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Innovation Ecosystem: Cooperation Matters!

The case of the SME, Cluster and Automotive Industry in German System

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Deutsche Gesellschaft fur Internationale
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B5/1, Safdarjung Encalve, New Delhi 110029
India
Tel: +91-11-49495353
Fax:+91-11-49495391

Email: amit.kumar@giz.de, stefanie.bauer@giz.de

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Innovation Ecosystem: Cooperation Matters!

Innovation is a key driver of long-term economic growth and competitiveness: it plays a crucial role in increasing productivity and developing higher quality products and services and in diversifying economies and markets. Empirics show that companies that have a record of successful innovation usually enjoy major competitive advantages, which is also reflected in a higher firm value.

Strengthening a countries' innovation system – namely, the interaction between actors involved in the innovation process as well as the institutions and the framework conditions that shape their actions and their relationships with each other – thus has become crucial for sustained economic development. Innovation, as it is commonly used in economics, hereby describes the commercially successful introduction or implementation of a product, process or organizational novelty. Or, following the often quoted German economist Joseph Schumpeter, innovation can as well be a new combination of existing knowledge. **However, it needs to be clarified that an innovation is not only what is "new to the world" but also what is new to the country or firm. In short, an innovation is a product or process which is new to the context.**

This paper deals with the Innovation Ecosystem and German Innovation Policy and its Governance, with special focus on clusters and the promotion of the German SME sector, the so-called "German Mittelstand". Citing the case of the German Automotive Industry, instruments and mechanisms of innovation system promotion are demonstrated in two practical successful examples, namely "Light-e-body", a nationwide cooperation of various shareholders and stakeholders for the development of a new lightweight electro mobility car body, and the case of the Stuttgart Region Automotive cluster, with its well-known representatives Daimler and Porsche.

While for a long time, governments have focused on promoting research and development institutions, it is now being acknowledged that innovation is a result of interaction between different actors: research institutions only being one group of actors. Governments therefore today need to invest in strengthening their countries' innovation systems. Identification of key actors, the promotion of their interaction, interlinkages and cooperation and favorable framework conditions are essential for successful innovations. Above all, in the case of a successful innovation system institutions matter – yet, cooperation matters even more.

Deutsche Gesellschaft fur Internationale Zusammearbeit Gmbh (GIZ)

The services delivered by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH draw on a wealth of regional and technical expertise and tried and tested management know-how. As a federal enterprise, we support the German Government in achieving its objectives in the field of international cooperation for sustainable development. We offer demand-driven, tailor-made and effective services for sustainable development.

When providing its advisory services in the field of innovation, GIZ draws on its cooperation network consisting of scientific, professional and research institutions and of implementing organizations of the German Federal Ministry for Economic Cooperation and Development (BMZ), the German Federal Ministry of Education and Research (BMBF) and the German Federal Ministry of Economics and Technology (BMWi). Its presence in the field ensures that GIZ has access to the relevant political, scientific, academic and business institutions, and an insight into the special features of the political and institutional environment.

Our range of advisory services is geared to the National Innovation Systems (NIS) approach. It aims to facilitate the transition from economic systems based on factors of production to knowledge-based systems. We advise on designing an approach to innovation promotion that combines political, strategic and instrumental aspects.

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Automotive Component Manufacturers Association of India

The Automotive Component Manufacturers Association of India (ACMA) is the apex body representing the interest of the Indian Auto Component Industry. Its active involvement in trade promotion, technology up-gradation, quality enhancement and collection and dissemination of information has made it a vital catalyst for this industry's development. Its other activities include participation in international trade fairs, sending trade delegations overseas and bringing out publications on various subjects related to the automotive industry.

ACMA's charter is to develop a globally competitive Indian Auto Component Industry and strengthen its role in national economic development as also promote business through international alliances. ACMA is represented on a number of panels, committees and councils of the Government of India through which it helps in the formulation of policies pertaining to the Indian automotive industry.

For Exchange of Information and especially for co-operation in trade matters, ACMA has signed Memoranda of Understanding with its counterparts in Australia, Brazil, Canada, Egypt, France, Germany, Iran, Italy, Japan, Malaysia, Pakistan, South Africa, South Korea, Spain, Sweden, Thailand, Tunisia, Turkey, UK, USA and Uzbekistan.

ACMA represents over 670 companies, which contributes more than 85% of the total auto component output in the organised sector. In the domestic market, they supply components to vehicle manufacturers as original equipment, to tier-one suppliers, to state transport undertakings, defence establishments, railways and even to the replacement market. A variety of components are being exported to OEM's and after-markets world-wide. ACMA is inseparably linked with the auto component sector and hence forms the channel through which business contacts are established with the Indian Automotive Industry.

Website: www.acma.in

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Institutions Matter!

The Concept of the National Innovation System

1.1 Introduction

Historically, all concepts of a National Innovation system go back to Friedrich List's "national system of productions" in which he highlights the role of national institutions and infrastructure within the production process. In the 1980s, Freeman and Lundvall developed the concept of a "national innovation system": Freeman created the term "national system of innovation" on the basis of List's concept in which he claims for an active role of the state in the promotion of technological infrastructure. His colleague Lundvall further explored the role of social interactions between different actors within an economic system. In summary, "the concept of national innovation systems rests on the premise that understanding the linkages among the actors involved in innovation is key to improving technology performance" (OECD, 1997, p. 9).

While there is no consensus on one single definition of a national innovation system, there is a wide agreement on the following stylized facts:

- A model of an innovation system identifies key actors, activities, relations and institutions as well as starting points for systematic innovation and technology promotion.
- It helps to explain and stimulate innovation processes at different levels: the national, regional and sectoral level.
- Interactions between different actors in the models can be distinguished in terms of "knowledge/innovation producers" and "knowledge/innovation appliers" in the public and private sectors.

From an institutional perspective, the innovation system encompasses players from the fields of: 1.) Production and Economy (companies), 2.) Education and Training (schools, universities, research facilities that are engaged in training and development), 3.). Science and Research (universities, public and private research institutes) and 4.) Public administration and Politics. (please refer to Figure 1 below)

In short, businesses, educational institutions, applied research institutions as well as political actors and bodies that enable framework conditions are key actors in the innovation system.

In any innovation system, the system's innovation capacity is determined by the character, quality and intensity of interactions between its actors e.g. research and development alone are necessary but insufficient conditions to increase an economy's innovative activities.

1.2 Promoting Innovation Systems – An Approach

A successful promotion of any country's innovation system needs to be customized to country specific strengths and weaknesses. It means that there is no one national innovation system (NIS) approach but each context demands different aspects of the national innovation system to be fulfilled in order to be successful. Apart from the formulation of integrated policies and the general support of cooperation, dialogue platforms and networks, following the model of a NIS, the concept of innovation system promotion targets the before mentioned actors in three ways: It 1.) reinforces and improves the capacities of all actors of the NIS, 2.) builds "bridges" between the actors, and 3.) addresses and improves framework conditions necessary for developing innovations.

1.2.1 Reinforcement – Strengthening Key Actors in the Innovation System

One way to improve the innovation system is to improve the capacities of the different actors, such as companies, vocational training institutions, applied research institutions, universities, R&D in firms etc. The following offers some examples of starting points for reinforcement:

- A high-quality education system that produces skilled personnel for R&D and for implementing innovations in the private sector is highly important for the creation of sufficient human capital.
- The creation of an increased capacity for research by improving the quantity and quality of basic as well as applied research with relevance to the private sector. Hence, firm-relevant research is offered and can be used to the advantage of companies.
- Improving innovation-oriented private/governmental service offers.
- Introduction of innovation management in SMEs.
- Improvement of supply of private consulting services for innovations and innovation management as well as for business start-ups and the creation of networks.
- Foster entrepreneurial thinking at universities.

1.2.2 Bridging – Strengthening Cooperation between Actors

Interaction, cooperation and networks within and between the different actors of the innovation system, between knowledge producers and users, are crucial for bringing about commercially successful innovations. Institutions (Business Incubators, Consulting Services connected to Universities, Innovation agencies, Promotion institutions, Cluster and competency networks) which connect actors of "knowledge appliers" and "knowledge producers" as well as the public and private sector are necessary. For companies, it is important to collaborate with others, e.g. with their suppliers, with research institutions, within a network of companies etc., in order to generate new ideas and innovations, especially as it is thinking "outside the box" that leads to innovations.

More concrete, bridging means e.g.:

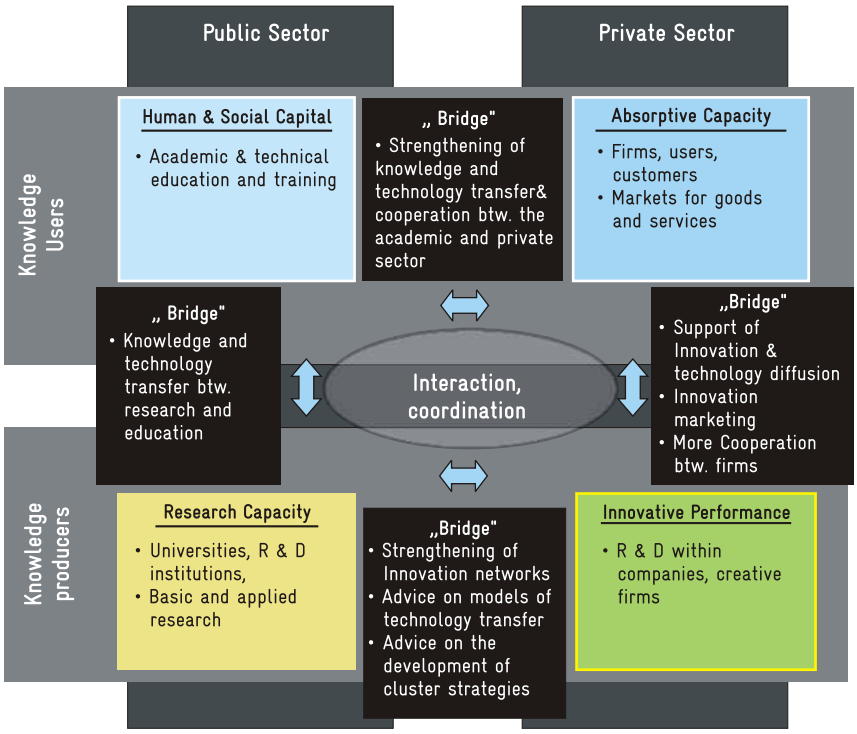
- Strengthening innovation networks through intermediaries as e.g. business incubators or consultancies.
- Advice on the development of cluster strategies.
- Advice on models of technology transfer.
- Improvement of the structures and mechanisms for knowledge and technology transfer of universities and research institutes. Here, possible ways are: To clearly define the roles of all participants in the innovation system, organizational development, action plans and best practices for the promotion of spin-offs etc.

1.2.3 Frameworks – Supporting an Enabling Environment

Strengthening the individual actors of the innovation system and promoting interaction amongst them needs to be complemented by continuous improvement of the overarching framework conditions that shape the behaviour and opportunities of the individual actors. This usually has to be done by local/regional/national governments. Issues such as intellectual property rights, availability of information and communication technologies, the legal framework for company start-ups and bankruptcies, the existence and functioning of quality infrastructure, the fiscal system and access to finance, amongst others, all form part of framework conditions affecting innovation capability and activities. A few starting points could be:

- Advice on national innovation policies and their coherence as well as the coherence of instruments, analysis and M&E-tools.
- Promote inter-ministerial cooperation and policy coherence.
- Awareness raising on the importance of innovation.
- Building regional dialogue platforms and expert networks.
- The training of policy and decision-makers.
- Advice on reforms of public financial sources: transparency, effectiveness and efficiency.
- Advice for the implementation and use of analytical tools (innovation scoreboard).

Figure 1: Different ways to stimulate an Innovation System



Source: Arbeitskreis Innovationssystemförderung 2010

1.3 German Innovation System as a "Role Model"

Many developing countries and emerging economies consider the German national system of innovation as a role model for the development of their own national systems of innovation. The mere look at the statistics is indeed impressive:

- In 2010, Germany spent 2.82% of its Gross Domestic Product (GDP) on research and development (R&D), out of which the private sector accounts for the largest share (1,9% of GDP) (Eurostat 2013).
- Germany is a top-performer when it comes to patent applications, not only in terms of absolute numbers of patent applications to the European Patent Office, but also in proportion to GDP and per million inhabitants.
- 65.1% of German enterprises are "innovative companies", meaning that they are active in product and/or process innovation.

This impressive R&D and innovation performance is based on a national system of innovation that is composed of a wide array of research organizations, higher education institutions, training institutions and companies. They are supported by government agencies through hundreds of different programs in the fields of research, education, vocational training and economic development[1]. Collaboration between the science sector and industry is the order of the day, which contributes to the innovation-based strength and competitiveness of German companies on the global market. Innovation enjoyed high political priority for quite a long time, which is evidenced by the "High-Tech Strategy", adopted in 2006 and spearheaded by the Ministry for Education and Research, which consists of the following three main pillars:

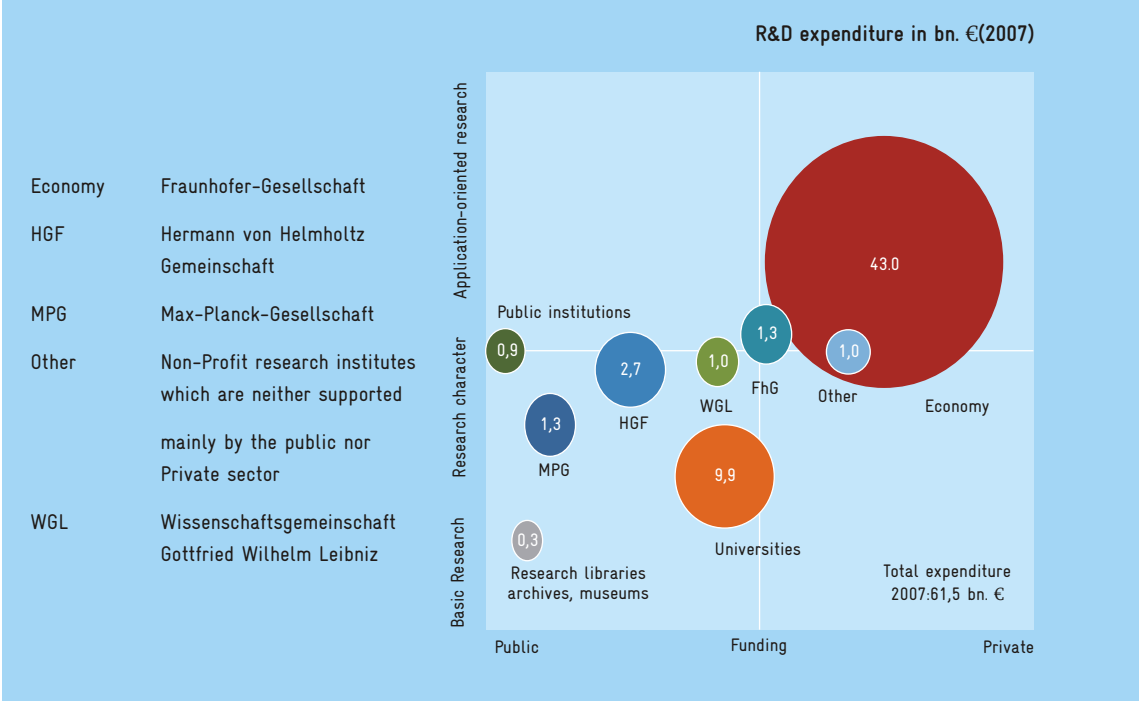
1. Promotion of innovation in four selected priority areas (so-called 'needs areas', namely: health, climate protection/protection of natural resources/energy, mobility, security) and related key technologies (such as biotechnology, nanotechnology etc.);
2. Promotion of cooperation between science and the private sector, and
3. Improving the framework conditions for innovation.

In addition to the federal government, the states are also involved in promoting innovation, but their programmes are not part of the "High-Tech Strategy".

In contrast to many other European countries that have created specialized, independent agencies for the implementation of innovation policy and programmes, in Germany, this is managed by a diverse set of research organisations, associations and companies, the 'Projektträger' , or project executing agency (European Commission 2009).

[1] For an overview see www.foerderdatenbank.de (database of funding programmes, maintained by the Federal Ministry of Economics and Technology (BMWi).

Figure 2: R&D expenditure of different actors in Germany



Source: Bundesbericht Forschung 2010.

Different levels of German Innovation System are described below in detail:

1.3.1 Macro-level: Creation of a favourable Framework for Innovation

In order to strengthen local capacities for innovation, a favourable framework is a necessary precondition. In Germany, this is particularly done in the following fields:

- **Access to finance:** Improved access to venture capital for technology-oriented start-ups through instruments such as the High-tech start-up fund and the EXIST-program.
- **Easening of Start-ups:** Minimum capital for founding GmbHs has been lowered, from 25,000 Euro to 10,000 Euro and introduction of an electronic commercial register, significantly speeds up and simplifies the registration of new companies.
- **Public procurement:** Changes in the law against restraints of competition have allowed federal ministries to adapt their tender procedures in favor of innovation and resource-efficiency.
- **Intellectual Property:** Several legal initiatives on the national and European level are improving the coherence of intellectual property rights and their enforcement. In addition, newly established patent agencies in universities are supporting the institutions, researchers and SMEs in filing and applying patents.

- **Quality infrastructure:** In order to enable SMEs to profit from this, dialogue platforms with SME representatives have been established and norms and standards are being introduced in education and training.

- **Red tape reduction:** An independent Council consisting of lawyers, industry representatives and researchers has been established which reviews each governmental bill.

1.3.2 Meso-level: Strengthening of crucial institutions

- The German "Dual Education System" and System of Vocational Training Developed historically from the system of apprenticeship, the "German Dual Education System" is considered by many countries to be a system of high quality and efficiency. It combines in-company trainings with classroom instructions in both humanitarian and technical topics. This is made possible by a close cooperation of companies (in which the practical training takes place), technical schools (education of students, training and development) and chambers (which test for qualifications and later issue widely recognized certificates).

- Universities of Applied Sciences have a clear focus on applied research and are in close contact to companies. There is an intensive and lively exchange between the two actors, since a large part of the professors are representatives from businesses and many students complete internships at cooperating companies often writing their final thesis within and on behalf of a company.

- Research Facilities can be found both inside and outside universities, and both in public and private hands. The most well-known representatives both in terms of innovation promotion and expenditure on R&D (please refer to figure 3) are three institutions: the Hemholtz Association, the Max-Planck Gesellschaft and Fraunhofer-Gesellschaft. They carry out high level research in various research fields and are commonly seen as a major driver of the German Innovation System.

1.3.3 Micro-level: support of individual businesses

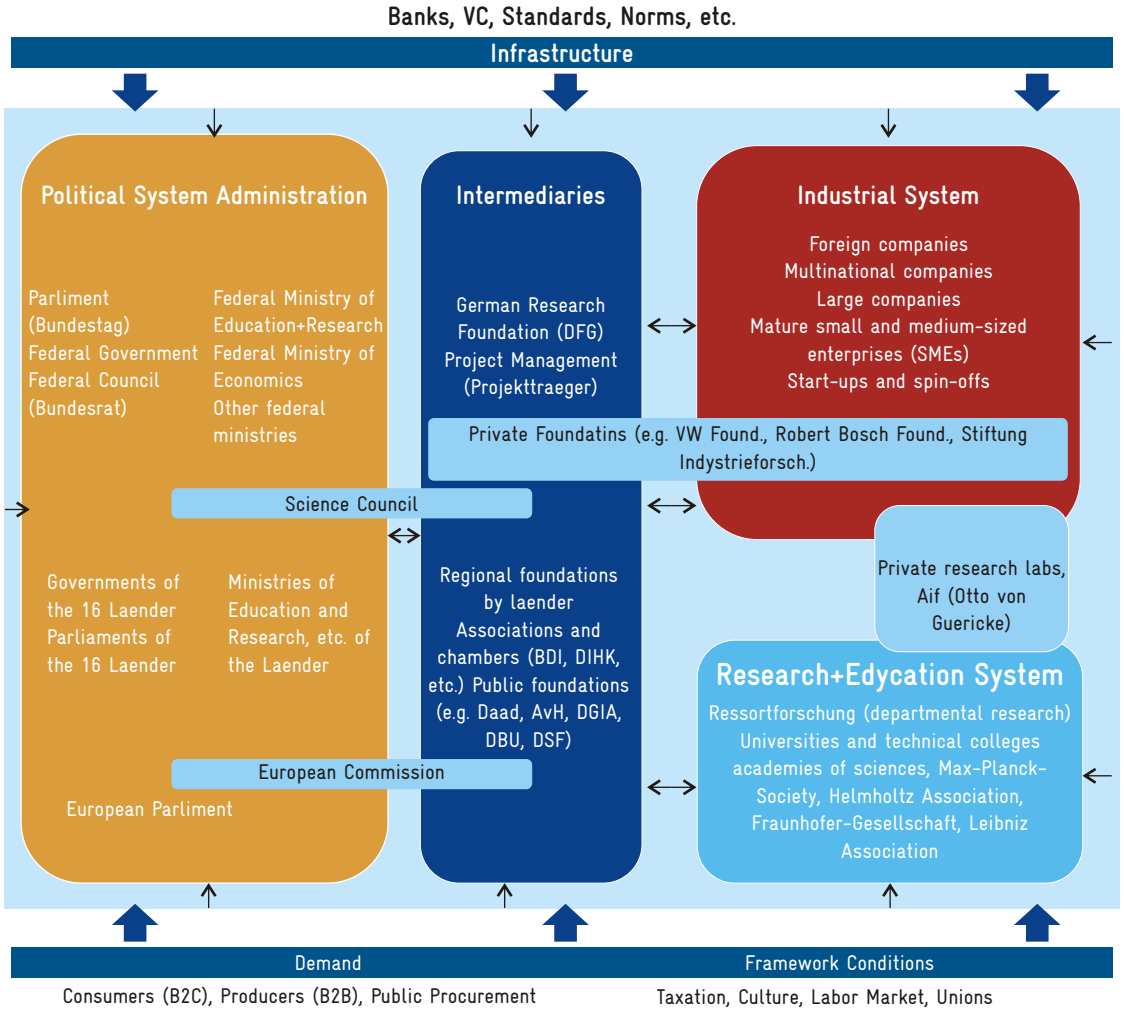
As Figure 3 clearly shows, private businesses account for a major part of R&D investment in Germany. Therefore, German Innovation Promotion also addresses individual businesses, for instance with the help of:

- **Business competitions** that aim at identifying promising approaches and are generally linked to the funding of selected projects

- **Promotion and financial** support of promising business start-ups

- **Technical support and training,** usually in the form of public-private initiatives such as CEFE. (For more information see http://www.cefe.net/)

Figure 3: Actors at different levels of the German Innovation System



Source: Frietsch/ Kroll 2010.

German "Mittelstand"

Clusters and Innovation

2.1 Promotion of Innovation and Competitiveness of the "German Mittelstand"

As an essential driver of innovation, competition and economic dynamism, small and medium-sized enterprises (SME) are considered to play an essential role in creating jobs and income. The German Mittelstand[2] is often depicted as one of the success models for SMEs realizing their role as drivers for economic development and is characterized by following key qualitative dimensions:

- High degree of specialization
- Flexibility
- Long term orientation and responsible organizational culture
- Long-term vocational training
- Decentralized presence.

Figure 4: Different Quantitative Definitions of the „German Mittelstand"

EU Definition of SME

	Employees		Annual Turnover (in €)		Annual Budget (in €)
Micro Enterprises	0-9		Up to 2 million		Up to 2 million
Small Enterprises	10-49	And	Up to 10 million	or	Up to 10 million
Medium-sized Enterprises	50-250		Up to 50 million		Up to 43 million
All SME	0-250		Up to 50 million		Up to 43 million

	Employees		Annual Turnover (in €)
Small Enterprises	0-9		Up to 1 million
Medium-sized Enterprises	10-499	And	1 to 50 million
All SME	0-499		Up to 50 million

Source: EU, IfM

[2] Mittelstand' is used in Germany synonymously as the term SME'.

The SME-sector is a key actor in the German innovation system and a lot of policies and support institutions enable innovation in this sector. The governmental promotion programs usually are designed to facilitate the innovation potential inherent in SMEs rather than providing direct support to companies, i.e. supporting start-ups or applied research. Another area of promotion is the development of specific sectors considered to be of particular importance for the national, local or regional economy. One of the current initiatives is the "Mittelstandsinitiative" (initiative for supporting SME), which consists of various promotional tools to further improve the terms for entrepreneurship. The focus areas are promotion of innovation, training and start-ups, SME financing, energy and resource efficiency and also the reduction of red tape. Some examples of these are:

- **Innovation Vouchers**

  Innovation (Research or Knowledge) Vouchers are available for SME at institutions such as chambers. They encourage SMEs to innovate. Empirics show that SMEs make careful use of the vouchers as part of their overall investment. SMEs can also use them to form clusters and to pool their resources and interests in order to realize a more extensive project. For more information see: http://www.bmwi-innovationsgutscheine.de/

- **Central Innovation Program for the Mittelstand (ZIM)**

  The purpose of ZIM is similar to that of innovation vouchers but it provides grants to specific larger-scale research projects. An evaluation showed that each Euro invested in a grant led to a total of more than 3 Euro added value. For more information see: http://www.zim-bmwi.de/

- **EXIST**

  EXIST seeks to support university students and researchers in setting up their own business. With a monthly scholarship, grants for material expenses and individual coaching, young people with a business idea in the field of innovative technology or innovative knowledge-based services are supported in realizing their business plan. For more information see: http://www.exist.de/ .

2.2 Cluster: Small System of Innovation

Only looking at indices such as the amount of research institutions, funding programs or the budget for R&D etc. is a necessary but insufficient condition for innovation capacity. These rather form the "hardware" of an innovation system. It is however the cooperation and interaction between all actors of an innovation system that forms the key to success. Here, clusters play an important role as they coordinate the NIS "bottom up". Typically clusters consist mainly of industry (SME and non-SME) which is supported by universities and research institutes in their innovation efforts. Cluster is nothing else than a network of industry and research institutions/universities" (VDI/VDE, 2012). Hence, each cluster reflects a (sub-) system of innovation of a specific industry (e.g. automotive, renewable energy or manufacturing industry).

Cluster Management Organizations: Enablers of Cluster Collaborations

A cluster management organization facilitates collaboration within a cluster by providing a variety of services. These cluster management organizations consist of different participating cluster actors, the industry and research sector included, in order to e.g. mediate contact, to support the identification and initiation of projects etc. The following table presents the main categories of services offered with examples of services:

Figure 5: Categories of services provided by cluster management organizations

Categories of services	Examples of services
Acquisition of third-party funding for projects (public funds)	• Acquisition of R&D and non-R&D projects on behalf of cluster members • Distribution of information about funding programs
Collaborative technology development, technology transfer and R&D projects	• Organization of tasks forces/working groups • Management of projects on behalf of cluster members • Legal advice, e.g. on IPR
Internal networking among cluster members	• Regular meetings, get-togethers, thematic events/workshops for cluster members • Internal newsletter, databases etc.
Development of human resources	• Participation in the development and implementation of vocational training or study courses together with external partners such as universities • Training courses for cluster members
Development of entrepreneurship	• Consulting and coaching • Acquisition of financing (e.g. venture capital, banks, public funds) on behalf of entrepreneurs
Matchmaking and networking with external partners/promotion of the cluster location	• Information material, website, press releases, publications • Presentation of the cluster and its members on trade fairs or conferences • Events/workshops to present the cluster • Matchmaking/partnering events
Internationalization of the cluster	• Presentation of the cluster and its members on trade fairs or conferences, networking visits, study tours • Offices or other permanent representations abroad • Cooperation with export promotion agencies

Source: VDI/VDE 2012

From a policy perspective, it is not a specific service which determines the innovative success of a cluster. It is the mix of services which is important. Beside other benefits for the businesses, clusters increase productivity and in many cases they play a significant role for the rate and success of innovation activities (Porter 1998).The "cross-pollination" of ideas and innovation was the main driver for the achievements of the Silicon Valley model (Saxenian (1994) in European Commission Staff Working Document, 2008).

The Case of the German Automotive Industry

The German automobile industry directly employs only around 2% of overall German labor force, but constitutes for approximately 1/3 of overall German investment in R&D. 25% of people employed in R&D work for or with the automotive sector. With an 8% of total industrial value-added in Germany, the share of the automobile industry is exceptionally high in international comparison. It is one of the skill-intensive industrial sectors in Germany. The sector recovered unexpectedly fast from the latest international financial and economic crisis; not least because of its immense innovation capacity.

3.1 Specifics of the German Automotive Industry

However, in order to understand its success, both economically as well as in terms of innovation capabilities, one must take a closer look at the organizational structure. Even though the German Automotive industry is often reduced to its most well-known representatives (such as Daimler, BMW or Volkswagen), these only constitute for a smaller share of the industry as a whole. The sector can be differentiated in two different kinds of producers i.e. large OEM and the supply industry. It is dominated by a modest number of large manufacturers, or Original Equipment Manufacturers (OEMs), such as Daimler, BMW, Porsche or Volkswagen. Each single company employs a large number of people and generates a large turnover. Relatively, however, the second type, smaller supply companies, occupies a much larger share of overall employment and revenue. Most of them show typical characteristics of German "Mittelstand" firms, as stated above, some, like for instance Bosch, have also developed to be large multinationals themselves.

Large OEMs concentrate their activities on selected core areas, which are seen as the unique selling points and the areas with the highest value added, such as engines and car designs. The supplier industry, in contrast, is characterized by highly specialized products, in which they are often among world market leaders. Hereby, companies usually do not deliver individual small items to the OEMs, but produce whole systems within the car, like for instance the block lighting set, gearbox, or braking system respectively.

The German Automotive Industry is organized in regional clusters, from which the most eminent are Stuttgart (OEM: Porsche and Daimler); Munich (OEM: BMW) and Wolfsburg (OEM: Volkswagen). Apart from that, there are a large number of smaller regional clusters from foreign-owned companies such as General Motors (with its regional brand Opel) and Ford.

The German Automotive Clusters constitute as an excellent example for the innovation capabilities generated by a cluster structure. Since generally there is only one large (or in the case of the Stuttgart region two) OEM, it holds a high degree of market power and stands vis-à-vis a larger number of supplier companies. This leads to a high level of competition and thus pressure on costs and productivity. The supplier industries put a significant effort in their own R&D activities in order to respond to this pressure and stay competitive. The German Automotive regional Clusters thus give a perfect incentive structure for successful innovation. And indeed, many automotive supplier companies within the big regional clusters have developed to highly innovative companies with an extremely high productivity, efficiency and competitiveness.

Supplier companies in the regional clusters have strong linkages with universities. Furthermore, they are the forerunners of the German system of vocational training and dual education system. Jobs in the automotive sector are well-paid and rank among the highest in Germany in terms of overall working conditions. (ZEW, NIW, 2009).

In Germany, the Federal Ministry of Economics and Technology supports the creation of framework conditions conducive for innovations. Some examples for ongoing initiatives include:

- Support of the development of a harmonized European car emission legislation
- Support of the efforts of the automotive industry for the introduction of alternative propulsion technologies and fuels
- Coordination of the work of EU directives and EU regulations between European institutions and the German automotive industry.

In the following, two examples for cluster promotion for innovation in the automotive sector will be given in order to show successful approaches on different levels.

3.2 Example 1: the nationwide project "Light eBody"

The Federal Ministry of Education and Research supports a variety of projects aiming at developing innovations within the Automotive Industry. All projects are based on the cooperation between the public and private sector and form a platform for innovation. The project "Light-eBody" was the result of a contest of the German Ministry of Education and Science (BMBF) and constitutes as an example of a successful innovation promotion that involves a large variety of key actors and is set at different levels of the beforehand described innovation system.

The project "Light-eBody" is incorporated within the National Electro Mobility Development Plan of the German Federal government. Since the current capacities of batteries for electric cars are still limited, resource efficiency is crucial for the commercial success of electric cars. Any reduction, as in the case of a resource-saving car body is an important step for achieving this goal.

Under the overall project control of the RWTH Aachen University, 12 partners are involved in the project: One large OEM (Volkswagen), several companies belonging to the supplier industry (Röchling Automotive, Böllhoff Verbindungstechnik GmbH, Linde + Wieman, Altair Engineering GmbH, DOW Deutschland Anlagengesellschaft) producers of upstream industries (ThyssenKrupp Steel, Hydro Alminium Rolled Products), private research institutes (Ford Research Centre Aachen) as well as public research institutes (Fraunhofer Institute) and the University of Paderborn.

The example demonstrates how all key actors in this innovation system are strengthened and in this manner, an enhanced level of interaction between them can lead to successful innovation:

- **The project incorporates a large variety of stakeholders:** all important actors within the potential value chain for a newly developed lightweight car body are included in the initiative:
  - Not only universities but also key research institutes for technology development in the automotive industry such as the Fraunhofer-Gesellschaft as well as private research institutes are included in the cooperation.

- Knowledge producers of the private sector are encompassed within the project: the companies of the supplier industry which are included in the project are all among the global leaders for their specific field. The support given by the projects targets the actors that are most likely to develop successful innovation and provides additional incentives for the companies to invest in the development of a relatively new technique.

- To include all upstream industries in a cluster network in this case is crucial: producers of steel and aluminum play are significant part in the development of a lighter car body. This example shows that there is no standard set of actors involved in the successful innovation. It is rather important to identify all key players that might be relevant and include them in the cooperation.

- **Human and social capital is developed by** incorporating universities such as the RWTH Aachen University which educates and trains their students with applied-research questions that address challenges of developing lightweight constructions for the automotive sector.

- **Cooperation between the actors is strengthened.** Responsibilities of each stakeholder are defined in advance and an action plan is developed. The cooperation and the steady exchange of information between the network parties enable all participants to adapt quickly to new challenges and to develop creative solutions for upcoming problems.

- **Framework conditions** conducive for innovation promotion are constantly supported by policies of the Federal Ministry of Economics and Technology. The Federal Ministry of Economics and Technology e.g. promotes the international competitiveness of the German automotive industry for example through the development of competition neutral European rules for the reduction of CO2 emissions of cars. Beside the specific promotion of innovations within the automotive cluster, a key industry in Germany, general macro-level policies for innovation promotion such as patent protection, trade policies etc. are also in place.

To conclude, the cooperation between the public and private sector is key to success in the Light-eBody project. Not only the large network involving 12 stakeholders but especially the coordination between them and the explicit definition of the actors' roles in the innovation system and of an action plan are immensely important for the successful development of an innovative lightweight construction for cars. While not only the Federal Ministry of Education and Research promotes the specific Light-eBody project, the Federal Ministry of Economics and Technology ensures the provision of framework conditions conducive for innovations.

3.3 Example 2: Stuttgart Region Automotive Cluster

The Stuttgart Region is one of the most important industrial areas in Germany. It hosts more than 165.000 companies and generates a GDP of 101 billion Euro. The region shows a very high research density with R&D expenditure of the private sector constituting for more than 7% of the GDP of the region. It is home to the headquarters of well-known corporate groups such as Daimler, Porsche, Bosch, Festo, Behr, Alcatel-SEL. Apart from research capabilities of the companies, there are numerous university research facilties, 2 Max-Planck insitutes, 5 Fraunhofer institutes and a large number of private research institutions.

One of the most important industries in the Stuttgart Region is the Automotive Sector, which accounts for 45% of the overall revenue. With its well-known representatives Daimler and Porsche, the Stuttgart Automotive Cluster can be seen as the most eminent cluster of the sector in Germany. It employs almost 17% of overall workforce of the region. According to official sources, the cluster is one of the few Automotive Clusters in Europe with the whole range of value chain settled within one cluster. In terms of overall expenditure on R&D, companies in the Stuttgart Region invest an average of 5 billion, it accounts for 15% of overall private R&D investment in Germany – the fact that 75% of this investment goes into the automotive industry proofs a major focus of the cluster on innovation. Automotive companies of the Stuttgart Region have a share of 6% of GDP accounting for R&D and thus represent the Region with the highest research density in the sector in Germany.

In the case of the Stuttgart Automotive Sector, one must note that the development of the industry was not the result of state intervention or industrial policy. Daimler Benz was one of the first companies producing cars in Germany. During the last 130 years, the sector developed around this very successful manufacturer. However, one must not undermine the benefits of a good business and investment climate which can be positively influenced by public bodies.

In order to provide a favourable framework for further development of the sector, the "Verband Region Stuttgart", or association of the region Stuttgart was founded in 1994. Its main duties include a favourable traffic and transportation planning, regional planning, landscape planning as well as business promotion and tourism marketing for the region. Furthermore, the association is engaged in significant Cluster and Networkmanagement, which includes for the Automotive sector the following activities:

Cluster Initiative Automotive Region Stuttgart (CARS)

Initiated by the Stuttgart Region Economic Development Corporation, the Cluster Initiative Automotive Stuttgart GmbH (CARS) enables a higher level of interaction between the different actors within the cluster. The initiative is publicly initiated and driven; however, a large number of private companies are highly involved in different activities. Apart from general network management, CARS mainly focuses on the provision of information. More specific, activities of CARS can be clustered in four main areas:

- Information, sensitization and qualification in the form of trade fairs, workshops, training and development of employees in the sector
- Improvements in communication within the cluster, between different companies as well as the communication between science and companies
- Location Management
- Location Marketing

Horizontal networks for Financing, Education and Labour market / Talent search

Competence Center program for the Automotive Sector

In order to organize regional networks between companies, universities, research facilities etc. within the cluster. They provide a basis for know-how exchange and innovative cooperation. There is evidence that competence centers significantly improve the cooperation and effectiveness of research activities within a cluster and the transformation of results into marketable products and services. In short both the supply industry and the large OEMs closely work with universities and research institutions, in particular in the field of mechatronics, microelectronic, power electronics, telematics or material research. (GTAI 2013).

The objective of all those activities is the optimization of the use of innovation potential of companies, universities and research facilities; the stimulation of Public-Private cooperation, the support for start-ups and entrepreneurs and the creation of a joint learning environment. Overall, the "Verband Region Stuttgart" is an example for the application of the Innovation System Promotion.

Learnings for Innovation Promotion System for Indian SME

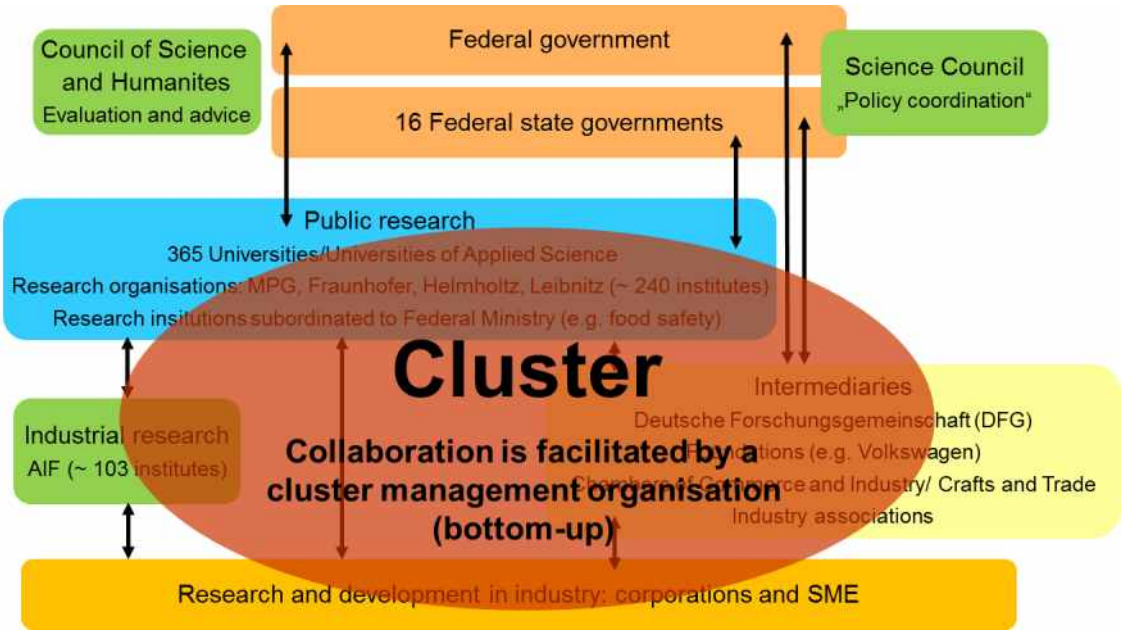
The strong performance of SME in Germany can be attributed to a whole range of determining factors: a value system which encourages entrepreneurship (meta level), a political system committed to shape a business-friendly environment especially addressing SME (macro level), a strong basic business support structure like institutions with a clear focus (meso level) and a long-term, quality-based pattern of economic acting (micro level). SMEs and SME support are essential elements of this system.

A differentiated system of SME promotion as it exists in Germany needs a very mature institutional environment and a proper interrelation between the different levels. Compared with the German national system of innovation there are two key differences in the Indian context:

The cluster innovation ecosystem is dysfunctional.

Indian clusters are rather mere business networks with no or very limited participation of research institutions and universities. While In Germany, clusters play a particular role as they eventually coordinate the national system of innovation "bottom-up". In Germany, typically clusters consist mainly of industry (SME and non-SME) which is supported by universities and research institutes in their innovation efforts. They are nothing else than small systems of innovation. Collaboration in a cluster is facilitated through a cluster management organization, which is partly public funded.

Figure 6: Cluster as a sub system of national innovation system (source VDI)



Source: VDI/VDE 2012

The innovation capacity of Indian MSME is weak.

For SMEs, prominent internal barriers are skill shortages due to the lack of effective in-house training programmes; an inability to move beyond the first successful internal processes for innovation.

Therefore favorable conditions will have to be created and developed from the micro to the metalevel and only the functioning interrelations and interdependencies between them enable competitive advantages for SME. However, this can be done neither by the state nor the market alone. Even though it is not possible to directly transfer the German experience of SME innovation promotion to other countries, there are some possible areas for exchange and supportive activities.

Metalevel:

- Improve relationship and communication channels between government and private sector
- Strengthen the commitment of the political system to shape a supportive environment for companies/SME

Macrolevel:

- Improve framework conditions securing a competitive structure of markets and compensation of market failures (access to finance, time a business has to spend to deal with the government…)
- Support key factors like enforcement of property rights, means of conflict solutions

Mesolevel:

- Capacitate SME support institutions with a clear focus (i.e. associations)
- Strengthen business support structures for SME, i.e. microfinance or specific SME programs which address specific challenges
- Support functioning of decentralized self-help organisations for addressing specific problems of SMEs (often localised), in particular support of cluster organisations

Microlevel:

- Support a quality-based pattern of competition
- Strengthen SME as suppliers to large companies within a functioning Value Chain

References

Arbeitskreis Innovationssystemförderung (2010): Förderung von Innovationssystemen – Ein Förderansatz für die deutsche Entwicklungszusammenarbeit, DIE, GIZ (ex-GTZ), InWEnt, KfW, PTB and DAAD.

Baptista, R. and P. Swann (1998): Do firms in clusters innovate more?, Research

Policy 27, 525-540.

Bundesministerium für Wirtschaft und Technologie (BMWi) (2007): Der Mittelstand in der Bundesrepublik Deutschland: Eine volkswirtschaftliche Bestandsaufnahme, http://www.bmwi.de/BMWi/Redaktion/PDF/Publikationen/Dokumentationen/doku-561,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf , retrieved: 1.03.2013.

Bundesministerium für Wirtschaft und Technologie (2009): National Electromobility Development Plan of the Federal German Government,http://www.bmwi.de/English/Redaktion/Pdf/national-electromobility-development-plan,property=pdf,bereich=bmwi,sprache=en,rwb=true.pdf , retrieved: 1.03.2013.

Bundesministerium für Wirtschaft und Technologie (2011): Schlaglichter der Wirtschaftspolitik, Monatsbericht August 2011, Niestetal: Silber Druck oHG.

European Commission (2008): The concept of clusters and cluster policies and their role for competitiveness and innovation: Main statistical results and lessons learned, Luxembourg: Office for Official Publications of the European Communities.

EUROSTAT database, http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/R_%26_D_expenditure, retrieved: 4.03.2013.

Forschungszentrum Jülich, Eine neue Technologieplattform für die Elektromobilität – das Projekt „Light-eBody", http://www.dgm.de/dgm-info/newsletter/2011/07/images/artikel_ptj.pdf , retrieved: 1.03.2013.

Freeman, C. (1995): "The National System of Innovation in Historical Perspective", Cambridge Journal of Economics, No. 19, 5–24.

Frietsch, Rainer; Kroll, Henning (2008): Recent Trends in Innovation Policy in Germany. In: New Challenges for Germany in the Innovation Competition. Final Report. Fraunhofer Institute for Systems and Innovation Research (ISI), German Institute of Global and Area Studies (GIGA) Georgia Tech, Program in Science, Technology and Innovation Policy (STIP).

Frietsch, R., Kroll, H. (2010): Recent Trend in Innovation Policy in Germany. In: Frietsch, R., Schüller, M. (Hrsg.): Competing for Global Innovation Leadership: Innovation Systems and Policies in the USA, Europe and Asia. Stuttgart: Fraunhofer Verlag.

Fromhold-Eisebith, M. and G. Eisebith (2005): How to institutionalize innovative clusters? Comparing explicit top-down and implicit bottom-up approaches, Research Policy 34, 1250-1268.

GIZ and ecbp (2008): An Executive Summary of "New Challenges for Germany in the Innovation Competition – Final Report" , http://www2.gtz.de/wbf/4tDx9kw63gma/ExecutiveSummary_InnovationSystemPolicy.pdf, retrieved: 2.03.2013.

Legler et. al (NIW) and Rammer et. al (ZEW) (2009): Die Bedeutung der Automobilindustrie für die deutsche Volkswirtschaft im europäischen Kontext, Endbericht an das Bundesministerium für Wirtschaft und Technologie, ftp://ftp.zew.de/pub/zew-docs/gutachten/AutomobEndBericht_final.pdf, retrieved: 28.02.2013.

Meyer-Stamer, J. & Wältring, F. (2000): Behind the Myth of the Mittelstand Economy. The Institutional Environment Supporting Small and Medium-Sized Enterprises in Germany. INEF Report, 46.

OECD (1997): National Innovation Systems, http://www.oecd.org/science/inno/2101733.pdf, retrieved: 27.02.2013.

Polt, Wolfgang et al. (2009): Das deutsche Forschungs- und Innovationssystem. Ein internationaler Systemvergleich zur Rolle von Wissenschaft, Interaktionen und Governance für die technologische Leistungsfähigkeit. Studien zum deutschen Innovationssystem Nr. 11-2010. Johanneum Research, technopolis group, Zentrum für Europäische Wirtschaftsforschung GmbH; http://www.joanneum.at/uploads/tx_publicationlibrary/Das_Deutsche_Forschungs-_und_Innovationssystem.pdf

Porter, M. E. (1998): The Adam Smith Address: Location, Clusters, and the "New" Microeconomics of Competition, National Association for Business Economics, 7-13.

The Economist (2010): Mittel-management, November, 25.
http://www.berndvenohr.de/download/veroeffentlichungen/presse/11_2010/101125_Economist_Mittel-management%20-%20Germany's%20midsized%20companies%20have%20a%20lot%20to%20teach%20the%20world.pdf , retrieved: 28.02.2013.

VDI/VDE/IT (2012): Report Scoping Study – Innovation Promotion through Clusters in India, VDI/VDE/IT Berlin.

Venohr, B. & Meyer, K. (2009): Uncommon Common Sense. Business Strategy Review, Spring 2009, 39-43.

MSME Umbrella Programme
Deutsche Gesellschaft fur Internationale
Zusammenarbeit(GIZ) Gmbh
B5/1, Safdarjung Encalve, New Delhi 110 029
India

Tel : +91-11-49495353
Fax : +91-11-49495391
Web : www.giz.de

Automotive Component Manufacturers
Association of India (ACMA)
The Capital Court, 6th Floor, Olof Palme Marg,
Munirka, New Delhi – 110 067
India

Tel : +91-11-26160315
Fax : +91-11-26160317
Web : www.acma.in