players and the total investment volumes implemented can be analysed in the fields of innovation strength. Network analyses with regard to regional and international cooperation partners are also possible with this data.

Patent Analysis

- Analysis of patent applications in a region
- Allocating of patents to technological areas

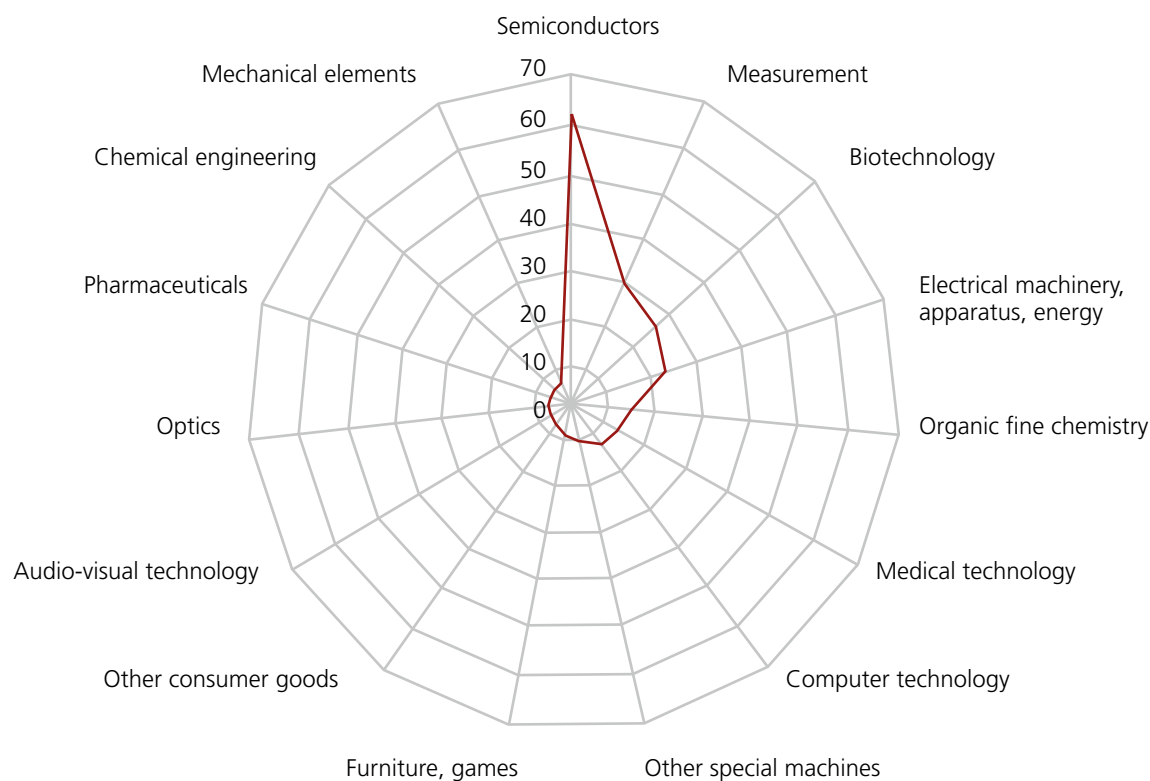


Figure 5: Regional patent applications (applicant principle). Database: DEPATISnet database at the German Patent and Trade Mark Office. Assignment to the technology classification according to Schmoch (Fraunhofer Institute for Systems and Innovation Research 2008) on behalf of the World Intellectual Property Organization (WIPO).

Analysis of national patent applications

Another element of identifying regional fields of strength and regional actors in these fields is the analysis of patent applications in a region. For this purpose, patent applications being registered at the German Patent and Trade Mark Office as well as at the Worldwide Patent Statistical Database (PATSTAT) can be analysed and visualised. The following is an example of such a regional analysis of technology focal points.

The patent classes were allocated to 35 technology areas in order to increase clarity. On the basis of such an evaluation, it can be identified in which of these technology areas strengths exist in a region. Moreover, it is possible to identify the actors behind them. Further evaluations, such as the relative strength of a region compared to the federal average, can also be evaluated with this database.

Identification of regional "innovation champions"

The innovation actors identified from the data sources of the Inno Trend Radar (FÖKAT, CORDIS, patent applications) are compared with each other in a further step. Key players in the regional innovation landscape ideally show a high level of activity in all three areas. On the basis of the three analysis components, a catalogue of criteria will be drawn up which will enable a ranking of "innovation champions" in the region.

For business development and cluster management organisations, key players can be defined that can be addressed through targeted activities in the area of portfolio management or positioned within the framework of marketing measures.

Optionally, further criteria for determining "innovation champions" can be added, such as innovation prizes in the region.

Networking Analysis

Cross-regional collaboration pattern: Partner regions of region Lake Constance in a given R&D field (red dot), values represent R&D investments in joint R&D efforts

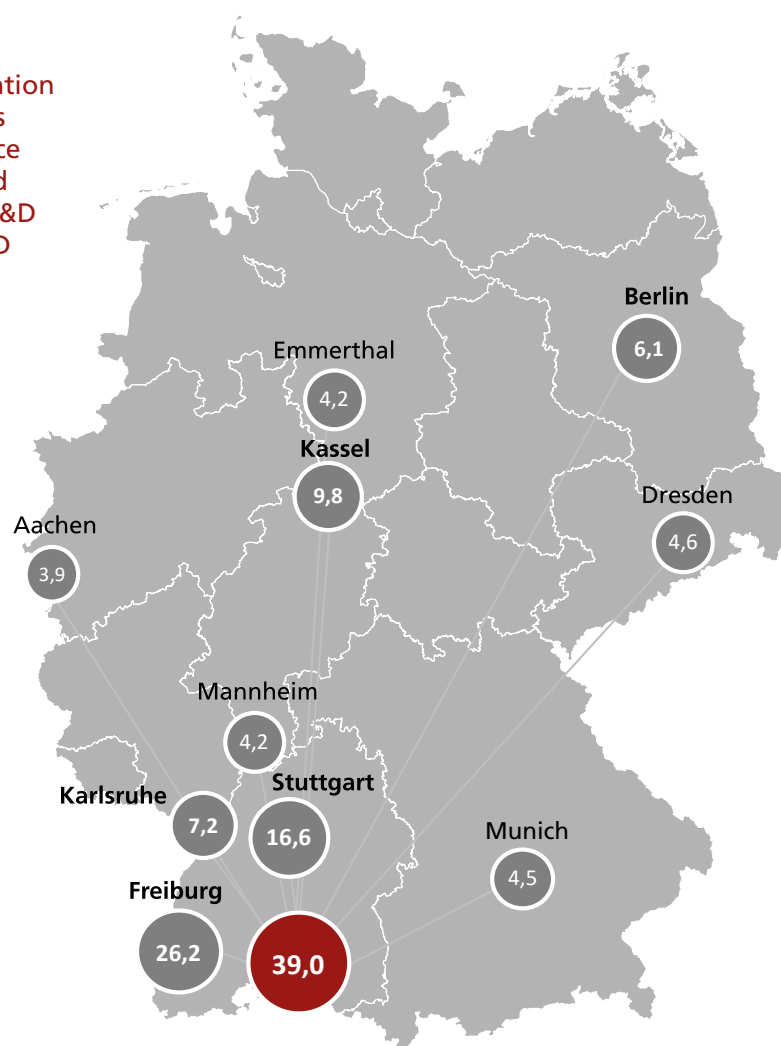


Figure 6: Exemplary visualisation of cooperation relationships in the field of R&D in a specific topic area

Network analysis: Cooperation relations in the field of R&D

In defined fields of innovation, the cooperation structures of the regional companies and research institutions are examined within the framework of joint R&D projects, the so-called R&D network analysis. Central questions here are:

- Do regional companies cooperate with regionally based research and higher education institutions or are supraregional partners primarily sought?
- Are there new cooperation potentials in the relevant fields of innovation that have so far been insufficiently covered within the region?

Answers to these and other questions enable a target group-oriented exchange process between regional R&D actors and the initiation of new cooperations in relevant innovation fields with future potential.

2.2.2 Cluster potential analysis¹

This analysis uses statistical data to identify the regional existence of **clusters** in the Porterian sense, i.e. a regional concentration of actors in related sectors. In a second step, they are compared with the coverage and performance of cluster initiatives. To this end, regional employment data developed within the framework of the **European Cluster Observatory**² will be used to measure the strength of professionally managed re-

¹ This instrument was developed by ClusterAgentur Baden-Württemberg, an initiative of the Baden-Württemberg Ministry of Economics, Labour and Housing.

² The European Cluster Observatory 2014 – 2017 was an initiative of DG Growth. (http://ec.europa.eu/growth/industry/policy/cluster/observatory_en)

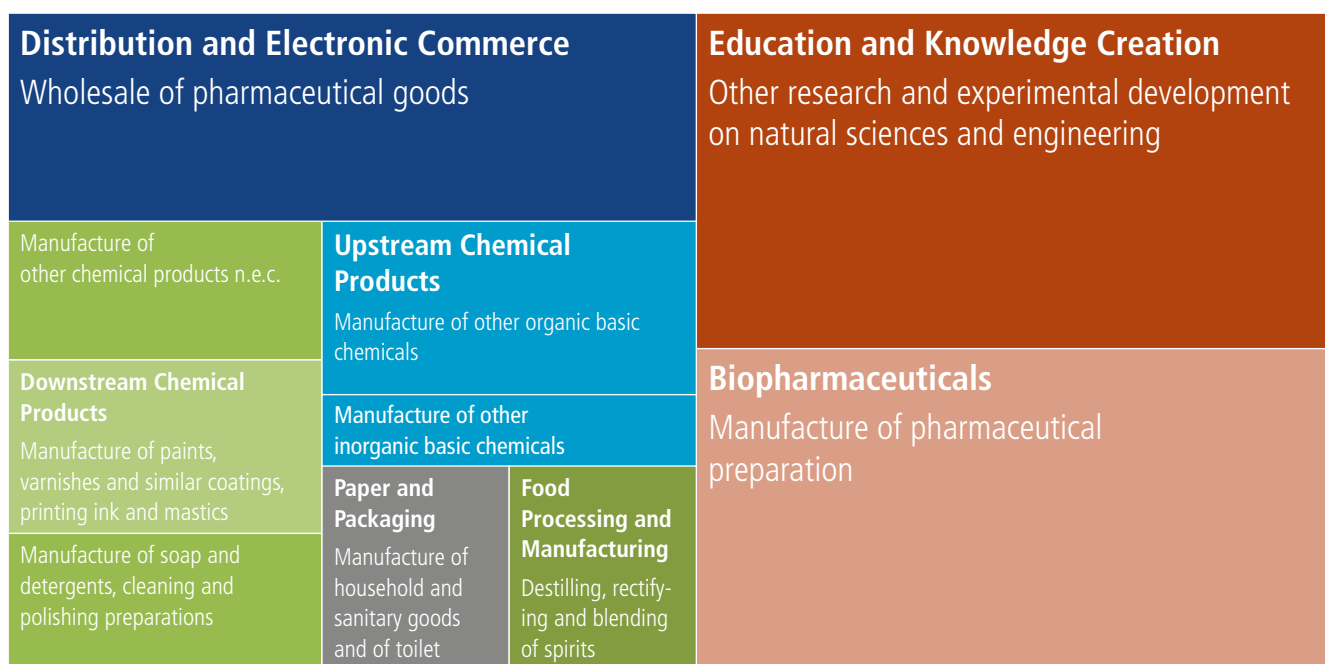


Figure 7: Exemplary illustration of the methodology of the European Cluster Observatory (illustration: iit)

gional clusters and compare them across Europe. In Germany, regional employment data can also be used. Data from the European Secretariat for Cluster Analysis (ESCA)³ are used to identify cluster initiatives and measure their quality. Indicators for cluster management excellence have been defined within the framework of the European Cluster Excellence Initiative (Kergel, Meier zu Köcker, Nerger 2014).

Clusters in new industries consist of a new combination of industrial sub-sectors. Traditional statistics can't be applied. Figure 7 illustrates a new approach how to better describe such industries. It is based on a new combination of NACE-codes, characteristic for the respective industry. Related employment data then can describe the relevance of such industries.

In the overall view of a region, individual particularly promising regions can thus be identified and represented. Figure 8 shows an example of such a representation. Ten so-called emerging industries of a region can be seen. The graph shows the development of employment and the localisation⁴ of the individual sectors, i.e. the relative proportion of employment in a sector in a region compared with the proportion of employment in the corresponding sector throughout Europe.

The European Secretariat for Cluster Analysis (ESCA) has a dataset of more than 1,000 cluster initiatives and Centres of Scientific Excellence worldwide with data from 2011 up to today. The data set thus covers a large part of the efficient cluster management organisations in Europe and provides information on which clusters already have cluster initiatives and how the quality of these can be assessed. In this respect, the step from the pure identification of a cluster to the identification of a cluster management organization can be made with this data. Figure 9 shows an example of what such an analysis can look like. The aim is to be able to classify how the structure and performance of individual sectors and cluster initiatives operating within them are to be assessed from the point of view of regional economic development agencies in order to adapt their economic policy instruments to the situation.

2.2.3 Horizon Scanning

The third strand of the analysis contributes to a critical assessment of the structures, processes and priorities of the current orientation of economic policy instruments with regard to their capacity to adequately accompany existing and future developments. The Horizon Scanning instrument has been developed for this purpose.⁵ In this context, the iit uses established

³ Online unter: <https://www.cluster-analysis.org/>, zuletzt geprüft am 30.09.2018

⁴ Localisation relates the share of employment in the sector in total employment in a region to the share of employment in the sector in total employment across Europe. A value of 1 therefore means that the sector's share in the region is as high as the European average. Values greater than 1 indicate an above-average concentration of the sector in the region.

⁵ cf. Bovenschulte et al. (2014)

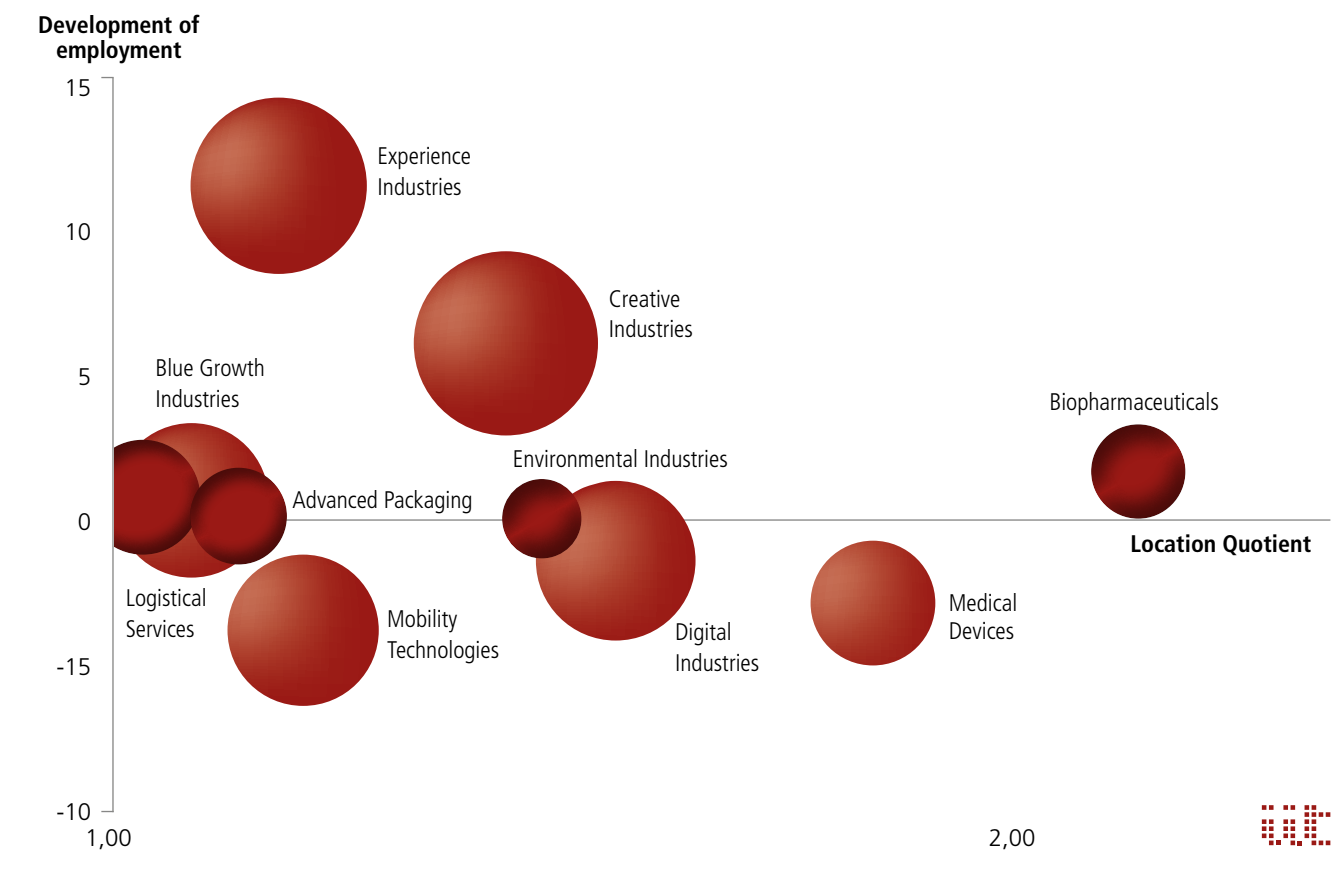


Figure 8: Illustration of the emerging industries of a region (Nuts 2 level) (Source: European Cluster Observatory, illustration: iit)

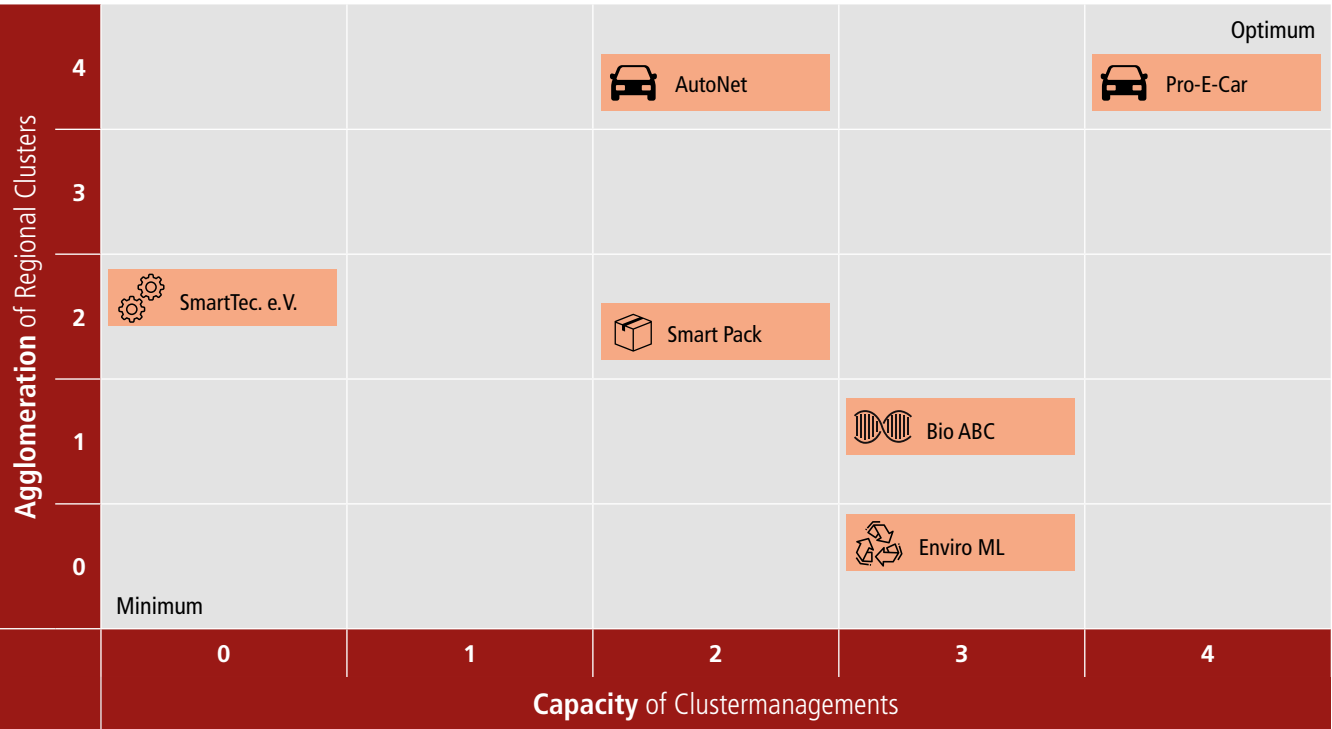


Figure 9: Fictitious example of a cluster potential check (Meier zu Köcker et al. 2018)

methods of software-supported futurology and trend analysis which are used among others for the permanent Horizon Scanning of the Office for Technology Assessment in the German Bundestag. Horizon Scanning can be classified as part of the methodological canon of strategic foresight or futurology. The core task of Horizon Scanning is to identify weak signals and emerging issues and trends that can have a significant impact on the economic structure of the region.

The essential individual steps of a Horizon Scanning are the following (see also Cuhls et al. 2015):

Step 1: Definition of the search areas, in this case technology topics, as well as their characterization by suitable search terms. The results of the strategy process developed so far are the essential building blocks for this.

Step 2: Definition of sources and evaluation methods or search strategies.

Step 3: Carry out the scanning, i.e. search for possible topics. Optionally, the context can be included, e.g. political framework conditions, social discourses, regional particularities.

Step 4 (partly parallel to step 3): Completion and validation of various interim results by experts involved.

Step 5: Visualisation and communication or transfer of the results.

Horizon scanings are rarely performed with a single method (Cuhls et al. 2015), rather different approaches are combined. These include, for example, web or text mining methods, social media analyses, bibliometric analyses, qualitative content analyses, patent analyses and expert based methods such as brainstorming, surveys, interviews, workshops etc. Methodically, contents from the previous work steps of strategy development are used and deepened.

Usually, this information is used to identify those thematic fields that the region considers to be relevant and new. These fields are aggregated to proposed topics and prepared as a longlist. In an iterative-participative process, those proposals on technological topics are selected and further processed that are particularly relevant and which can be expected to have a significant influence on the economic development of the region.

2.3 Phase 2: Synthesis of the analytical components

2.3.1 SWOT

A SWOT analysis is a strategic planning tool used to assess the strengths, weaknesses, opportunities and threats of a system or process. SWOT analysis is a frequently used tool applied in the preliminary stages of decision making and as a precursor of strategic planning in various types of applications. Within the framework of the analysis, it serves as a collection of the essential results in a uniform analytical framework.

2.3.2 Definition of regional innovation fields with future potential

In Phase 1, regional future potentials were scrutinised from a variety of perspectives. The task now is to bring these together intelligently, to consolidate them and to fix the essential core topics in order to form the content framework for the regional innovation strategy (see Figure 8). This will be discussed and validated by regional innovation intermediaries as well as experts from regional business and science using the workshop approach described below.

2.3.3 Bottom-up qualification: Entrepreneurial Discovery Workshop (EDW)

Within the framework of a bottom-up **Entrepreneurial Discovery Workshop (EDW)** and based on the analysed potentials structure-changing transformation processes are identified that overcome the boundaries of existing regional industries, open up new and future-relevant fields of innovation and thus have an influence on the development of the region. The aim is to identify, describe and understand these in a targeted manner, involving relevant innovation actors like cluster managers as experts in the fields they represent, experts from business and science, and other intermediaries in regional development and policy (Foray et al. 2018).

For the implementation of the EDW, the methodological approach of the so-called **synergy diamond** is recommended, which can be adapted to the specific context and requirements. The diamond model was developed as part of the Interreg project S3-4-AlpClusters. Using it, the participating experts discuss the regional strengths as well as the relevant future development trends for the region in order to identify structu-

Set of Methods for Strategy Development

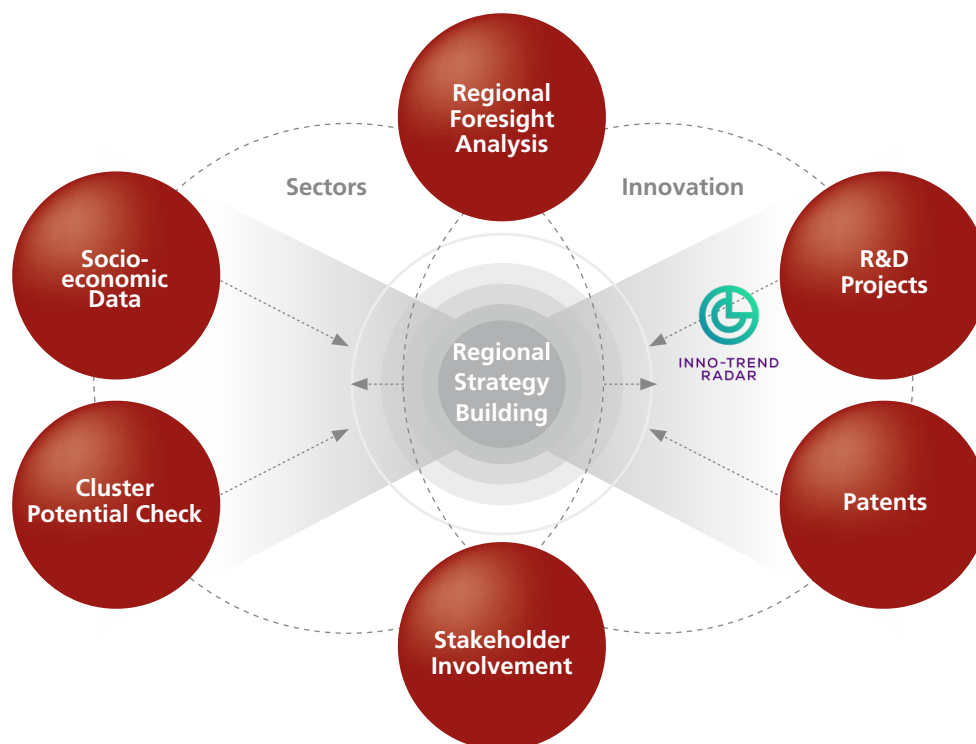


Figure 10: Synthesis of the methodological building blocks

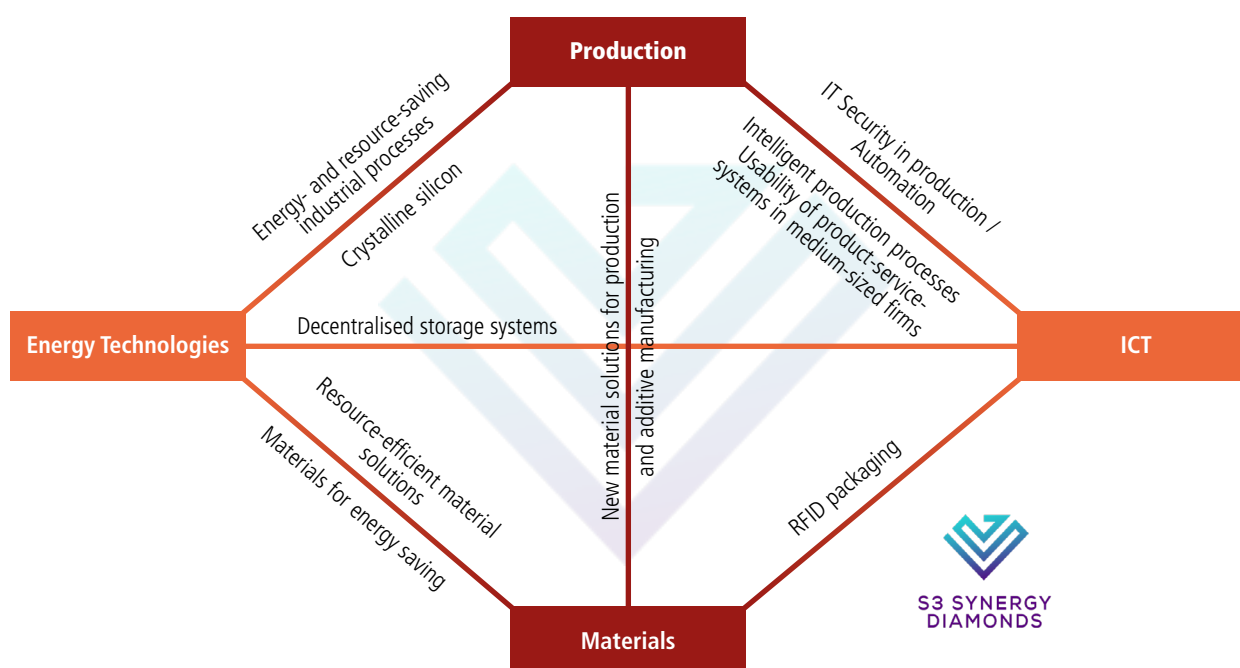


Figure 11: Exemplary representation of a synergy diamond with structure-changing potentials

rally changing processes, i.e. new future fields with innovation potential that are located between the corners of the diamond, i.e. the regional fields of strength. The results from the analysis phase are used as external input. Figure 12 shows an example of the synergy diamond of the Northern Black Forest region. This was developed within the framework of an EDW moderated by the ClusterAgentur Baden-Württemberg together with the regional economic development agency, the Wirtschaftsförderung Nordschwarzwald GmbH, and regional intermediaries.

In a further step, the most important fields from the actors' point of view are evaluated and prioritized. Knowing the essential fields of innovation that change structures, future development potentials can be assessed and strategic fields of action can be derived. The basis for the implementation of economic and innovation policy instruments has thus been laid.

The methodology is based on the assumption that the structure-changing processes are identified and updated jointly with innovation actors in a region through a continuous search and learning process (OECD 2013). This enables an interactive and deepening participative design process, which also contributes to answering the question of how cluster structures will ensure responsiveness and flexibility in the future.

Bottom line

As individual as the characteristics of different regions are, as individual are the ideal economic and innovation policy instruments to further develop existing development potentials. These individual instruments should be elaborated on the basis of a rational, data-based analysis and the broadest possible involvement of the relevant actors. To this end, a structured strategy development process provides an adequate framework for the further development or reorientation of the regional strategy and for the review of existing instruments.

In the present article, individual instruments were presented in the form of a modular toolbox, which have proven themselves in practice and can help to adequately accompany transformative processes.

This toolbox serves different purposes: Both the reorientation of innovation strategies, the identification of key innovation actors in R&D and business (innovation champions), a strength-field-based settlement policy (network analysis) and a targeted R&D policy (research needs/activities in the region).

The process of analysis is characterised by a fact-based inventory, a neutral benchmarking with other regions and a targeted

analysis of interdependencies between regional actors and supraregional actors. On this basis, tailored promotion on the part of business development is possible and investments can be supported in a targeted manner, above all by involving the most important regional players.

The goals, priorities and measures developed in this process have to be regularly reviewed and adjusted in line with the dynamics of the transformation processes. The culture of co-operation in the region also plays an important role here. Economic promoters can provide important impulses and play an enormously important role as mediators in adapting the region to processes of structural change. The task of actively involving regional actors in these processes is continuous and labour-intensive. The instruments presented can provide assistance in this respect.

The approaches and instruments presented here are in line with the idea of intelligent specialisation, which has also been part of European economic and innovation promotion for several years. With intelligent specialisation, the competitiveness of existing industries and clusters is to be strengthened and new fields of specialisation are to be opened up. In this way, new development paths can be taken with the aim of initiating transformative processes towards structural change. Specific factors such as existing related fields of strength, political regulation, natural potentials or social resistance have a decisive influence on the entrepreneurial discovery process and continually create new development potentials for the regions. If these development potentials are implemented accordingly, this not only strengthens the region but also the competitiveness of Germany and Europe as a whole.

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