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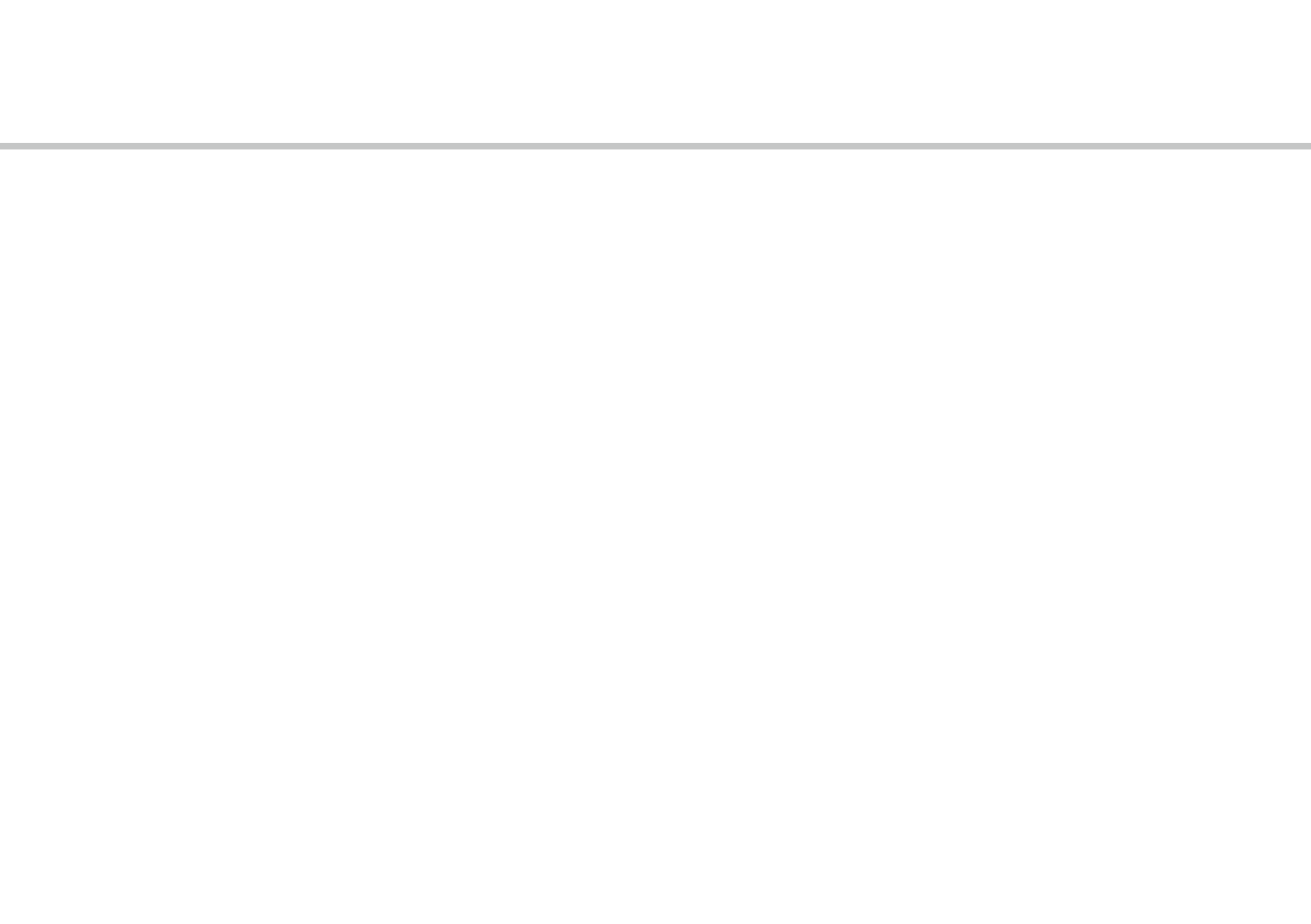


Bundesministerium
für Bildung
und Forschung

With Services to Economic Success



HIGH-TECH STRATEGY



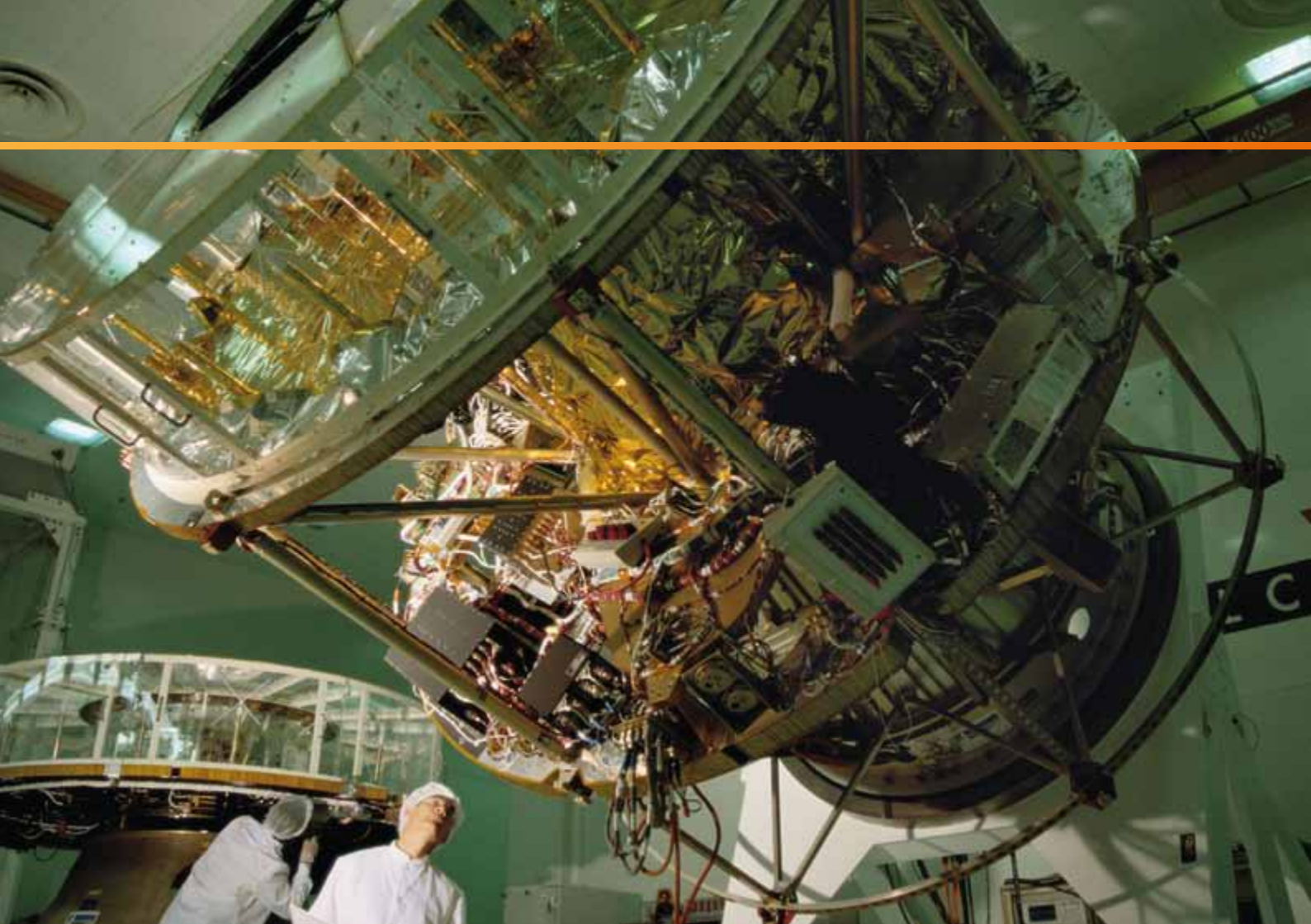
With Services to Economic Success





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1. Services as a Field of Innovation within the High-Tech Strategy

The growing importance of the service sector makes the process of tertiarisation seem to be inevitable. Nonetheless, the right approach to dealing with this trend is essential to assuring Germany's role as a global economic leader. The Federal Government is aware of the significance of services for innovation and has taken this into consideration and established services as a specific field of innovation within the "High-Tech Strategy for Germany". The new and updated High-Tech Strategy launched in 2010 is continuing this policy. It is entitled: "Ideas. Innovation. Prosperity. High-Tech Strategy 2020 for Germany".

An analysis of the strengths and weaknesses but also the challenges and opportunities in the field of services shows the urgent need to buttress the research landscape for service management as well as to create a scientific foundation for innovation management of services. With its infrastructure, its level of education and excellent reputation, especially in engineering, Germany is already well positioned to take advantage of the potential of the service sector. Furthermore, the EU services directive provides additional opportunities for exports, especially in the particularly dynamic field of knowledge-intensive services. However, more dedication to research and development of services on the part of companies as well as an optimisation of the cooperation between

the development of technology and services is needed. Knowledge-intensive and therefore also innovative services are one of the most important foundations of technological research and development. They should be incorporated more into technological research in order to better exploit the potential for growth and job creation.

Service research is an established part of public research and innovation policy and is making a distinct contribution to increasing the competitiveness of companies and to specific service research. The important role of services in innovation is further emphasised by the fact that service research is part of the Federal Government's 2006 "High-Tech Strategy" and continues to play an important role in the High-Tech Strategy, which was extended in 2010. The explicit consideration of services also reflects the nature of services. By now, they have become a systematic component of any kind of economic activity. When the focus shifts towards customer utility and a solution orientation, it no longer makes sense to distinguish between product and service. Since services and service research are agents of innovation and a driving force in it, it was therefore sensible to include them as part of the High-Tech Strategy. In the context of this line of reasoning, services are viewed as mediators and connectors between company, technology, market and customer. It is often only through them, a focus on solutions and utility becomes practicable.

SERVICES AS A FIELD OF INNOVATION WITHIN THE HIGH-TECH STRATEGY

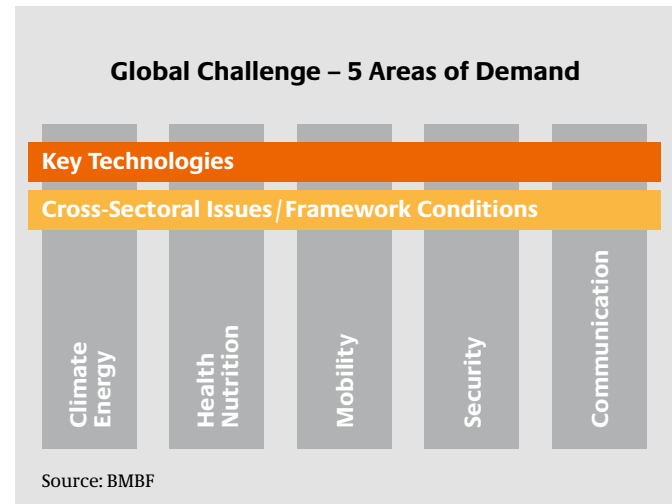
Examples of the driving forces behind such innovations are new societal needs, socio-economic problems, new or changed living conditions and styles of consumption. Thus innovation processes are no longer limited to individual companies but take place within corporate and value creation networks as well as in society as a whole with the participation and consideration of various groups of stakeholders.

At the core is the concentration of resources on five “areas of demand”, where, according to the BMBF and under the consideration of cross-sectoral issues and framework conditions, key technologies play an important role.

The areas of demand mark areas that are societally relevant and urgently require policy action. This action entails the government, business and other stakeholders defining research and innovation policy tasks. In all areas of demand, key technologies are seen as groundbreaking for solutions and the framework conditions of each specific area need to be taken into account. The term “key technologies” also subsumes services. As a bridge between the areas of demand as well as within them, services play an important role in coping with societal and economic challenges. This integrative approach has gained significant international attention and broad support from the scientific community as well as the private sector.

The implementation of the High-Tech Strategy is being accompanied by the Industry-Science Research Alliance,

which includes leading representatives from science and industry. It is a forum in which specific innovation strategies and measures are proposed and initiatives for their implementation are developed. The High-Tech Strategy will continue to undergo systematic evaluation within the Industry-Science Research Alliance.





The following Trends illustrate the Significance of Services:

Solution instead of product:

Products are increasingly differentiated through accompanying services and innovative solutions are realised as individualised, “hybrid” forms of output that are tailored to the needs of the customer. Usage-based concepts (such as operator models for example) increasingly replace product-oriented structures with service relationships.

Global competition instead of local market:

The swift development of ICT is increasing the significance of information as a component of solutions – and with that also the possibility of separating services from their place of creation. Because of that, digital services, for example, can be marketed worldwide from one central location.

Systemic thinking instead of focus on individual output:

Instead of “supply” of a product or a service, the focus is shifting to the project-like, joint value creation of the actors involved. The design of the entire system of these actors offers enormous potential but also requires new approaches. Healthcare, traffic and energy supply systems, for example, connect numerous stakeholders using services. At the same time, a targeted, scientific foundation or its application for improved efficiency of these service systems is still lacking.

(Brochure “Auf dem Weg zu einer Service Science, Empfehlungen an die Taskforce Dienstleistungen im Rahmen der Forschungsunion Wirtschaft – Wissenschaft”, 2010, excerpt from the introduction, page 6)



Strong Integration of research-intensive Industry and knowledge-intensive Services

The strong increase in the production of goods has not led to the creation of new jobs. On the contrary: From 1995 to 2006 employment in research-intensive industry has decreased by 12 percent. At 18 percent, that figure was even higher in other industries. In other words: The research-intensive fields have prevented an even stronger employment reduction in industry. The research-intensive industry has focused more strongly on its core competencies, namely on the manufacturing of consumer goods. It has reduced the level of vertical integration and outsourced the production of intermediate goods to non-research-intensive industries, the service sector and abroad. From 1995 to 2000, the share of value creation in research-intensive industries decreased by 3.7 percent annually.

As a result, jobs were lost in the research-intensive industries. Within the commercial sector, knowledge-intensive services have a particularly high growth rate. From 1995 to 2005, their share of total value creation increased from 27 to more than 31 percent.

In 2006, 41 percent of those employed in private sector services worked in knowledge-intensive services. Their share of the total number of people working in private sector services was little under 25 percent. The strong expansion of services can mostly be explained with the increasing cooperation between industry and services when it comes to intermediate goods. Due to their demand for high-quality intermediate and equipment goods, services are increasingly becoming a driving force for innovation. The German economy, just like those in other industrialised nations, is undergoing a structural transformation in two ways:

- On the one hand, the growth of the industrial sector is modest when compared to that in the service sector. The employment trend has been clearly negative since the early 1990s.
- On the other hand, knowledge and research-intensive fields of business are expanding, both in manufacturing as well as within the service sector.

Knowledge-intensive Services increasingly contribute to Job Creation

Unlike industry, the service sector has been making a positive contribution to overall employment since the mid-1990s, with knowledge-intensive services being more dynamic than other services. The number of working hours in knowledge-intensive services increased by 22 percent from 1995 to 2006. In other services there was an increase of 3 percent. These trends can be observed not only in Germany but internationally as well: Employment in the industrial sector is decreasing in most developed economies but less so in research-intensive industries than in non-R&D-intensive ones. In the knowledge-intensive service sector, however, employment has increased significantly. Nonetheless, Germany experienced a temporary stagnation of the development of employment at the beginning of this decade.

(EFI (Commission of Experts) report, 2008, text passage “Starke Verflechtungen zwischen forschungsintensiver Industrie und wissensintensiven Dienstleistungen,” page 66 et seq.)



2. The “Action Plan DL 2020”

Services have a cross-sectoral function for the entire economy. They contribute essential preliminary work to the production of physical goods and support and assure their market success. In a modern society services are part of virtually every economic activity. Especially in strategically important areas of our economy, goods and services increasingly go hand in hand and are more and more intertwined with innovative technologies. Services offer a significant and not yet fully exploited potential for finding solutions, especially to the socio-political challenges as they are exemplified in the Federal Government’s High-Tech Strategy. These are some of the key areas that can help increase Germany’s economic strength.

With the programme “Innovation with Services” research on services has already successfully investigated many aspects related to its subject. In order to more effectively exploit the potential of services to meet a broad range of societal challenges, services have to be combined with (new) technological developments earlier and more closely. At the same time, stakeholders from business and society need to be connected. When research aspects specific to services are taken into account in technological research, this influences the design of the technology. A similar holistic view and approach promotes user and utility-oriented solutions

and taps new customer groups and markets. Currently, the prevalent approach is the technology-push approach: It focuses on technological development and seeks possible applications and users later. Pull approaches on the other hand emphasise combining customer and user needs with possible technological applications right from the start and thus assure a good market entry and market success. Experience has shown that this customer and user-oriented research and development is a significant factor in successful technology transfer. Combining service and technology-oriented research also creates bigger incentives for companies to increase their research and development in the area of services. This is true across all industrial sectors.

In order to respond to these demands, the BMBF presented the “Action Plan DL 2020” in September 2009. The plan contributed to defining the contents of the programme “Innovation with Services” in the area of services and technology. This was the start to combine service research with technology-oriented technical programmes of the Federal Ministry of Education and Research (BMBF). The “Action Plan DL 2020” consistently implements the recommendations of the Research Union of the High-Tech Strategy of the Federal Government and makes close ties between technological innovation and services the focus of research funding. The Federal Government’s High-Tech Strategy is focussing on

THE “ACTION PLAN DL 2020”

fundamental goals in order to reshape the economy in a sustainable way. Therefore it offers good opportunities and starting points for a further expansion of service research within the research funding as well as research and innovation policy of the Federal Government. In order to take advantage of these opportunities, it is necessary to refine the conceptual framework of service research in Germany in the context of economic transformation.

The strength of the High-Tech Strategy is to combine the

resources of private enterprise and science in order to accelerate innovation in the areas of demand and to shape lead markets. With the “Action Plan DL 2020”, the BMBF will continue its efforts in this area. The combination of service research with other fields of research as well as technological research and development is at the core of the Action Plan. The early integration of service research in other fields of research and development accelerates the market entry of innovations and ideas and therefore leads to new products, processes and services more quickly.



During the implementation of the Action Plan, the focus is on those fields having a particularly strong connection to services and that, combined with service research, have the potential to provide answers to pressing societal questions. The “Action Plan DL 2020” provides a framework for these aspects of research funding. Funding guidelines have already been developed jointly with other BMBF departments. Examples include the area of healthcare regions, mobility, and assistance in the context of demographic change. Here, the fact that the research proposals were focussed more closely on markets and people and thus were more likely to deliver practical solutions and business models suitable for the market illustrates the effectiveness of this approach.

The farthest-reaching experience with the implementation of the Action Plan lies in the connection between the fields of service and energy research: The accompanying, scientific research of the BMBF competition “Energy-Efficient City” was conducted by service researchers.





3. BMBF Competition “Energy-Efficient City”

Cities and communities need to act for climate protection, reduce consumption of primary energy sources and lessen their ecological footprint. The German Federal Ministry of Education and Research (BMBF) therefore initiated the Competition “Energy-Efficient City”. Driven by the climate-protection goals of the German Government and based on the prevailing urban conditions, participants in the city competition had to develop innovative and holistic approaches, constantly recognizing the key role services can and must play to spur energy efficiency in German cities. Within this framework, the goal is also to prove that joint efforts of services research und energy research offer a high potential for innovation, and to face global challenges at the local level. In September 2010, five winners were selected and are now given the opportunity to implement their concepts between 2011 and 2016.

A scientific research project led by the Institute for Futures Studies and Technology Assessment (IZT) accompanied the funding initiative. In addition to practical assistance, supporting instruments, and recommendations, the accompanying research placed great emphasis on further reinforcing the stimulation effect of the BMBF competition. It also put a special focus on service innovations with respect to climate protection on the local level.

Key Questions

The following key questions are central to the “Energy-Efficient City” competition:

- Which strategies, technologies and service innovations help consumers, businesses and administrations to use energy in the most efficient way?
- Which business models, cooperative structures, organisational structures and processes reinforce solution-focused approaches to saving energy at the urban level?
- How can holistic, interdisciplinary and practical concepts be developed and implemented at the local level?
- How can services-research tools and results be established at the local level to support interdepartmental planning and policy?
- How can two major research programs be brought together that usually work independently of each other in order to assure joint learning and the most effective use of research funds?

The Role of Service Innovation in the BMBF Competition

For a long time, the potential for service innovations – both to create jobs and to solve the challenges that society faces – was not realised. Services were considered to be of low importance for technological innovations, rationalisation, and the enhancement of productivity. Today, the potential of services is increasingly being recognised at the local level, but innovations with services are still hampered by planning and policies that do not go beyond the boundaries of single departments. An understanding that services can make a significant contribution to increasing urban energy efficiency and meeting climate protection targets has only recently begun to spread. The BMBF competition “Energy-Efficient City” and its goal to focus on services have contributed to this change.

During the competition, the contributions of innovations with services increased in the majority of the contestants’ concepts. Also, the understanding of service innovations as a factor of success for implementing energy measures was strengthened in various respects: Services are considered instrumental in fostering the use of energy-efficiency technologies, accelerating the implementation of energy-efficiency concepts, as well as opening up and strengthening new markets in the field of energy efficiency. Here, information and communication technologies play a major role.

In the urban system, services serve as a link between providers and users, a link between players and technologies, and

a bridge to overcome obstacles. The services that will be realised in the implementation process are not entirely new: They were mentioned in the relevant literature or previously tested in other cities. Typically, they were adapted to the particular local conditions in the course of the BMBF competition. This applies in particular to establishing a sustainable energy-supply structure and to managing the effects of demographic change. In each case, services will be tailored to the needs of the communities. The involvement of local stakeholders in government, business and civil society will increase and local cooperative structures will be set up to strengthen efficacy. Furthermore, energy efficiency services will be bundled to further increase their efficiency and effectiveness.



Examples include:

- Information services for citizens. For instance: a mobility portal that keeps citizens up-to-date in real-time about various means of transportation on roads and rail, including public transportation routes and timetables, the degree of congestion on the roads, the availability of parking, traffic warnings, and construction sites.
- Comprehensive service portfolios. For instance: service packages such as energy-saving renovation measures as well as the planning, financing and installation of energy efficient heating systems.
- Contracting services for private households, enterprises and public authorities, pooling resources to tap the full potential of their energy-saving potential.
- A digital market place for energy-efficient services with a main focus on products and services from small and local firms.
- Services to identify roof areas for the installation of solar panels and to alert house owners respectively.
- Services to increase the conservation and utilisation of heat that was previously lost.
- A fund, financed by citizens to speed up urban energy-efficiency measures.

- Creation of the position of a local energy-efficiency manager who addresses consumers according to their needs and lifestyles and raises awareness of energy conservation and climate protection. The local energy-efficiency manager will link strategic, operational and exploratory levels (planning, networking, coordinating, moderating, informing, and communicating).

Further innovations with service measures and tools described in the winners’ implementation concepts include for instance service engineering at the local level and the accounting of public energy services as a basis for subsequent strategy building and the setup of energy-efficiency measures.



Assessment of initial Results

Within the BMBF competition “Energy-Efficient City”, service and energy research work together successfully. The implementation concepts of the winning cities prove that there is great potential for increasing energy-efficiency and climate protection: New technologies lead to new solutions and customer-oriented business models, while urban stakeholders in administrations, businesses and civil society can

coordinate their efforts and act together strategically. The BMBF competition shows that efforts to bring together the different research areas may improve the effectiveness of the research and bring it closer to practical implementation. The competition is one of the first examples of the successful combination of service research with other research disciplines. Service research, funded by the BMBF for 15 years, thereby proves that its approaches and results can be transferred to other fields of application.



Another conclusion is that joint efforts can provide appropriate responses to key societal challenges and spur implementation processes. New solutions may be found through cross-discipline research and the collaboration of government, businesses and civil society. The competition “Energy-Efficient City” is a good example for such efforts and solutions. Service research will contribute to finding solutions to urban challenges – this is a lesson learnt by most of the participating cities of the BMBF competition.



4. Practical Example: PIPE – Hybrid Value Creation in Mechanical Engineering and Plant Construction

Hybrid value creation is a driver of innovation. Goods and services are united more and more often in hybrid products. However, despite the fact that there is largely a consensus on the competitive advantages and the economic utility of hybrid products, feasible approaches to an integrated development of goods and services in companies hardly exist. This is precisely where the BMBF came in with the funding focus “Production and Services” and asked various partners to develop good, applicable examples to illustrate the concept.

In the BMBF-funded PIPE project, partners including the Vaillant company, the Institute for Information Systems (IW i) at the German Research Center for Artificial Intelligence (DFKI) and the University of Hamburg develop an innovative approach to integrating production and services in mechanical engineering and plant construction.

Here, the focus – exemplarily for the mechanical engineering and plant construction industry in Germany – is on the Sanitation, Heating, Ventilation and Air-Conditioning (SHK) industry. The SHK craftsmen who predominantly conduct the technical customer service have been transformed from pure technicians to service providers and have to take the

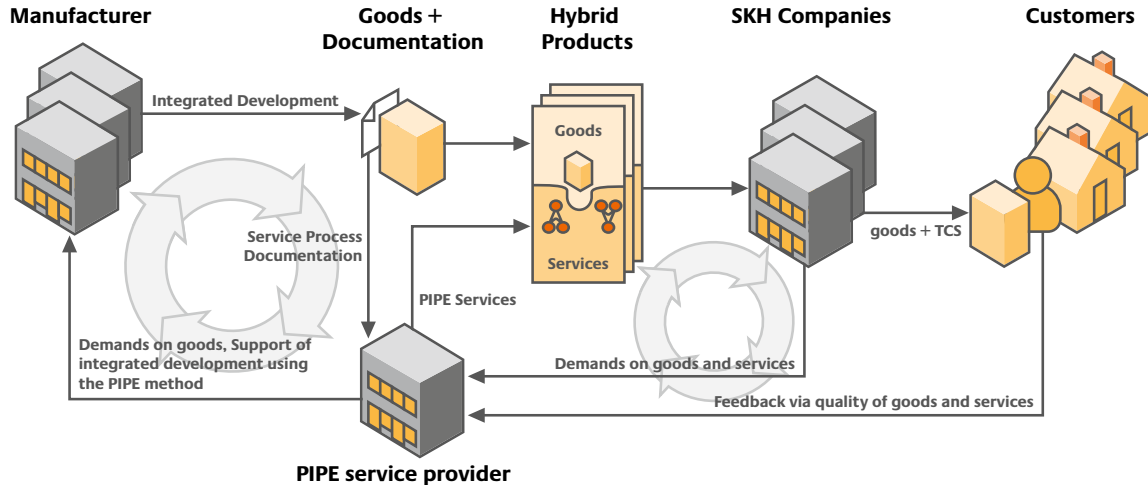
entire process of the customer order into account. With the quality of their work, they not only determine the customer’s satisfaction but also the good reputation and economic success of their company. Their work is becoming increasingly more challenging due to the growing complexity of products and services.

The guiding idea of PIPE is to increase the efficiency of the technical customer service using a mobile information system, which dovetails product development and service by means of a feedback loop. This way, product development and the course of a service are integrated by means of a service process documentation. On this basis, a methodology for the development of hybrid products is designed. Then a product is implemented prototypically using the example of the SHK industry.

Two closed loops are created using this mobile information system. They contribute to improving the hybrid product and the product development by the manufacturer as well as to an improvement of the services offered by the SHK companies. This way, the technical customer service’s need for a customer-oriented set-up, servicing, maintenance and repair of machines and facilities is being taken into account

in product development. This in turn increases the efficiency of the technical customer service (loop 1). At the same time, the manufacturers are put in a position where, for the first time, they can develop hybrid products, which document the process-oriented product and service information, which is integrated into the lifecycle, at a justifiable cost (loop 2). This is possible thanks to the early dovetailing of product development, documentation, technical customer service, process consulting and modern information technology.

The result is an IT-based service tool for increasing efficiency in technical customer service through process-oriented and mobile use of technical service information. It allows service technicians to save costs and time by providing targeted information. Manufacturers can improve quality control and use feedback information for the development of products and services. The customer benefits from reduced service costs, transparency of energy costs and personalised customer communication.



5. Outlook: Further Activities

The experience thus far gained in the implementation of the “Action Plan DL 2020” clearly shows that the combination of service research with other technical programmes is productive. The “Action Plan DL 2020” and its adaptation to more recent developments shows that the cooperation across disciplines continues.

Fields for additional measures are being identified in dialogue with science and business. The annual reports of the “Commission of Experts” (EFI) are an indicator. In the first report in 2008, there was a call to further increase cross-departmental policy, to improve the service orientation within the High-Tech Strategy and to focus more on the topic area environment, climate, and sustainability. The commission sees the need for a comprehensive strategy for the topic area “Innovation for Sustainable Management.” It stated that Germany had excellent opportunities to develop relevant technologies and services for the world market and to sell them there. In this context, innovative services should be included. Services form the connection between the various components of the value creation chain of the individual economic cycles.

The central point of reference for the Action Plan is the High-Tech Strategy with its focus on the five areas of demand: energy/climate, health/nutrition, mobility, security and communication. Furthermore, the EFI report 2011 states that the

redirection of the High-Tech Strategy has to go along with a concerted public effort. A cooperation across disciplines and departments is necessary for a result-oriented research and innovation policy that is supposed to benefit society, companies and people. For service research there are activities in the field of energy that should be continued and new activities in the field of mobility that should be launched. Service research will make valuable contributions to both areas since the util-



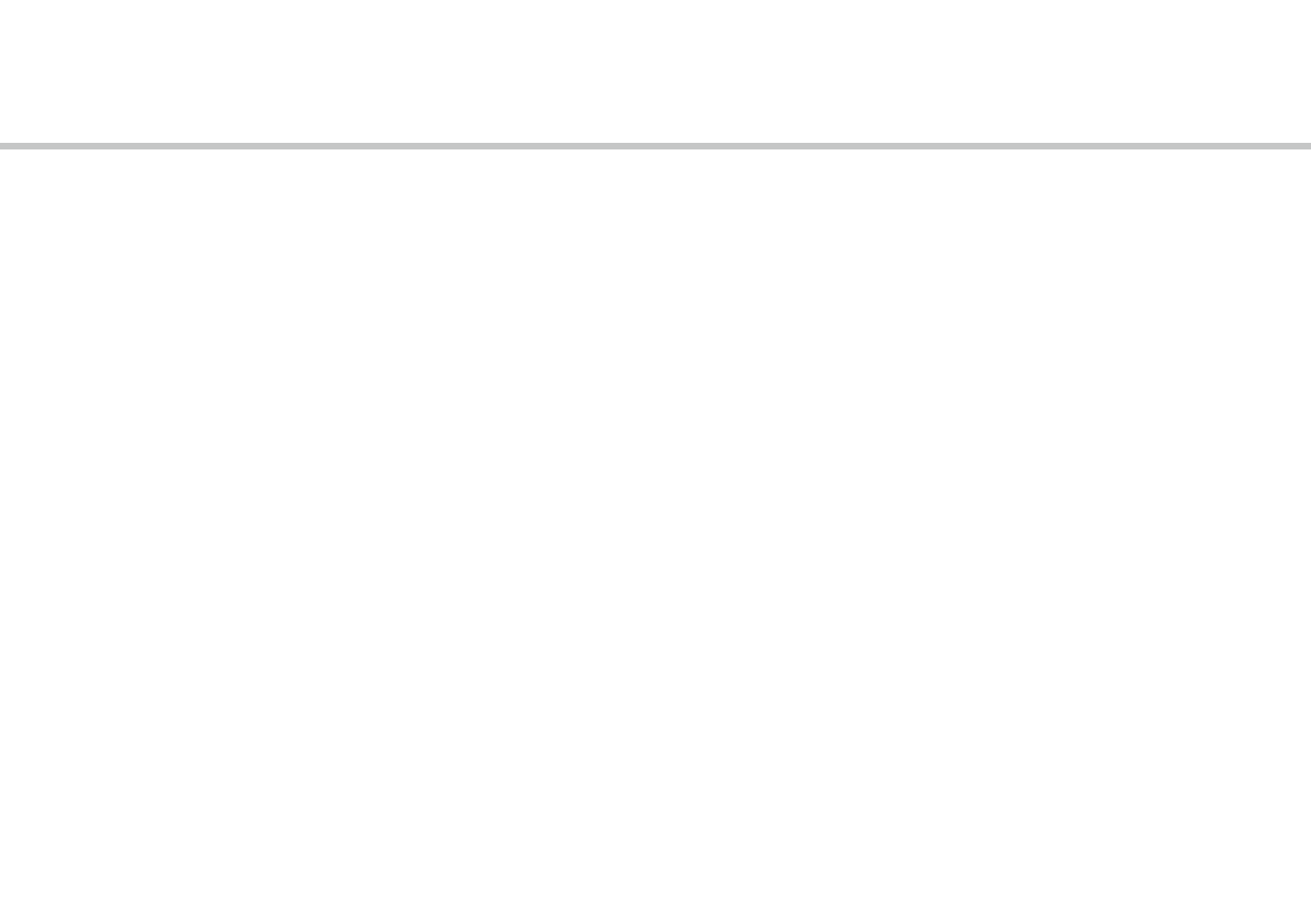
ity of products and services is increasingly generated in the context of service systems. A process-oriented concept of value creation suggests that corresponding funding programmes with their specific perspectives should be combined in a more targeted way.

The topics of the BMBF Foresight Process provide many valuable and continuative indications for a further implementation of the action plan. An important approach is the convergence of different technologies or the convergence between technologies and services. The interaction becomes particularly prominent in the areas of hybrid value creation and production systems, medical technology, and cooperative healthcare management. In the context of service and sustainability research, the Foresight topic “Producing-Consuming 2.0” is highly significant and contains numerous points of reference for a cooperation across disciplines in service, consumption, production and sustainability research, for example.

The “Action Plan DL 2020” remains open to new suggestions and can respond flexibly to current needs. For further information, please contact:

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