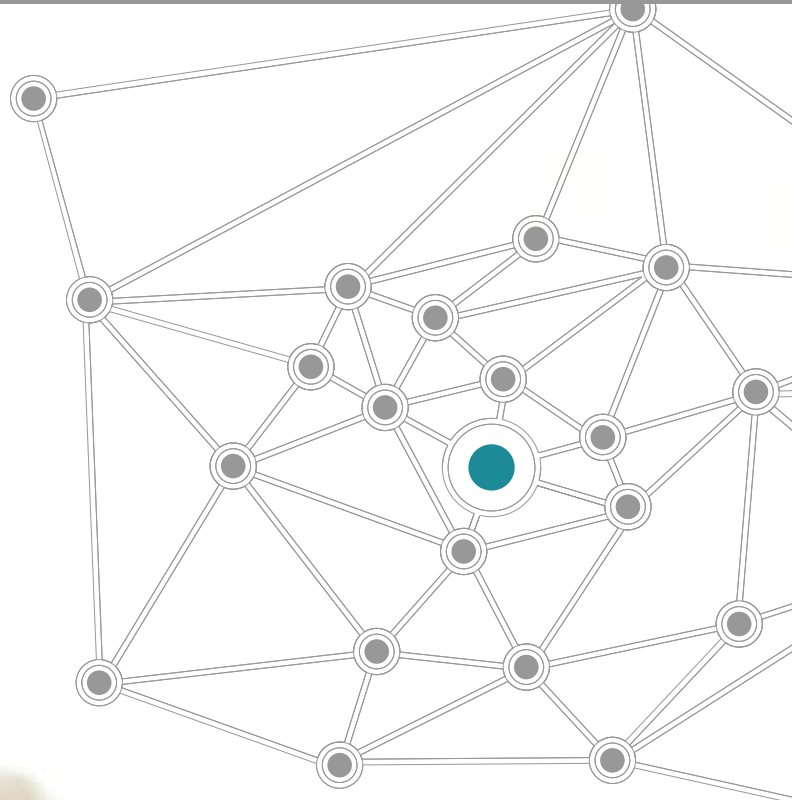




Fraunhofer
ISI

FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH



ANNUAL REPORT
2009



FRAUNHOFER ISI

The Fraunhofer Institute for Systems and Innovation Research ISI analyzes the framework conditions for innovations. We explore the short- and long-term developments of innovation processes and the societal impacts of new technologies and services. On this basis, we provide our clients from industry, politics and science with recommendations and perspectives for key decisions. Our expertise lies in a broad scientific competence as well as an interdisciplinary and systemic research approach.

With 180 staff members from science, technology and infrastructure, we are a highly motivated team, whose scientific expertise and systemic research approach fulfills the diverse requirements of our clients. The increase of our annual budget to over 19 million euros in 290 projects documents this successful work.

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CREATING GROWTH WITH FORESIGHT

The past year was greatly influenced in economic, political and societal terms by the financial crisis and the subsequent negative impacts on the economic climate, employment and national budget.

Contrary to this trend, the year 2009 was once again a growth year for the Fraunhofer Institute for Systems and Innovation Research ISI. Growth for us means, on the one hand, establishing and consolidating new, fascinating topics of innovation research, but also growing as an organization. With 172 employees at present from science, technology and infrastructure, we form a competent, highly motivated team, whose qualified, neutral expertise and systemic approach meets the diverse requirements of our clients. Last, but not least, the increase of our annual budget to over 19 million euros in 2009 proves how successful we are.

Recognizing future innovation opportunities, specific innovations as well as identifying and evaluating the resulting changes for society are the crux of the Foresight Process conducted on behalf of the Federal Ministry for Education and Research (BMBF). Fraunhofer ISI has been in charge of this Foresight Process since September 2007. As a highlight, we introduced the eight "future fields" in June 2009, which represent priorities for future research and technology promotion on account of their outstanding significance for society and the economy.

At the Climate Summit in Copenhagen, scientists from Fraunhofer ISI supported the German federal government in developing and evaluating proposals to design future climate policy.

The "European Manufacturing Survey (EMS)" continued this year, looking at the use of technical and organizational innovations in production and the resulting improved performance of manufacturing industry.

But not only national developments or the global impacts of new technologies and innovations set the tone for our work in Fraunhofer ISI. At the moment, we are also conducting a foresight study for the Fraunhofer-Gesellschaft itself and are developing future scenarios which describe the



potential environment of the Fraunhofer-Gesellschaft in the year 2025, in order to identify chances and risks for our work, and prepare and position ourselves accordingly.

As in our research projects, we also follow extraordinary paths in our everyday work. Our Institute's culture is characterized by networked thinking and a global perspective for our activities. Only in this way can we find answers to the important questions of future development. We used the design of the present Annual Report to illustrate this point: children as our future and networks as an engine for innovations determine the ways our society can develop in the future.

As an internationally leading innovation research Institute, we collaborate with other countries and thus guarantee different perspectives on the research subject. Visiting scientists come to us from the USA, Japan and the BRICS countries. Our scientists also go abroad as visiting scholars. We cultivate an intensive relationship with China and Russia and have begun first talks to establish cooperations with research institutions in India and Brazil. We aim to further intensify this collaboration next year, because dealing with innovations always means learning from other cultures and feeding the knowledge gained back into our own scientific research.

We would like to take this opportunity to thank our clients for the exciting research questions they asked, but also our partners: the University of Kassel, the Berlin University of Technology (TU), the Université Louis Pasteur in Strasbourg, the ETH Zürich, Virginia Tech in the USA and the Institute of Policy and Management (IPM) in Beijing. A special thank you goes to the Fraunhofer Materials and Components Group – MATERIALS as well as the Fraunhofer Alliances Energy, Nanotechnology, SysWasser and Transport.

We look forward to continuing our good cooperation!

Prof. Marion A. Weissenberger-Eibl
Director of the Institute

Dr. Harald Hiessl
Deputy Director of the Institute

SYSTEMS RESEARCH FOR SUSTAINABLE ENERGY USE

The ongoing dialog between the members of the Board of Trustees and the directors of the Institute has a significant influence on the success of Fraunhofer ISI. Once again, this year there was a lively exchange on important research topics such as energy and mobility.

Interview with the Chairman of the Board of Trustees, Dr. Stephan Bieri and Prof. Marion A. Weissenberger-Eibl, Director of the Institute

The motto of Germany's Year of Science 2010 is the "Future of Energy" and energy is also a main research focus within the Fraunhofer-Gesellschaft. Fraunhofer ISI has carried out many interesting projects in this field in 2009. What range of topics did you work on?

Weissenberger-Eibl: Again we had a huge number of exciting projects last year. We are approaching this topic from many different perspectives: renewable energies, energy efficiency, the energy demand of the information society, but exploring the possibilities of energy harvesting is also part of the picture.

Bieri: This topic presents a special opportunity for Fraunhofer ISI. Systems research is required to make progress in the field of energy. Production, transmission, distribution and consumption are closely interlinked, especially in grid-bound energy sources. Without a smart grid, the capacity to meet peak loads and efficient storage, the new energy technologies in particular will not manage a breakthrough. A similar picture emerges for energy efficiency, for which economically favorable conditions have to be established.

How will your clients benefit from this?

Weissenberger-Eibl: To give you an example: We identify potentials of efficient energy use for companies in order to show them where energy is being wasted in production processes. This saves the companies costs and enhances their profitability.

Bieri: I agree. In addition, we ought to look at the relationships within and between sectors. The fact that energy supply companies have been offering more energy services over the past few years relates to the business potential of intelligent energy application. Fraunhofer ISI is able to do both: put things in a macroeconomic context and play a part in optimizing individual aspects on an operational level.

“SYSTEMS RESEARCH IS NEEDED FOR PROGRESS IN THE ENERGY SECTOR.”

The examples just given help individual companies to manage their business successfully. But what does the research conducted at Fraunhofer ISI mean for our society and its citizens as individuals?

Weissenberger-Eibl: A stable economy is ultimately founded on successful corporations. These create jobs and contribute significantly to an affluent society. Individual citizens probably feel the effects of this more directly than they perceive the achievements of climate protection. And yet everyone stands to benefit from these achievements: if we analyze how to use existing energy sources more efficiently and how to better exploit the potential of renewable energies, this helps to reduce CO₂ emissions.

Our projects show that there is a large variety of technical and non-technical measures to reduce the emissions of CO₂, such as



renewable energies, intelligent traffic management, reducing energy consumption and structural measures. As far as I am concerned, the right approach to protecting the climate is to link the different measures and then analyze their impacts on our society. We are under enormous pressure to act today, to keep global warming as minimal as possible and to develop innovative measures to avoid greenhouse gas emissions. Our research reveals how these often seemingly abstract climate protection strategies can actually become useful innovations which are part of people's everyday lives. For example, private households could reduce total energy consumption by ten percent just by using the energy potential contained in their wastewater.

Bieri: What we have to do is show how social and business solutions can be brought into line with resource conservation.

A socio-political topic in the context of climate protection and energy which has been receiving a lot of attention lately is electric mobility. Fraunhofer ISI is involved in the Fraunhofer's "Systems Research Electric Mobility". What is your part in this project?

Weissenberger-Eibl: The Fraunhofer project "Systems Research Electric Mobility" aims to help the German automobile industry secure its globally leading position in this field in the long run. We are coordinating the topic "Technical system integration and socio-political issues" and investigating the practical impacts on society of introducing this technology. Which obstacles could arise? Which infrastructure has to be created to provide charging points? Do people really want this innovation and what has to be done to guarantee its acceptance? So you see, we are not just looking at electric mobility as a technology, but at the whole system of framework conditions which has to be tailored to the implementation of this innovation.

Bieri: Yes, this is where Fraunhofer ISI is in an excellent position. As I know from similar programs abroad, so much hinges on consumer behavior, on the state's framework conditions right up to regional planning policies. In addition to that, the Institute's

involvement in the field of materials science makes the essential technological feedback possible.

What does this actually mean? Can you give us an example?

Weissenberger-Eibl: We are researching consumer acceptance of electric mobility, for example. The development of the most intelligent technical solutions will still not help if they do not meet consumer needs. Furthermore, it is important to come up with business models to finance the build-up of the charging infrastructure. Which types of mobility are electric vehicles suited to? We are looking at when which type of transport is most efficient in terms of conserving resources, over what distance and for what purpose. Mobility is going to become more varied and more flexible.

Electric mobility will change the value added structures between automobile manufacturers and their suppliers. New business models can help to secure the competitive edge here. The next step is to ask questions about infrastructure build-up, charging points and charging controls. Here we arrive at one of the core challenges of electric mobility – the further development of battery technology. How can this development be designed to be sustainable right from the outset, for example when selecting and recycling the necessary raw materials?

“WE NOT ONLY LOOK AT ELECTRIC MOBILITY AS A TECHNOLOGY, BUT AT ITS WIDER FRAMEWORK CONDITIONS AS WELL.”

Bieri: I share this view. We have to pay close attention to altered value added structures. The automobile industry is characterized today by a high degree of outsourcing. I can imagine that the desired electric mobility can only be achieved by greater vertical

integration, which extends right up to the energy suppliers and energy storage operators. The topic of the vertical integration of manufacturing is yet another forte of Fraunhofer ISI.

“ONE GOAL FOR 2010 IS TO EXTEND OUR STRATEGIC COOPERATIONS.”

The European Institute of Innovation and Technology (EIT) has designated a consortium from Karlsruhe as one of the “Knowledge and Innovation Communities” (KIC) in the field of sustainable energy (KIC InnoEnergy). Fraunhofer ISI is involved here in the innovation side of things. What is the Institute’s contribution here?

Weissenberger-Eibl: We are one of the partners in KIC InnoEnergy at the Karlsruhe co-location centre, one of three European “Knowledge and Innovation Communities” which are being sponsored by the European Institute of Innovation and Technology (EIT). 35 partners from the private sector, universities, research organizations and business schools make up the European consortium. The goal is to create a sustainable energy system for Europe by 2050. Fraunhofer ISI will contribute its expertise in energy system analysis among other things at the co-location centre Karlsruhe, which is one of the European lighthouse projects.

Bieri: Karlsruhe and its immediate surroundings with the newly formed KIT is an ideal setting for an institute such as Fraunhofer ISI. I sincerely congratulate the Directors of the Institute and all those involved in this cooperation at Fraunhofer ISI. While I was Chair of the Board of Trustees, I pointed out the significance of such contract mandates.

What do you expect for the Institute in 2010?

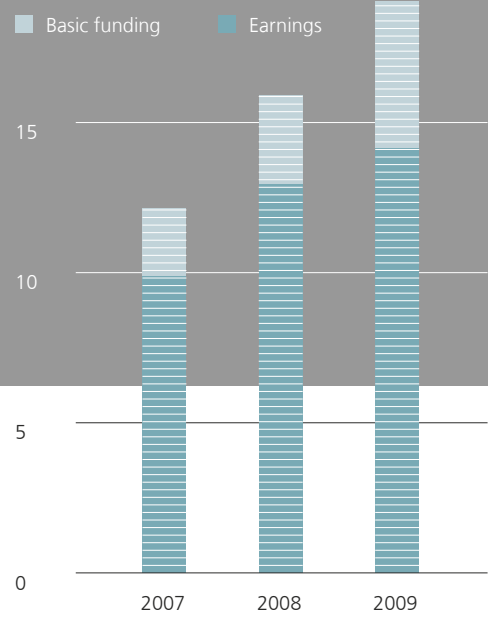
Weissenberger-Eibl: We will continue to pursue our strategy process. This includes extending strategic cooperations, continuing

to develop our expertise in policy consultation and stepping up the dialog with companies from the private sector.

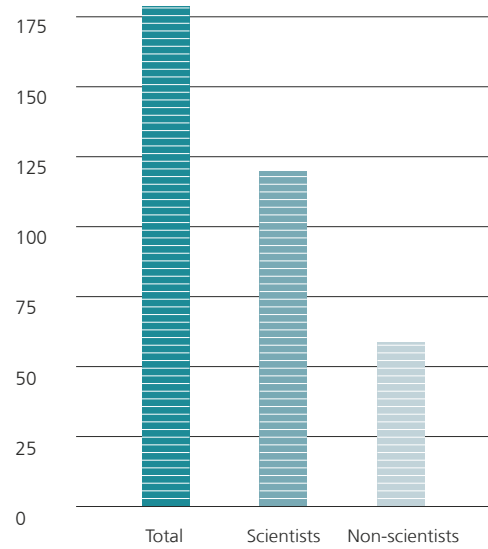
Bieri: I can only applaud these moves. In the US, I see how difficult it is at present for highly qualified institutions to acquire third-party funding. Success in contract research depends heavily on how well we are able to communicate our knowledge to potential clients from industry and government. I hope the Institute continues to be successful in this sense as well. I would like to take this opportunity to express my thanks to Mrs. Weissenberger-Eibl for the good cooperation we have enjoyed and pay tribute to her for what she has achieved as the Institute’s Director.

Weissenberger-Eibl: Dear Mr. Bieri, since you gave up the chair of the Board of Trustees at the end of 2009, I would like to thank you – on behalf of the Institute as well – for your long-standing commitment to Fraunhofer ISI and our good working relationship. Your support, input and the fruitful dialog between the members of the Board and the Institute’s directors meant a lot to us. We wish you all the very best for the future.

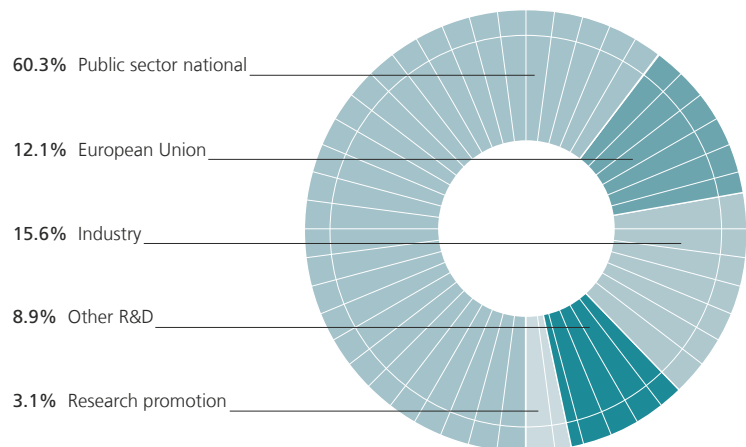
The interview was conducted by Kathrin Schwabe.



Development of turnover 2007 – 2009 (in million euros)



Number of staff



Clients

TOPIC 1

“WHEN I AM BIG, I WANT TO EXPLORE
THE WORLD IN AN ELECTRIC CAR. THAT WAY
I WILL BE DOING SOMETHING FOR
THE ENVIRONMENT AT THE SAME TIME.”



FUTURE MOBILITY SCENARIOS

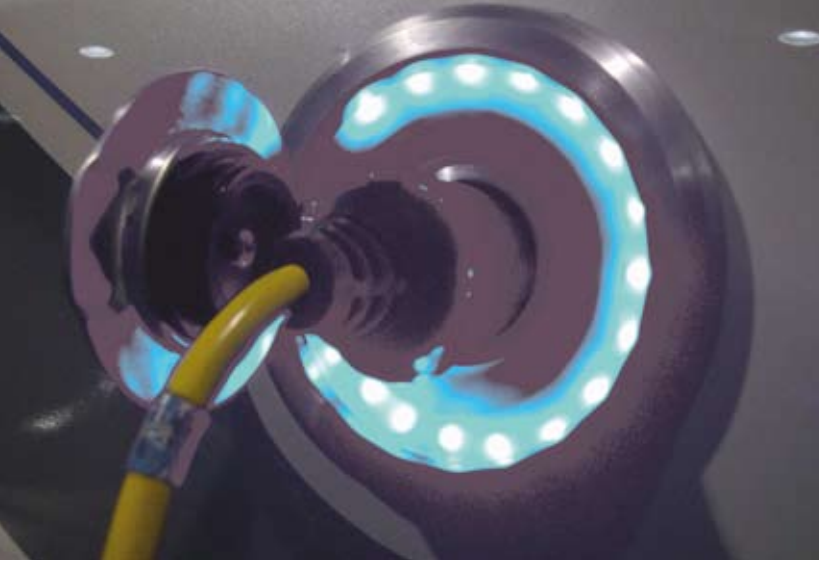
Our concept of mobility and how we organize it is about to change. Climate change demands that the transport sector, too, will have to lower its emissions of harmful greenhouse gases. Acting in concert with the impending shortage of fossil resources, pressure is building on industry to come up with innovative solutions, and provide alternative propulsion technologies. The challenges of alternative mobility concepts are many tiered and offer industry and society numerous opportunities. These range from challenges concerning technology development through integrating new concepts in existing infrastructures up to political and social issues, such as how to manage the framework conditions and acceptance of new technologies in a population. The question asked by Fraunhofer ISI is: What will mobility look like in the future?

The contribution of transport to climate policy

A targeted development of promising future mobility concepts must be based on reliable information about transport trends. These are of paramount interest, particularly with respect to climate change.

Climate policy in Europe demands a significant reduction of CO₂ emissions: by 60 to 80 percent in the transport sector up to 2050.

Fraunhofer ISI analyzed the role of the transport sector as part of an EU project on the adaptation and mitigation strategies supporting European climate policy. The study shows that the transport sector will have to make a significant contribution to CO₂ reduction if the overall target of an 80 percent emissions reduction by 2050, which is actually quite realistic, is in fact to be achieved. In this scenario, transport would only be allowed to emit 40 percent of the corresponding emissions of 2005. In order to meet this target, a broad range of measures is necessary. These include integrating transport in the greenhouse gas emission trading scheme, CO₂ emission limits for cars and light commercial vehicles, switching to electric mobility and implementing new logistic concepts. Cars can make the biggest reduction in the medium term, while heavy goods vehicles demonstrate the biggest saving potentials in the long term. It becomes clear that positive results can be achieved the fastest with measures to improve energy efficiency. In the medium term, new propulsion technologies show the biggest potential, while, in the long term, increasing the share of biofuels and behavioral changes of transport users can contribute the most to meeting the targets.



Beacon of hope: Electric mobility

Electric mobility based on electricity from renewable energy sources is being treated as a beacon of hope for sustainable mobility. From today's viewpoint, this not only represents the most efficient propulsion concept, but at the same time contributes to solving a variety of environmental problems. However, the transition from fossil fuelled-drive systems to electric mobility will be a long journey encompassing numerous challenges.

Electric mobility with electricity from renewable energy sources is a beacon of hope for sustainable mobility.

Looked at from a systemic perspective, electric mobility does not only mean electrically driven vehicles. In addition to this, the bigger picture also includes energy generation, its transmission and distribution, the intersections between the grid and vehicles and energy storage. The Fraunhofer-Gesellschaft is therefore bundling its expertise and efforts under the heading of "Systems Research Electric Mobility". Fraunhofer ISI is coordinating the main topic of technical system integration and socio-political issues. This includes estimations of market development and customer acceptance, system analyses of the economic and ecological impacts as well as analyses of the competitive situation and specific funding measures.

Storing energy in batteries is one of the key challenges to electric mobility. Driving range and comfort and thus customer acceptance is dependent on battery capacity and charging technology. Furthermore, there are issues of safety and economic efficiency. In a roadmapping process, Fraunhofer ISI is plotting possible battery development pathways which are not only centered on lithium-ion batteries. Aspects of market penetration and the availability of the raw materials are also illustrated to give a holistic picture.

Routes to electric mobility

Electric vehicles will only gradually replace conventional ones. According to studies of Fraunhofer ISI, electric mobility will first catch on in small vehicles, electric scooters and light commercial vehicles in inner-city transport. The currently expected market growth figures for electric cars repeatedly raise the question about the availability of the necessary raw materials. The discussion here centers on the expected demand for lithium, a subject which was therefore investigated by Fraunhofer ISI. Even under very conservative assumptions about supplies, the lithium reserves available world-wide will be sufficient for even high demand up to 2050. However, setting up efficient recycling programs for lithium is still to be recommended in order to conserve the raw material basis.

The objective of Fraunhofer ISI is to analyze the driving forces of and general conditions for electric mobility with the help of the scientifically established methods of technology foresight in order to prepare the ground for strategic decisions. Shaping the supportive framework conditions to make a fertile breeding ground and environment for innovations is just as important here as the early identification and promotion of innovative technologies.



Communication in a highly mobile world

Mobility cannot be regarded in isolation from its social demands and impacts. This is why it is necessary to analyze the future of mobility and transport in the respective context. This includes, for example, the question of what everyday life will look like in a highly mobile society. Fraunhofer ISI has developed one scenario as part of the FAZIT studies, which describes the future relationship of information and communication technologies and mobility. The trends towards more information and networking in transport which are already visible today will continue in the future. Driver assistance systems, internet services in vehicles and adaptive systems to realize situation- and location-dependent services could already be part of our everyday lives as early as 2020. Safety aspects in particular are already enjoying the limelight. The communication between individual vehicles and transport infrastructures is regarded as an important component to raising safety levels in road traffic. At the same time, such systems are in themselves a risk factor. This is why Fraunhofer ISI is participating in an EU project with the goal of devising safety architecture for automobile onboard networks.

Scenarios of a highly mobile society depict the trend towards real-time information enabling optimized multi-modal transport.

Demonstrating feasibility

The system transition to electric mobility can only succeed if all the new components work together smoothly and efficiently and are accepted by the customers. Fraunhofer ISI is therefore involved in several pilot and demonstration projects which aim to show the new systems' feasibility. In the Electric Mobility Fleet Test, the potentials of plug-in hybrids and electric cars and the efficient use of renewable energies in transport are being researched together with partners from industry and academia. The subjects of interest here are both the overall utilization potential for the traffic segment "Electric Mobility" and the individual users with their very specific prerequisites and preferences. Within the research project MeRegioMobil, the aim is to efficiently integrate mobile electrical storage in vehicles into the existing energy system by designing innovative information and communication technologies. Fraunhofer ISI is examining issues of economic efficiency, developing suitable business models and analyzing customer acceptance of innovative control options. Demonstrating coherent overall concepts represents a decisive step towards realizing sustainable mobility in practice and simultaneously shaping the energy supply of society in an efficient and sustainable way.

“WHEN I GROW UP, I WOULD LIKE
MY IDEAS TO MAKE SURE THAT LOTS OF
PEOPLE HAVE JOBS.”



THE ECONOMIC DIMENSION OF INNOVATIONS

Out of the crisis with innovations – this formula has developed into a central motif in the confrontation with the consequences of the financial and economic crisis. What exactly is meant by it, however, often remains unclear. The economic aspects of innovations are complex. Therefore it is worthwhile to take a closer look in order to understand the significance of innovations for the economy.

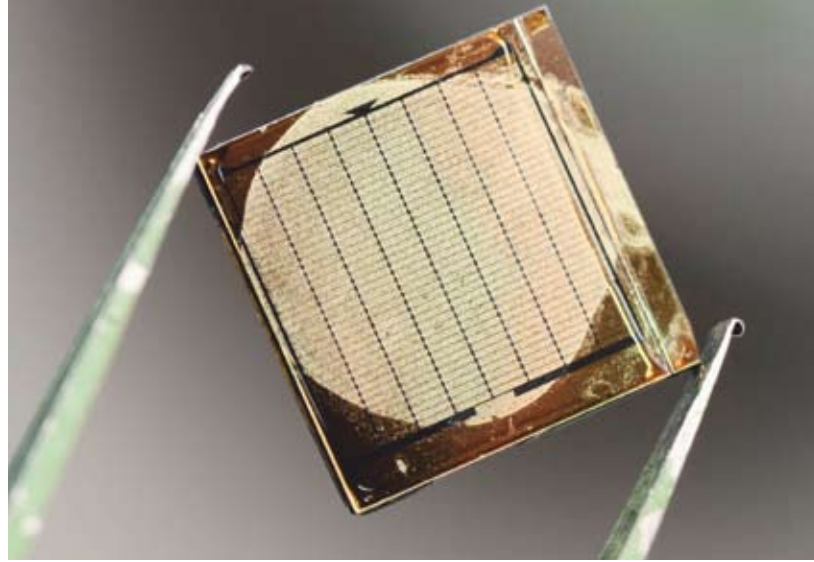
Renewable energies and associated innovative energy technologies such as biomass or onshore wind can lead to new jobs and economic growth.

Economic impacts of innovations

Individual firms profit from innovations as well as entire economies. In a study on behalf of the European Union, Fraunhofer ISI examined the effects on economic growth and the employment market which can be achieved through the continued expansion of the share of renewable energies in the energy supply by the year 2030. Both by maintaining the current EU goal of 20 percent reduction by 2020, and by assuming an ambitious energy policy, the verdict is that the impacts will be positive overall. Even achieving the current targets will lead to the creation of several hundred thousand jobs in the EU in the renewable energy sector, on balance. At the same time, economic growth will receive considerable impetus. The study shows: a policy that promotes innovative energy technologies also makes economic sense.

Opening up markets with innovative products

Often innovations are equated with new products. Many examples show that they are of key significance for the high-tech location Germany. Innovative products can open up the markets of the future. This applies particularly to the technologies which are regarded as specially contributing towards solving the global environment and climate problems. In a number of studies performed on behalf of the Federal Environmental Agency, Fraunhofer ISI examined the future market chances of products from the field of environmental technologies. Bioplastics, synthetic biofuels or electricity storage technologies – to name but a few – will experience a constant upswing in the coming years. This development however will not be an automatic success. Fraunhofer ISI recommends some ways in which enterprises can be successfully supported. In addition to basic and application-oriented research, the often small firms could for instance receive financial assistance in realizing demonstration models to demonstrate their new technologies.



Technologies as a pre-condition for innovations

The opportunities for technological innovations lie in the production processes of manufacturing industry. This applies, for example, to robots and automation technologies, which at present are frequently only suitable for large companies. In order to investigate how small and medium-sized enterprises could profit from this in the future, this technology must be better adapted to meet their special requirements. In an EU project, Fraunhofer ISI examined the economic potentials of a new robot technology specifically for smaller and medium-sized enterprises and developed the “LCC tool” for this purpose. The “life cycle costing” software provides interested firms with a sound cost-benefit comparison for the entire life cycle of the innovative robot application, from the purchase through operation up to disposal.

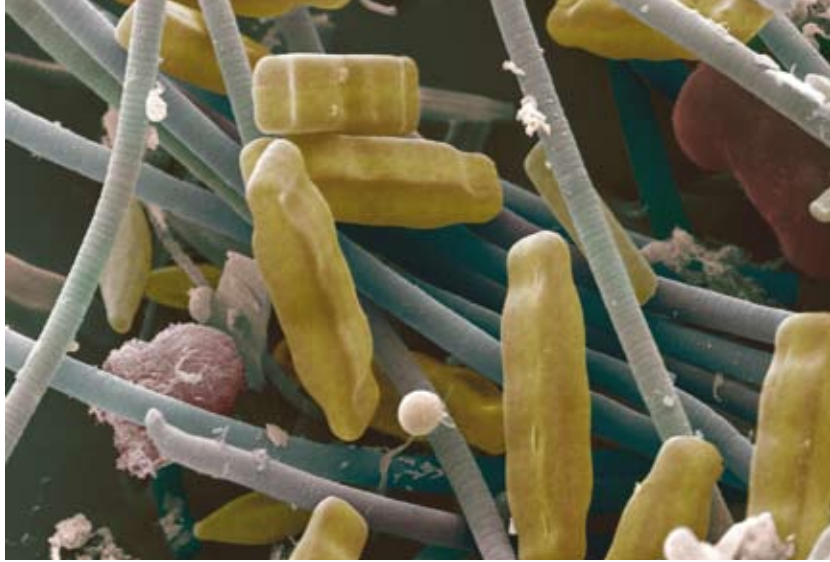
More than technology – innovative services

The consideration of the total cost of ownership of capital goods is becoming increasingly important. These costs include, besides the costs for hardware and software, operation and maintenance, also the opportunity costs due to plant downtime. In various projects with firms, Fraunhofer ISI has developed concepts and methods to design and evaluate such business models. New service-based innovations for the capital goods industry can contribute to opening up economic potentials for the entire product life cycle. Fraunhofer ISI has examined such business models. To date, tangible goods and product-related services were sold and the operating risk lay with the customer. Service-based business models, in contrast, involve the manufacturers of the capital goods in operating and market risks. Products are no longer being sold, but opportunities for utilization or performance results.

Service-based business models open up new fields of activity and economic potentials over the entire life cycle of a product.

Networks as a motor for innovation

Besides technological innovations, organizational innovations in a company are important to safeguard competitiveness. Rising energy costs are an incentive to increase energy efficiency. However, the search and decision-making costs are often too high for individual firms to identify and successfully implement the appropriate measures. The Local Energy Efficiency Networks (LEEN) are an instrument to assist enterprises. These are moderated networks with between ten to fifteen companies which jointly define targets to reduce CO₂ emissions, exchange experiences about identified and implemented measures and compare the realized savings in a regular monitoring process. It transpires that reducing CO₂ emissions generates profits for the companies and the energy efficiency in the networks increases twice as fast as the average for Germany industry. On average, the firms save ten to twenty euros per ton of avoided CO₂. Starting this year, Fraunhofer ISI has been responsible for monitoring 30 pilot networks with over 300 companies and thus helps to tap the long-term potential of several thousands of firms in Germany.



Strategic foresight – a lead through knowledge

Assessing the potentials of ideas and strategically implementing them is one of the crucial tasks of innovation management. Fraunhofer ISI offers tailor-made innovation planning for enterprises, associations and politics in the area of futures research. A current example is the support for the European Wind Tunnel Association. Wind tunnel technology is increasingly feeling the competition from the numerical simulation of flow processes. The objective of the project is therefore to strengthen the innovation capability of the European wind tunnel operators in technology competition. Fraunhofer ISI identified future developments with the help of a technology roadmap. The broad perspective is also important in this context. In addition to the technological developments, the innovation system of wind tunnels is analyzed, in order to identify the strengths and new possibilities for this technology.

The opportunities arising from investments in innovations are confronted by the economic risks. Assessing risks is often difficult. This means that unconventional research ideas beyond the known paths and established patterns of thinking are often not examined seriously. Instead of the usual approach of reducing the complexity at the beginning of innovation processes, Fraunhofer ISI also pursues the opposite path. For the Fraunhofer Materials and Components Group-MATERIALS, a methodology is being developed which generates unconventional research perspectives and ideas proactively and systematically and identifies the hidden potentials of high-risk research projects. Therefore it is necessary not only to allow different modes of thinking, but to actively encourage them. Networked, open and lateral thinking – innovations often only emerge when we countenance new aspects.

Futures research means estimating the potentials of ideas, implementing these strategically and tailoring innovation planning to companies, organizations and policy-makers.

TOPIC 3

“WHEN I GROW UP, I’M GOING TO BE THE
GERMAN CHANCELLOR – AND THEN I
NEED TO KNOW WHAT’S GOING TO HAPPEN
TOMORROW.”



SYSTEMIC ASPECTS IN POLICY ADVICE

Political actors increasingly demand sound knowledge from scientists. In its national and international policy advisory activities, Fraunhofer ISI pursues a broadly based approach in research, technology, innovation and energy policy. The Institute has extensive expertise in giving policy advice. With its studies, evaluations, benchmarking and monitoring research, Fraunhofer ISI as an independent scientific Institute places its expertise and competences at the disposal of political players at the national and international levels.

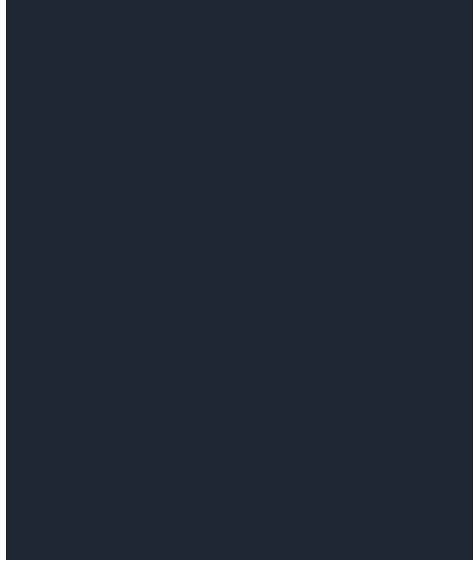
Policy advice changes require scientifically grounded knowledge based on early recognition of the relevant topics, analyses of the problems involved and the identification of new alternatives.

Tasks and functions of policy advice

Policy advice must do justice to complex fields of action and, at the same time, reduce the recommendations into communicable alternatives for decision-making. It therefore points to possible alternative courses of action and provides policy-makers with a framework for orientation. Policy advice also communicates strategic knowledge. Its effectiveness and efficiency depend on three factors: firstly, its relevance is determined by whether the needs of political decision-makers, current issues and the requirements of political processes are adequately met. Secondly, the scientific expertise must be appropriate and credible. And finally, the stakeholders' values and convictions should be taken into account, conflicting interests and viewpoints included as well as conflicts named. A yardstick for the quality of scientific policy consultancy is how well it manages to combine factual correctness and political relevance.

Trends in policy advice

The demands of policy advice are changing. This is reflected in an increasing trend towards scientific bases for political decisions. This "evidence-based policy-making" approach, as it is called in the Anglo-Saxon world, combines the demands to design political decision-making processes more systematically and to justify decisions more rationally. Politics is considered here as a learning process which enables appropriate and rapid reactions to societal and economic challenges. Thus the creation of new knowledge and the (re-)combination of existing knowledge stocks take center stage in political decision-making processes.



Early recognition and shaping the future

The contribution of science encompasses the early recognition of relevant topics and issues, problem analysis, providing results, identifying alternatives for action as well as formulating recommendations and developing regulatory standards. In the Federal Ministry of Education and Research's (BMBF) Foresight Process, which was completed in 2009, Fraunhofer ISI was in charge of identifying the relevant research topics for the next years. Based on these results, the federal government's research and innovation policy can be adapted to trends in a timely fashion and thus effectively designed. Compared with earlier foresight processes, the aim is to design future support programs. Fraunhofer ISI aids its implementation through continuous monitoring. In in-depth workshops the players network in order to develop joint ideas and specific measures. This process is accompanied by a tracking system, in which selected topics are observed and further analyzed. The expertise of Fraunhofer ISI in the field of foresight is also highly appreciated abroad. At present the Institute is advising the Lithuanian and Romanian governments on conducting foresight processes in order to further develop their university systems.

When interests and values differ, promoting communication and coordinating innovation policy activities between individual actors can help to reach a consensus.

Success through intensive communication

In addition to scientific expertise, process and organizational knowledge is increasingly in demand nowadays. This means that policy advisers must actively integrate stakeholders from politics and administration in the process. While the latest scientific findings from theory and practice are processed and, ideally, translated into specific policy options, policy advisers assume the role of "idea" or "knowledge broker". As a result, the roles are no longer clearly allocated between advisors and clients, but the neutrality of the consultants must be maintained. Besides "pure" consulting, negotiations are increasingly taking place in the networks comprising science, administration, politics and industry. Providing policy advice therefore contributes to consensus-building in the face of different interests and values.

A fundamental assumption of innovation research is that innovations are often the result of interactive and interdependent processes between different players in the innovation system, like enterprises, universities, research organizations and state institutions. Innovation policy has a number of financial and systemic instruments at its command to influence the innovation system, in order to favor the development and implementation of innovations. This includes backing new networks or the support for innovation policy decision-making processes through instruments such as foresight, technology assessment or evaluation. These instruments call for a great deal of coordination across various policy fields and policy competences. It is therefore necessary to coordinate the activities and areas of responsibility relevant for innovation policy of the different departments and ministries. Different understandings of the social roles, traditions, organizational cultures or opposing political rationales for action are serious barriers to effective coordination. Fraunhofer ISI assists ministries in the necessary cooperation processes. With the horizontal orientation of the High-Tech Strategy, the federal government has already created a key condition



for successful collaboration and coordination processes across departmental boundaries. In a policy benchmarking of medical technology innovations for the Office of Technology Assessment at the German Bundestag, however, Fraunhofer ISI pointed out further optimization potentials for intra- and inter-ministerial coordination.

Fraunhofer ISI is also active at the international level. The Institute accompanied the federal German government and the EU for instance to the negotiations at the UN Climate Protection Summit in Copenhagen. This included the preparation and assessment of suggestions on the participation of industrialized, emerging and developing countries in a future, multi-lateral climate protection regime, as well as the development of a computerized analytical tool that enables the timely quantitative evaluation of negotiation proposals during the actual negotiation process, among other things.

Evaluating and comparing

A classical instrument of policy advice is evaluation studies. Policy measures and promotional programs are, as a rule, evaluated with a view to their effectiveness and efficiency, either through monitoring or after project completion. Policy instruments are thereby assessed and the experiences recorded for future activities. At the same time, evaluation studies can justify past and future decisions. On behalf of the EU Commission, Fraunhofer ISI, together with European partners, has for the first time comprehensively analyzed and compared evaluation practice in Europe. In the project InnoAppraisal, it emerged that the research results do not as a rule flow directly into the design of new measures. However, they provide valuable background information for administrations, which again can be included in political processes. Fraunhofer ISI's analyses became part of the policy advisory process in that policy-makers were integrated in the research process and thereby stimulated to reflect on their own practices.

Evaluation studies help to assess the effectiveness and efficiency of policy instruments and thus provide empirical values for future activities.

Systemic thinking – systemic counseling

Systemic policy advice considers issues in their contexts and formulates appropriate political concepts. It requires broadly based skills which cannot be reduced to the mere writing of reports by academic experts. Due to its systemic perspective, Fraunhofer ISI has the skills to provide different types of advice in the various phases of the policy process and is thus a reliable partner in policy-making.

TOPIC 4

“WHEN I AM BIG, I WANT EVERYONE IN THE
WORLD TO FEEL SAFE.”



SYSTEMIC RISKS AND SECURITY RESEARCH

Security is a key issue of national and international politics. Some years ago its discussion was characterized by terrorism and preventing threats to public safety from internal and external sources, but today security is being discussed in a broader context: it crops up in debates about global megatrends like climate change as well as in technological and social questions like the further development of the information society. Fraunhofer ISI analyzes security issues from a systemic perspective and tackles current problems arising from the risks confronting the economy and society in the globalized world.

In the course of globalization, security research is no longer exclusively concerned with preventing dangers, but investigates the interaction between society, politics and technology.

A broader view of security research

The extension of security-related concerns to further topics is also reflected in the understanding of today's security research. While the development of security-relevant technologies and the protection of public safety were in the forefront until now, today the interplay of societal, political and technological aspects is being increasingly investigated. Fraunhofer ISI advises the Federal German Ministry for Education and Research on the implementation of a research program emphasizing the social-science issues of security research. In this program, the development of technical security systems is examined in the context of a comprehensive transformation of societal and political security architectures. The aim is to merge the positions of social science and the humanities, in order to negotiate fundamental questions and trends of a societal, basic law and democratic-theory nature. The resulting orientation guidelines enable the processing of central questions about technology strategy and individual technology projects in the security area, in the context of social innovations.

Current focuses of the civil security research program are security awareness in society, the dynamics and economics of security cultures as well as the role of security-relevant actors. What does security mean today? Debates about security frequently lead to uncertainty in society, particularly if it is feared that freedom and democracy will be curtailed as a result of new measures. As the increasing complexity and networking of security systems simultaneously increases their vulnerability, the costs and benefits of security measures must be constantly weighed up. The change in security requirements and architectures means that many governmental and non-governmental stakeholders have to be included, whose interaction calls for new legal framework conditions.



Security and risk

Whoever wants to guarantee security must be in a position to assess the risks and dangers to public safety. In various research projects, Fraunhofer ISI investigates the risks arising from climate change, for instance. On behalf of the EU, the impacts of extreme weather conditions on the economy and society in European regions are modeled, in cooperation with partners. The transport sector is the center of attention, as infrastructures and traffic flows can be especially affected by extreme weather conditions due to the linking of different transport modes. Disturbances in this area can have consequences for value added networks. Based on this knowledge of possible impacts, recommendations for effective risk and emergency management can be offered to policy-makers. At the same time, the adaptation of the transport sector to the changed framework conditions contains great potential for economic innovations which European companies can exploit to position themselves in worldwide competition.

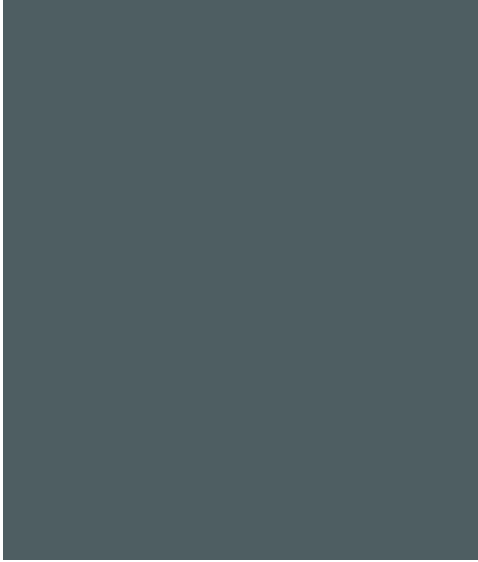
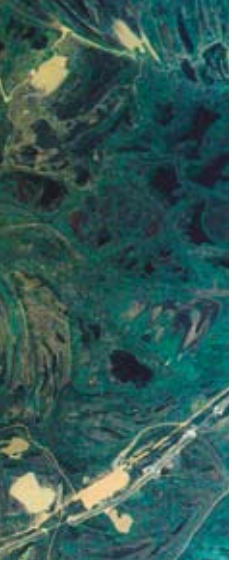
Risk management requires a good knowledge of the possible consequences of catastrophic events. In cooperation with the Office of Technology Assessment at the German Bundestag, Fraunhofer ISI examines the consequences of widespread electrical outages on critical infrastructures such as water supply, information technologies, financial services or health care. In an increasingly networked society, events like these can cause indirect effects on industry and society which must be identified and understood in order to take effective precautions. Risk management does not only target the acute consequences of events. Mitigating climate change can also be regarded in the long term from a security-policy perspective. If energy consumption is falling, the security of the energy supply increases. The efficient use of energy contributes in the long term to risk management for society.

Economic aspects of security

Security aspects also play an increasingly important role in industry. Economically, development has been regarded for a long time from the perspective of job security. Outsourcing jobs is always connected with risks. Among other things, Fraunhofer ISI found that the trend for off-shoring production is slowing down and in the wake of the economic crisis has fallen to the lowest level for 15 years; several companies have even transferred parts of their production back to Germany. The reasons were primarily loss of flexibility and quality problems.

Job security today depends on the security of products. In the globalized economy, product piracy, that is the copying of products and services, has become a problem which can threaten the very existence of companies. Two thirds of firms in the capital goods sector are already affected. The product pirates have their sights not only on products, but also components and spare parts as well as non-material objects like services, processes, rights, know-how and business models. Product piracy can only be effectively combated if aspects of IPR protection are considered not only during the development and manufacturing stages, but also in later phases of the product

Climate change entails numerous risks and threats to different types of infrastructure systems and their associated value added networks.



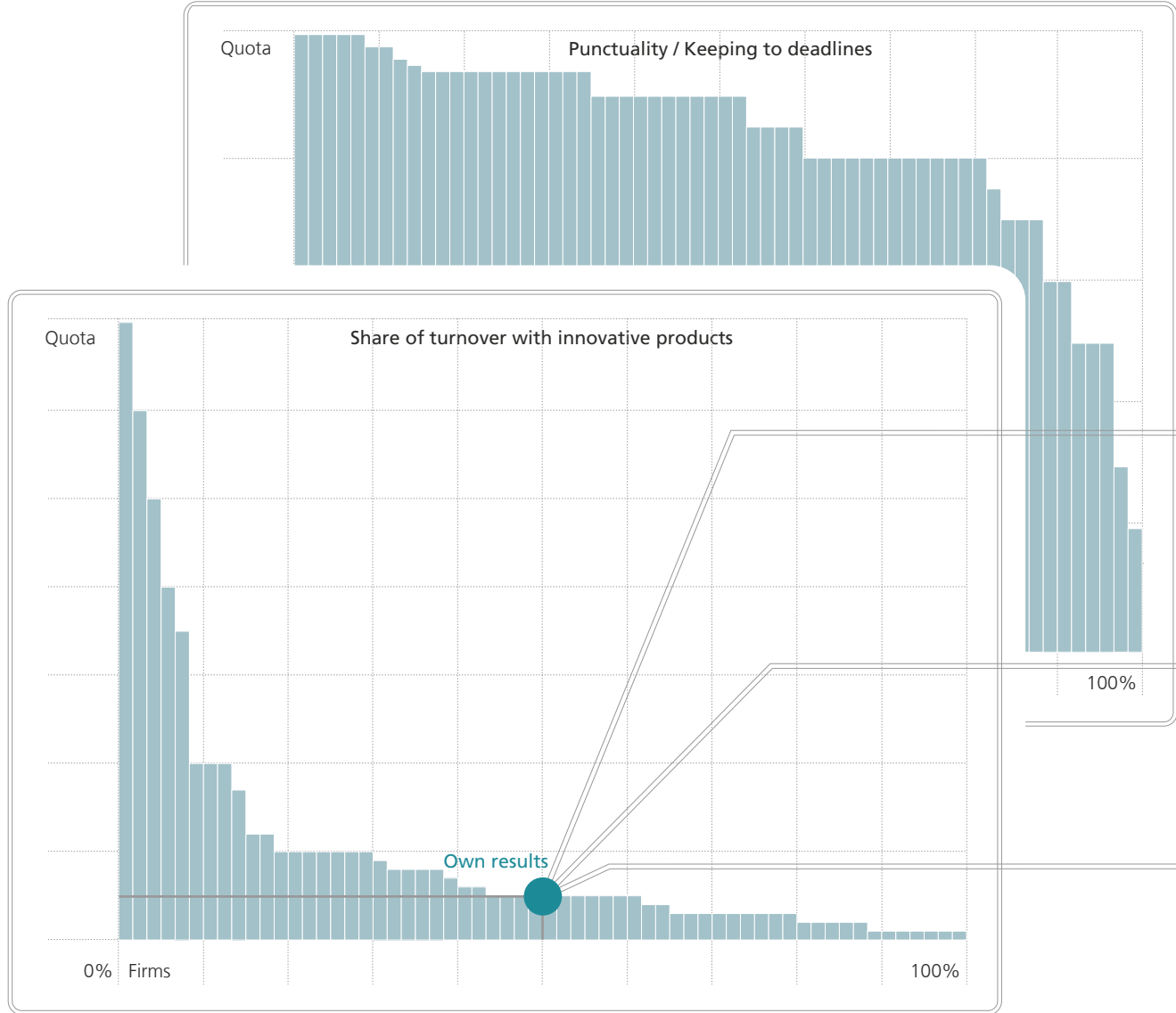
life cycle. Together with its partners, Fraunhofer ISI examines how threats can be recognized in the product portfolio and countermeasures taken. Security measures in the products themselves offer improved protection, and also related service processes, plus steps to improve traceability. Examples of technical measures are innovative procedures to label and recognize products or the integration of self-destructive elements at the product level.

Fraunhofer ISI: Security as a research perspective

The recognition of risks plus ensuring security are of key significance to society. A closer look shows that security issues permeate all societal, political and economic areas. Due to its systemic perspective, Fraunhofer ISI is in a good position to analyze the interdependencies between political, economic and technical aspects and to develop appropriate strategies.

Protection against product piracy has to be integrated into every stage of the product life cycle.

BENCHMARKING: TAPPING POTENTIALS



With its online benchmarking system, Fraunhofer ISI offers its customers an individual analysis, enabling them to directly compare themselves with competitors and pinpoint development potentials. Our benchmarking compares the performance figures of one's own company with those of specific firms. It shows where the enterprise is ranked and which untapped potentials still exist. The Fraunhofer ISI's online tool at www.modernisierung-der-produktion.de enables companies to conduct a benchmarking exercise of great informative value, for a small outlay. Company-specific data which were collected from 1 450 firms in the survey "Modernization of Production" in 2009 provide the basis for the benchmarking exercise.

www.modernisierung-der-produktion.de

Benchmarking – Who can I compare myself with?

The exclusive, innovative, value added online benchmarking process offers the possibility of consolidating individual, tailor-made groups according to the specific criteria of the firm concerned (company or batch size, types of production and complexity categories of the products manufactured). Thus an anonymous peer group in a comparable situation emerges, ensuring a sound comparison.

Facts and figures – Where do I stand ?

Once the peer group is created, their performance figures are immediately displayed, not only as average values, but also their distribution. After entering their own data, the companies at once receive a detailed assessment, which depicts their competitiveness in relation to the comparison group.

Detailed assessment – What results do I get?

The assessments which are prepared as convenient pdf documents permit a variety of uses. The graphics from the pdf file can be used to illustrate the competitiveness of a company in a transparent and meaningful manner. Thus firms have sound facts and figures available for audits and convincing arguments for talks with clients, investors and banks.

A NEW DOCTORAL MODEL LEADS TO SUCCESS

With the new doctoral program started in 2008, Fraunhofer ISI has improved the framework conditions for young scientists and, at the same time, expresses its appreciation of the important theoretical and methodological contribution of dissertations to the work of the Institute. Prof. Marion A. Weissenberger-Eibl gave the impetus for the newly designed program shortly after her appointment as Director of the Institute. Her goal was to make Fraunhofer ISI more attractive for PhD students/post-graduates than companies, universities and other research institutions.

The model was developed by all 20 post-grad students employed at Fraunhofer ISI at the turn of the year 2007/2008, in collaboration with the directors of the Institute. Measures were jointly developed and tested for feasibility in workshops. Since April 2008, all PhD contracts are based on the new model: in the first year, the doctoral candidates have a full-time contract and contribute to project work. In this phase, the topic of the doctoral thesis is decided, together with Fraunhofer ISI. In the second to fourth year the candidates have a 75 percent job contract. Thus sufficient time remains to write the thesis besides working on projects at the Institute.

What is significant in the Fraunhofer ISI model is not only the aspect of monetary compensation, but the comprehensive "total package" of good working conditions. For instance, the PhD students organize a colloquium twice a year, in which they present their work and discuss issues with the other scientists from Fraunhofer ISI. In addition, a scientist from Fraunhofer ISI with a doctoral degree acts as a mentor for each PhD candidate. New, too, is the PhD speaker, who represents the interests of fellow doctoral candidates.

Already after running for only two years the doctoral model appears to be very attractive to post-graduates. The number of candidates as well as of completed theses is continually rising and the model is a clear success for Fraunhofer ISI.

In 2009, Daniel Jeffrey Koch, among others, presented his doctoral thesis entitled “Internationalization of Technological Service Innovations in the Capital Goods Industry”.

What were your experiences with the doctoral program at Fraunhofer ISI?

Koch: As a former doctoral student I naturally welcome Fraunhofer ISI’s decision in favor of a standard arrangement. The pre-determined framework conditions greatly facilitated orientation at the beginning. It shows you perspectives, where the dissertation can lead to, how you can proceed, but at the same time also forces you to finish the thesis within the specified time of four years.

Many find the lively exchange between PhD candidates, mentors and other scientists very fruitful. Did it also help you when writing your thesis?

Koch: The general exchange of experiences and the discussions among the candidates, but also with the mentors, are an excellent idea. During the colloquia you can present the latest stage of your dissertation. The feedback, tips and suggestions naturally help in further processing the topic. I also find it good that the PhD speaker can directly approach the Institute’s directors on behalf of all the PhD candidates. In this way they can experience at first hand what concerns the doctoral candidates at the moment and can act accordingly.

In your thesis you write about technological service innovations and the resulting potentials. What is the value added of your work for the economy?

Koch: My work is principally concerned with the connection of new technological innovations, the associated services and how new successes and new turnovers can be generated from them. In the course of my thesis, I dealt very intensively with the early phases in the innovation process. Many firms do not know

where new ideas come from. In my thesis I explain how open, unconscious or latent needs can be detected early on and utilized, by identifying potentials and deficits in relation to the utilization of the capital good or in the process in which the capital good is integrated. The human capital of co-workers plays a decisive role in this context. I hope that my work contributes not only a scientific explanation, but can also offer practical suggestions.

Do your findings open up new research fields for Fraunhofer ISI?

Koch: We as a systemic research Institute are already very successful in the area of investigating new potentials in the early phases of innovation processes. The demand from industry and business is very high, according to scientific surveys. This applies not only to developing entirely new service offers, but above all to understanding the systematic generation of ideas. In this respect, my results support the already successful work in progress, which is the objective of any scientific work.

Now that you have completed your own doctorate, will you become a consultant for the new candidates in the program?

Koch: Yes, why not? I find it exciting to examine new topics in depth, to exchange and share my knowledge with others. But of course also learning something new. It is important to promote the method of exchange which is so characteristic of the Institute and thereby support aspiring PhD candidates.

Dr. Daniel Jeffrey Koch is the Coordinator of the Business Unit Management of Innovations and Technologies in the Competence Center Innovation and Technology Management and Foresight at Fraunhofer ISI.

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OUR INSTITUTE, OUR DAILY WORK AND OUR RESEARCH ARE
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WE NEED AN INTERDISCIPLINARY TEAM OF SCIENTISTS TO
ENSURE THAT THE DIFFERENT PERSPECTIVES ON OUR RESEARCH
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INTERDISCIPLINARY TEAM OF SCIENTISTS



Competence Center Industrial and Service Innovations



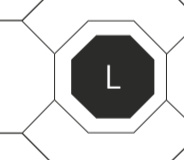
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Team of the Director



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A BROAD RANGE OF ADVANCED SCIENTIFIC THEORIES, MODELS AND METHODS



Competence Center Regulation and Innovation

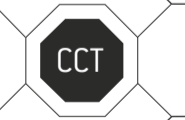


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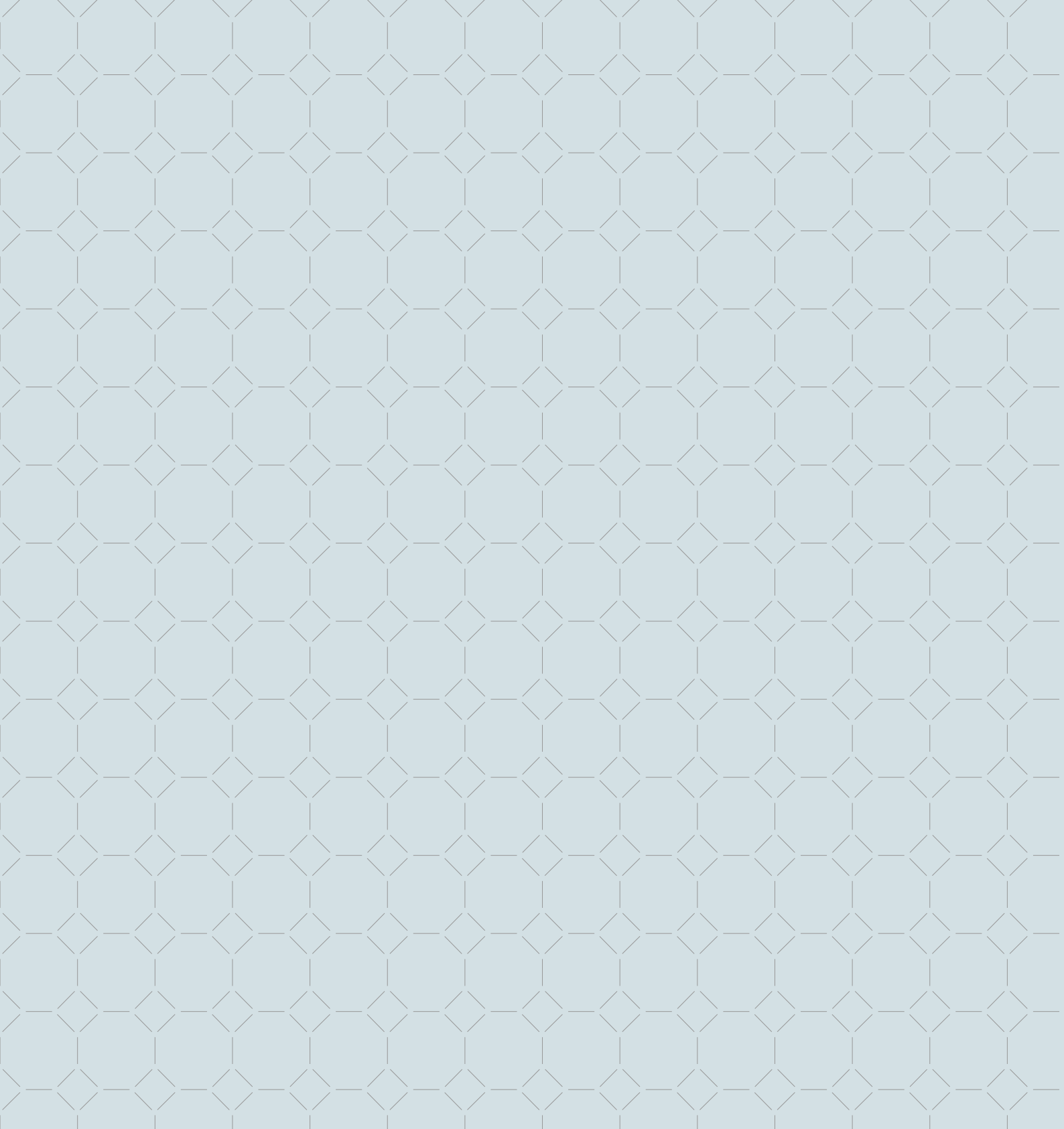
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A SYNERGY OF TECHNICAL, ECONOMIC AND SOCIAL-SCIENCE KNOWLEDGE

Competence Center Service and Internal Management

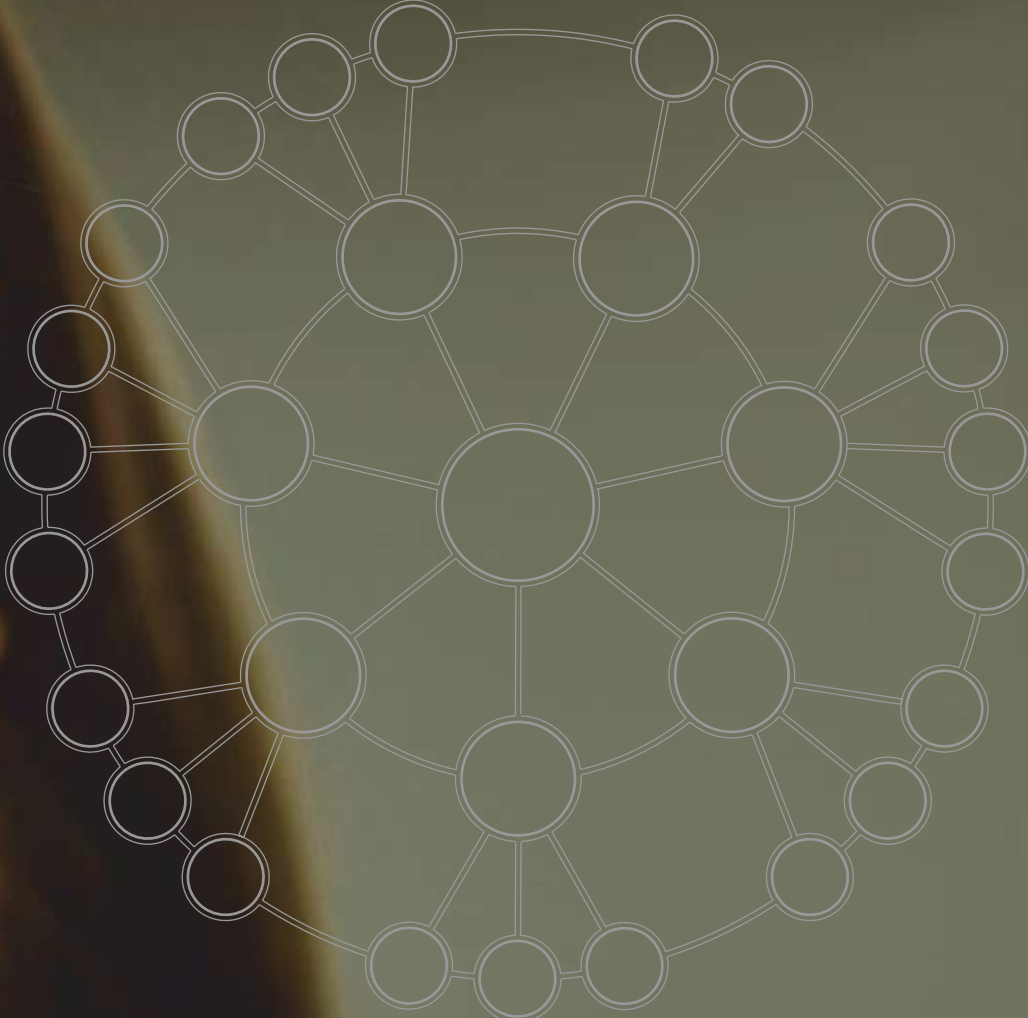


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COMPETENCE CENTERS

“WHEN I GROW UP, I WOULD LIKE TO
DISCOVER NEW THINGS WITH OTHER
RESEARCHERS AND HELP EVERYONE.”



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SUSTAINABLE ENERGY USE IN EVERY FIELD

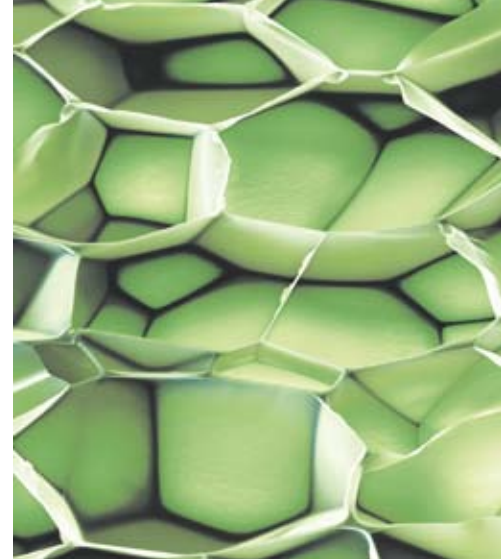
CC ENERGY POLICY AND ENERGY SYSTEMS

High energy prices, supply security and the finite nature of resources make efficient energy use, the use of renewable energy sources and an environmentally-friendly energy supply unavoidable. The Competence Center Energy Policy and Energy Systems conducts research into how a sustainable energy system can be achieved. It examines development pathways for future technologies, makes forecasts of energy demand and emissions, determines the potentials of CO₂ reduction measures and analyzes markets for energy sources, energy technologies and energy services. The scientists develop and evaluate measures and instruments for the diffusion of sustainable technologies and examine their impacts on employment, income, economic structure and the environment. In this way, they support policy-makers and companies in implementing measures which contribute to the diffusion of energy-efficient and renewable technologies and advise them when setting priorities for research and development. This helps to improve their competitive position in the energy sector.

Energy and climate policy are increasingly intermeshing with other policy fields. The Business Unit Energy and Climate Policy develops and evaluates instruments and measures which can help to realize climate protection targets in the post-Kyoto era. In the project "Climate Policy Regime 2012", our scientists are supporting the German federal government in developing and analyzing proposals to shape future climate policy. They are actively involved in working on an agreement for the period after 2012; for example, by developing the computer-based analysis tool ClimStrat, which is able to quickly evaluate alternative suggestions in the negotiation process, as a member of the German delegation at the Climate Summit in Copenhagen in December 2009, and through their work in an EU expert group supporting the chief European negotiator in international climate negotiations.

Renewable energies are making an important contribution to climate protection, supply security and competitiveness. The Business Unit Renewable Energies covers the costs, benefits and potentials

Research results on energy-efficient technologies together with CO₂ emission forecasts form the basis for a sustainable national and international climate policy.



of these energy sources, develops and evaluates policy instruments for their effective and efficient promotion, and supports decision-makers in setting priorities for research and development. For example, the study "Growth and Employment Effects of Renewable Energies in Europe" has become the main reference for the Parliament and Commission of the European Union and for national governments and the international field. Among other things, the Fraunhofer ISI discovered that the target of a 20 percent share of renewable energy in final energy consumption in 2020 is feasible and can result in 2.8 million jobs across Europe.

The Business Unit Energy Economics develops scenarios and models of future energy demand in Germany and Europe. In addition, market analyses are conducted for innovative energy supply and demand technologies and services. Research focuses on new energy carriers such as hydrogen and electricity for sustainable mobility, which is currently a hot topic of public debate. Its project "Energy technologies 2050 – Main issues for research and development" is helping to set priorities for future government funding of non-nuclear energy research.

The Business Unit Energy Efficiency analyzes technologies and measures to increase energy efficiency and works out strategies for companies and political decision-makers. It assesses new technologies and identifies indicators of efficient energy use. On a political level, researchers support and monitor the implementation of relevant EU directives to improve energy efficiency as well as important national activities such as the German government's Integrated Energy and Climate Programme and its Climate Initiative.

One highlight is the "30 Pilot Networks" project, which is being coordinated by this Business Unit. Based on the knowledge that many companies are only partially realizing their efficiency potential because of high decision costs and uncertain information, support is being offered to groups of ten to fifteen companies which cooperate in local efficiency networks. These get together to exchange their experiences and widen their knowledge in the process. In addition they receive expert advice for three to four years. This is how the project, which is being sponsored by the German Federal Ministry for the Environment, is helping to double energy efficiency – when compared with the industrial average – as well as reduce energy costs and CO₂ emissions.

Head Dr. Harald Bradke, Phone +49 721 6809-153, harald.bradke@isi.fraunhofer.de

The analysis of new technologies and indicators of efficient energy use is an essential requirement for improving energy efficiency in every field.



IMPACTS OF THE ECONOMIC CRISIS CAN BE CUSHIONED

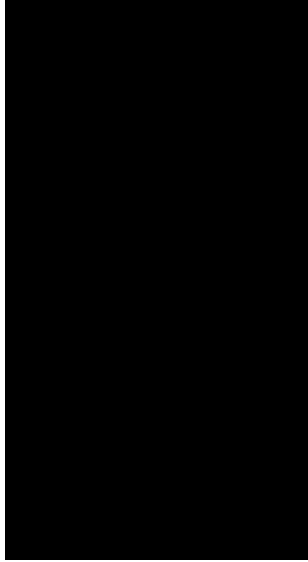
CC INDUSTRIAL AND SERVICE INNOVATIONS

Innovations are necessary to safeguard Germany and Europe as manufacturing locations. The Competence Center Industrial and Service Innovations identifies and evaluates process, product, service and organizational innovations as well as innovative, service-based business models which have the potential to safeguard value added in high-wage locations. On this basis, scientists then develop strategies with high future potential for companies, associations and policy-makers. The European Manufacturing Survey plays a key role here. This survey has been analyzing innovation patterns and trends in the manufacturing industry for 15 years and thus offers the possibility to examine different aspects of the economic crisis.

Having to compete internationally demands modern technologies and concepts of companies. These are evaluated in the Business Unit Technical and Organizational Process Innovations. Process innovations play an important role in maintaining and expanding competitiveness, especially in companies which are not intensively involved in research and development (R&D). They contribute to quickly and flexibly providing customers with high quality products and services and thus help companies to remain competitive, even in times of increased price competition. In addition to this, cooperating in innovation is a good way to compensate for non-existent R&D resources. The scientists discovered that non-research-intensive companies which cooperate with other companies or research organizations in R&D create product innovations more often. So far, however, this potential is not being tapped by every company.

One reaction to economically difficult times is often to relocate production capacities to low-wage countries. In the current crisis, however, a different picture is emerging: in a study for the Association of German Engineers, the Business Unit Sustainable Production Systems and Location Management, which researches relocations and backshoring as well as out- and insourcing, found that production relocations are now at their lowest level for 15 years. Only nine percent of manufacturing enterprises

The analysis of trends and innovation patterns as well as the development of service-based business models make companies fit for international competition.



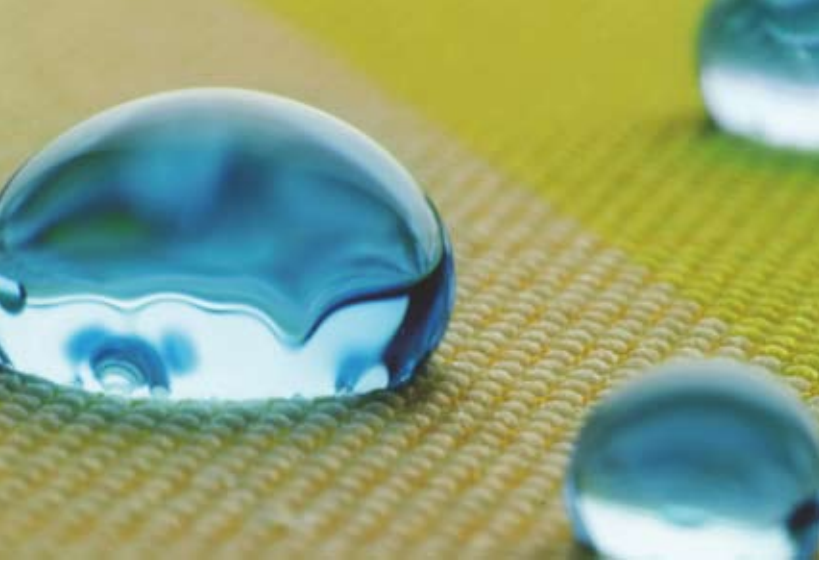
relocated parts of their production abroad between 2007 and 2009. The level of backshoring companies has remained stable at three percent for many years. Alongside losses of quality and flexibility, another reason for returning is the wage dynamics in classical target countries, which makes the new EU Member States in particular less attractive for relocation purposes. Another study revealed that manufacturing companies with a high level of vertical integration show high productivity. According to this, productivity tends to be increased by strategic insourcing and a cautious approach to outsourcing; any outsourcing considerations should be subjected to critical review.

*Conservative outsourcing
of capacities together
with strategic insourcing
can improve productivity.*

Service-based business models are analyzed and designed in the Business Unit Industrial Services. These integrate products and services and offer customers complete (hybrid) solutions to efficiently support their value added processes – instead of merely handing over products. These business models vary depending on the sector involved; in the project NEXT, for example, concepts were developed for the machine tool industry. In order to make it simpler for companies from this sector to construct their own individual business models, aids were designed ranging from strategic planning through simulation of use up to economic evaluation.

Service-based business models not only offer industry new opportunities for profit making, but can also make life more difficult for product pirates. The joint project "PiratPro" showed how such business models can help to construct an effective shield against product piracy. Offering customers problem solutions instead of simply selling them capital goods lowers the risk of plagiarism because third party access to the actual product technology is restricted. A comprehensive protection concept was developed in the project, which covers value added processes as well as protecting product technology. An accurate analysis of the danger of piracy plays a large role here. Only then is it possible to identify the threat of product piracy even before the imitations are produced. It is important to know which types of piracy are relevant for the company, which products are threatened and where the vulnerable points for attack are located in the value added process. A software tool was developed to support the pragmatic analysis of both acute and long-term risks.

Head Dr. Steffen Kinkel, Phone +49 721 6809-311, steffen.kinkel@isi.fraunhofer.de



RECOGNIZE CHANGES EARLY AND (RE-)ACT ACCORDINGLY

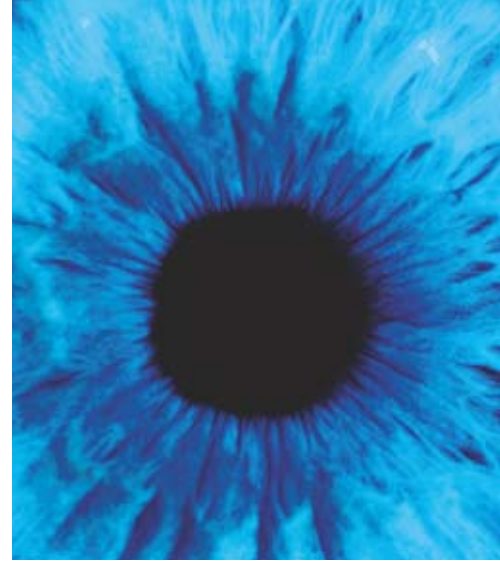
CC INNOVATION AND TECHNOLOGY MANAGEMENT AND FORESIGHT

Life is change with ever new challenges which call for innovative approaches. The analysis of changes in society, the economy and state interacting with technological developments is the core competence of the Competence Center Innovation and Technology Management and Foresight. It develops visions and strategies for the future for political actors as well as decision-makers in companies, associations and NGOs. Foresight and futures research reveal options for technology applications and their utilization in various contexts. The Competence Center has a sophisticated set of methods which consists inter alia of scenarios, dialog processes, Delphi surveys and road-mapping processes.

The Business Unit Futures Research and Foresight investigates how to deal with the future and the options it offers. Enterprises, public organizations and political actors need information about technological or societal challenges as a basis for decision-making in order to develop suitable strategies. In the framework of foresight research, the scientists are advising the governments of Romania and Lithuania, for example, on the conduct of their foresight processes. The project “INFU” examines what innovative processes could look like in the future and what changes they are subject to.

As the innovation process is becoming increasingly more complex and short-lived, both foresighted thinking and technological expertise are crucial for the success of innovations. The Business Unit Management of Innovations and Technologies develops and applies the methods necessary for holistic innovation management. Scientists constructed a roadmap for the European Wind Tunnel Association, for instance, which assesses the technological developments of wind tunnels, identifies new application fields and thus opens up future opportunities for the operators of wind tunnel plants.

The use of advanced methods allows pictures of the future to emerge which reveal new options to policy- and decision-makers based on innovative developments.



Materials are the basis for many new technologies. Using foresight methods, the Business Unit Strategies for Material Technologies develops strategies for new possible applications and innovative material developments. With the project "Risk2Return" the researchers embedded the debate about high-risk, high-return research in the Fraunhofer institutes. A methodology is being developed in the project which helps the institutes of the Fraunhofer Materials and Components Group – MATERIALS to generate unconventional research perspectives and ideas beyond the mainstream and identify the hidden potentials of high-risk research projects. Bibliometric analyses of various materials constitute an important research basis, which served as the foundation for the cooperation with the Chair of Innovation and Technology Management at the University of Kassel and were included in the project "Strategy to increase the Efficiency and Future Orientation in the Field of Materials Science and Material Technology (MATWERK)" of the German Research Association (DFG).

In the project "Technological Foresight", the scientists, together with the Association of German Machine Tool Builders, investigate how to improve the competitiveness of companies with respect to possible future developments in the field of machine tool technology. The study examined the status quo and the trends in machine tool technology in Japan, one of the most important competitors for German companies. The results support the firms in recognizing crucial developments in a country whose innovation culture widely diverges from that of Western Europe, and in deriving guidelines for their own research and development strategy.

Since September 2007, Fraunhofer ISI has been in charge of the Foresight Process of the Federal German Ministry for Education and Research (BMBF), which aims to ensure the innovation capability of Germany as a research and education location. The goals of the project are to point out future priorities in research and technology, identify areas for activities cutting across research and innovation fields, investigate potentials for strategic partnerships and to arrive at eight key action areas for research and development. These "future fields" include the following research areas: deciphering ageing, time research, modeling and simulation, sustainable living spaces for the future, sustainable energy solutions, including the possibilities of harvesting ambient energy, human-technology cooperation, as well as new forms of production and consumption, which meet the tougher challenges of the future.

Head Prof. Marion A. Weissenberger-Eibl, Phone +49 721 6809-201, weissenberger-eibl@isi.fraunhofer.de

Exploring future priorities in research and technology helps to secure the innovativeness of Germany as a center for research and education.



INNOVATIONS FOR SUSTAINABLE CHANGE

CC SUSTAINABILITY AND INFRASTRUCTURE SYSTEMS

The careful use of resources and the avoidance of emissions require innovations – at the level of technologies, policies and companies. Innovations for environmentally-friendly future markets provide business opportunities in industrialized, newly industrializing and developing countries; their successful implementation requires a comprehensive understanding of the necessary innovation processes. The research conducted by the Competence Center Sustainability and Infrastructure Systems widens the knowledge base for policy and corporate decisions. Its researchers study the ecological, economic, political and social aspects of sustainable developments and analyze possible solutions for sustainable resource use.

The infrastructure systems of water supply and wastewater disposal are facing new challenges due to climate change, demographic changes and ecological requirements. Technical, organizational, legal and political measures are necessary which help to make the systems more flexible and environmentally compatible. The Business Unit Water Management develops and assesses new water infrastructure systems and accompanies the implementation of innovative solutions. In the project “Priority Substances of the Water Framework Directive – European Regulation and National Programme of Measures”, the scientists are analyzing and evaluating emission reduction measures. The objective is to achieve a good ecological and chemical state of surface waters by 2015.

Technologies which protect the environment and improve resource efficiency are frequently integrated into processes, products and systems and are thus having an increasing impact on policy and economic sectors. The Business Unit Sustainability Innovation and Policy examines the diffusion and competitiveness as well as the consequences of sustainable future technologies in order to develop policy instruments for the sustainable and efficient utilization of raw materials. For example, technical innovations are needed to meet the goal of doubling German industry’s resource productivity by 2020 compared to 1994 which is part of the government’s national

Transport scenarios deliver recommendations for a transport and climate policy which conserves resources.



sustainability strategy. In the funding priority “Innovative Technologies for Resource Efficiency – Resource-Intensive Production Processes” of the German Federal Ministry of Education and Research (BMBF), Fraunhofer ISI is responsible for conducting the accompanying research in the integration and transfer project. One of Fraunhofer ISI’s tasks is to advise the BMBF on the further development of the funding program with the aim of strengthening the competitiveness and innovativeness of resource-intensive industrial sectors.

The increasing interactions between social, technical and ecological systems harbor risks. The research studies of the Business Unit Systemic Risks show possible ways to change the structural characteristics of these systems so that they are less vulnerable to natural disasters, crises or supply shortages – for example by promoting innovations for substituting raw materials. In addition, the consequences of a large-scale breakdown of infrastructure systems were examined in the project “Hazards and vulnerability in modern societies” for the Office of Technology Assessment at the German Parliament (TAB) and the interactions with industry and society were analyzed.

In the Business Unit Transportation Systems, national and European concepts and instruments are developed which guarantee the performance of the transportation systems indispensable to industry and society and, at the same time, limit the risks posed by the high volumes of transport to the climate and the environment. The studies offer strategic guidance to transport sector companies related to the new challenges of climate policy and the opportunities linked with electric propulsion and new mobility concepts.

This year’s highlight of the Competence Center Sustainability and Infrastructure Systems was the “Integrated Transport and Energy Baseline in Europe up to 2030” (iTREN-2030). This project, which involved six European partners and was coordinated by Fraunhofer ISI, sets a baseline for future European transport policy. The objective was to come up with an integrated system of models which can be used to illustrate and evaluate different European energy and transport scenarios. For the first time ever, the impacts of the global economic crisis on future traffic flows were quantified. According to the study, the crisis will only have a minor impact on passenger transport, while it will cause much lower growth in freight transport and thus support an overall declining energy demand in transport driven by more efficient cars and lighter trucks as well as alternative propulsion systems. The study offers sound policy advice for the European transport, energy and economic systems up to 2030, including recommendations for transport and climate policy as well as energy supply security.

New ways to change system structures have to be found to allow better and faster reaction options to natural disasters, crises or supply shortages.

Head Dr. Rainer Walz, Phone +49 721 6809-236, rainer.walz@isi.fraunhofer.de



HELPING TO SHAPE CHANGE USING INNOVATIVE TECHNOLOGIES

CC EMERGING TECHNOLOGIES

Innovative technologies emerge and diffuse in many different ways and influence each other. The Competence Center Emerging Technologies studies trends in science and technology and analyzes which conditions promote or hinder the application of innovative technologies, how they can be used, and what economic, ecological and social impacts they have. The researchers recommend how framework conditions have to be changed to promote innovations. To do so, they analyze and evaluate political and economic options as well as innovation policy measures.

Biotechnology is being increasingly used in medicine, agriculture, food production, industrial production and energy conversion as well as in environmental protection. The Business Unit Biotechnology and Life Sciences shows policy-makers possibilities to influence these fields. For example, scientists analyzed the biotechnology funding program of the Deutsche Bundesstiftung Umwelt (DBU) and made recommendations for their future research funding. In the EU project “Towards a European Strategy for Synthetic Biology” (TESSY), Fraunhofer ISI became one of the first research institutes to tackle the new topic of synthetic biology and showed how this can be developed in Europe, focusing, for example, on the importance of common standards. It was also shown that clarifying and implementing the patent laws for using publicly accessible information is an essential prerequisite to the further development and application of synthetic biology.

The consequences of demographic change can be managed by new impulses for the necessary changes in the health sector.

The health system needs innovations – to manage the consequences of demographic changes among other things. The Business Unit Innovations in the Health System integrates different interest groups when compiling concrete options for bringing about the necessary changes. For instance, the three-part series of conferences “MetaForum Innovation in the Health System” concluded with ideas on how to transform the health system. The experts’ advice, for example, includes implementing health as a guiding theme across all the policy fields, developing joint educational programs for health-care professions and introducing health education as a subject in its own right,



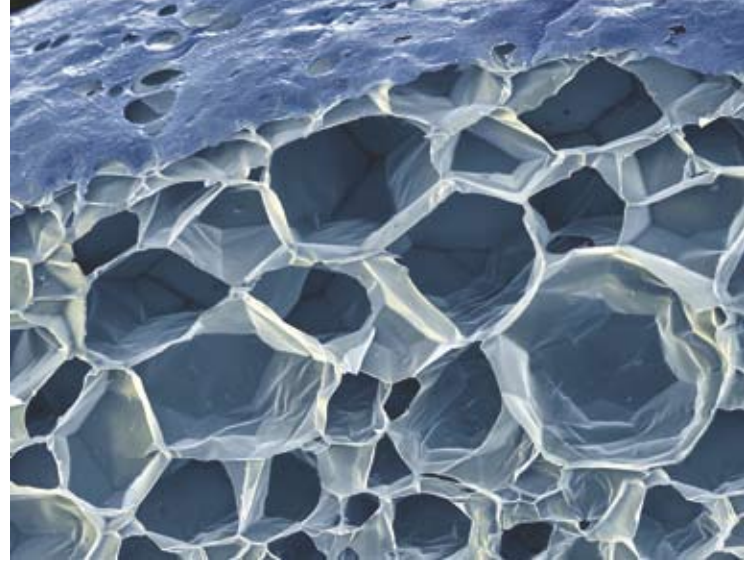
as well as allowing people more freedom of choice in health insurance premiums and services. In the Inno-HTA project (Health Technology Assessment), indicators were developed which allow an early and simple evaluation of new health technologies.

Information and communication technologies dominate our daily lives, both privately and professionally, and can deliver competitive advantages. The Business Unit Information and Communication Technologies researches IT-based technologies and new media with the objective of putting forward proposals for changing political, economic and legal conditions. Young people who have grown up with the internet get to have their say in the project "Hub Websites for Youth Participation" (HUWY): they exchange their experiences in their own online communities; their ideas about political participation in the internet are then passed on to the relevant decision-makers. The report "Ubiquitous Computing", which was compiled in cooperation with the Office of Technology Assessment at the German Bundestag, is also concerned with the ubiquity of the internet. Ubiquitous computing still requires a lot of development effort before it is ready for widespread application. For instance, frequency standardization and secure systems with functioning error monitoring have to be created. In addition, the researchers have examined the basic right to privacy of personal data. It is important to adapt data protection to the new possibilities, for example by creating an Employee Data Protection Act.

One highlight this year was the successful launch of the international project "NANORUCER". Here, scientists are examining the "Innovation System Nanotechnology" in Russia on behalf of the European Commission. This research paves the way for intensive scientific cooperation between Russia and the EU in specific sub-sectors of nanotechnology which are relevant to the future of both regions. Together with the Institute for the Study of Science of the Russian Academy of Sciences in Moscow, the main research groups and topics of nano research in Russia are identified. A systematic comparison with the research activities in the European Union makes it possible to determine topics for cooperation and put forward concrete suggestions for joint research projects.

Head Dr. Thomas Reiß, Phone +49 721 6809-160, thomas.reiss@isi.fraunhofer.de

Altering the framework conditions to promote innovations requires the analysis and evaluation of policy and economic options.



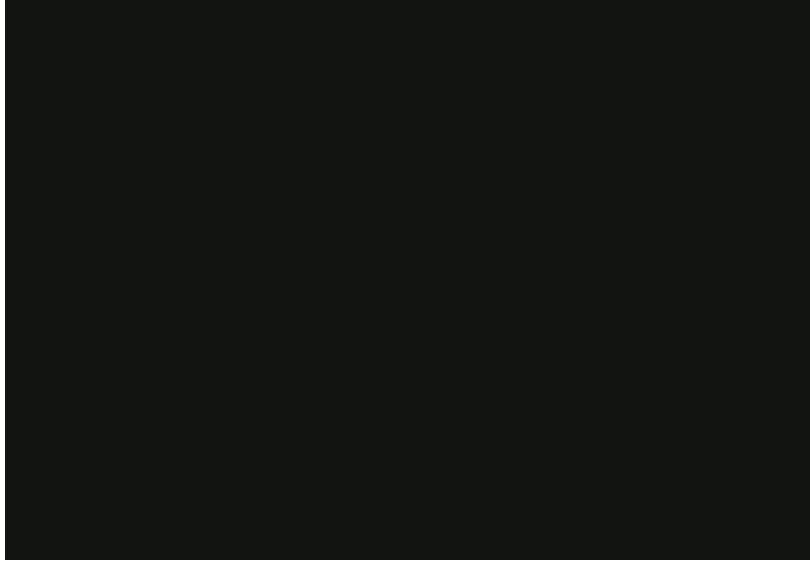
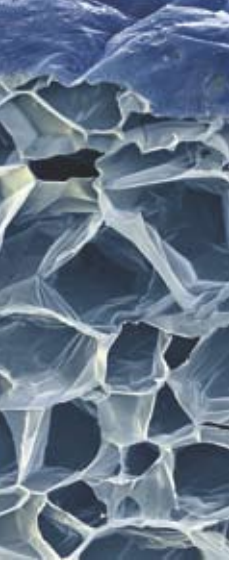
SHAPING RESEARCH AND INNOVATION SYSTEMS

CC POLICY AND REGIONS

Shaping political decision-making processes more systematically and providing rational reasons for decisions are the main tasks of policy consulting. The Competence Center Policy and Regions examines the functions and the changes in research and innovation systems at the supranational, national and regional levels. In this Competence Center, the various players, instruments and strategies in industry, science and government which produce knowledge and technological innovations are analyzed. The scientists in the Competence Center examine and develop existing and new promotional instruments and programs which provide the theoretical and methodological approaches to generate strategic knowledge. The qualitative and quantitative analytical methods applied in the Competence Center include surveys, document analyses, evaluations, discursive processes and peer group analyses as well as analyses of patents and publications.

The main research focus in the Business Unit Policy and Evaluation is to analyze, evaluate and develop strategies and policy measures. The researchers advise German and foreign ministries, the European Commission and domestic and foreign funding organizations. On behalf of the Federal German Ministry for Education and Research (BMBF), for instance, the factors conducive to effectively exploiting the potential of women in research and development in companies as well as in public research institutions were investigated. Starting point of the study was to identify women of above average creativity and innovativeness by means of patent and publication searches. Recently, a pan-European collection of data and information on evaluation practices was published, which was generated by a European consortium led by the Manchester Institute of Innovation Research. In addition, Fraunhofer ISI was in charge of the evaluation "Zentrales Innovationsprogramm Mittelstand, ZIM" (Central Innovation Program SMEs) of the Federal German Ministry of Economics and Technology (BMWi), which is an essential element for promoting enterprises in the Economic Stimulus Package II to tackle the economic crisis.

The scientific research and development of support instruments and programs reveals strategies for industry, science and government.

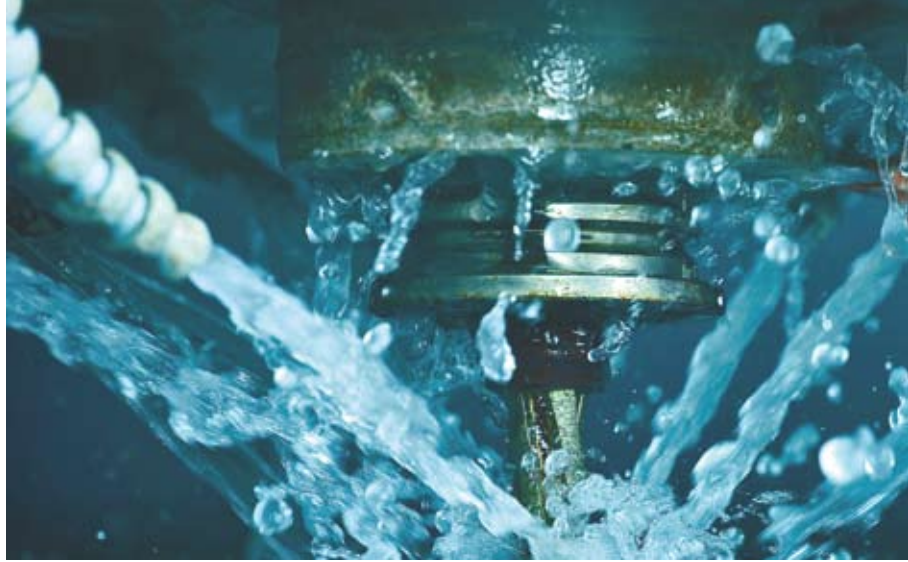


The Business Unit Regions and Clusters analyzes the structure and dynamics of regional innovation systems and technology clusters and provides scientifically sound analyses to measure, record and assess regional technology and innovation systems, for instance, the Strategy Report 2009 for Germany on EU Structural Policy, which was conducted for the BMWi. Objective of the study is to systematically record and evaluate the implementation of cohesion policy in Germany, in particular the strategic cohesion guidelines of the Lisbon Strategy and the Integrated Guidelines for Growth and Employment. The Strategy Report 2009 comprises an evaluation of the goals of the German national strategic framework plan and of the 36 German Operational Programs of the ERDF and ESF. Besides the presentation and analysis of Germany's socio-economic situation, the report concentrates on the development tendencies, successes, challenges and perspectives with regard to implementing national and regional strategies. The report underlines that the character of European structural funding, based on long-term oriented structural problems, must remain, especially in connection with addressing the real economic impacts of the financial crisis, and that a re-orientation of promotional strategies towards business cycles is inappropriate.

In the Business Unit Innovation Indicators, quantitative economic and social-science methods and indicators are developed and applied, in order to describe and analyze innovation systems, as well as assess their competitiveness. They allow innovation potentials, technological performance and possible future technological developments to be estimated. The Baden-Württemberg Foundation (a foundation of the federal state) utilizes the expertise of Fraunhofer ISI together with Elsevier B.V. Amsterdam to reflect the strategic direction of scientific and industrial research in Baden-Württemberg. The study depicts the current situation of science and research in this federal state in a national and international comparison. On this basis, research trends can be identified, as well as support to decision-making derived for future priority-setting in research and innovation funding by the Baden-Württemberg Foundation. Fraunhofer ISI's methodological focus in this project lies on patent analysis and in examining general and micro data, while their partner Elsevier B.V. investigates the science system by means of statistical analyses of scientific publications.

Specific indicators can help to identify the innovation potentials of technological performance as well as possible future technology developments.

Head Prof. Knut Koschatzky, Phone +49 721 6809-184, knut.koschatzky@isi.fraunhofer.de



REGULATION CAN HELP TO PROMOTE INNOVATIONS

CC REGULATION AND INNOVATION

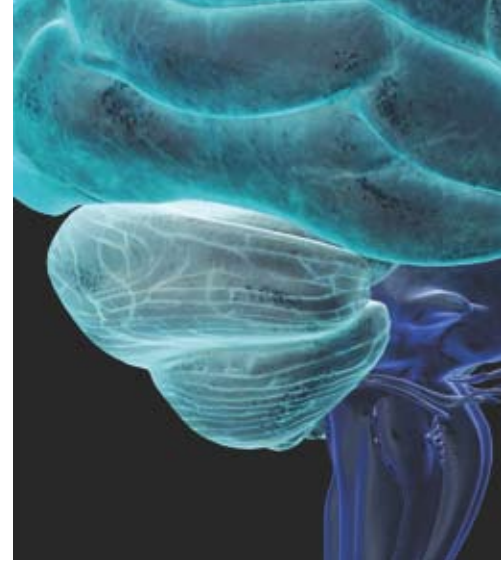
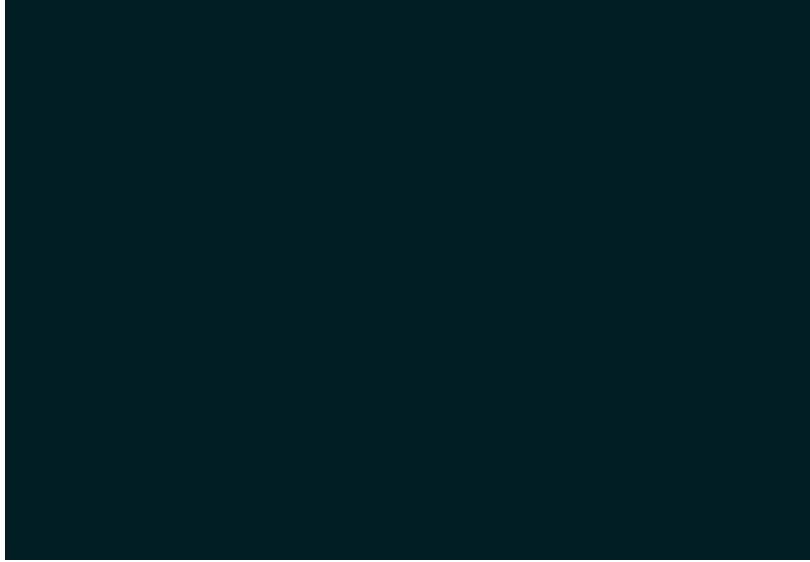
Innovations also require regulations: the Competence Center Regulation and Innovation examines this link as well as the possible influences of regulatory framework conditions on innovations, and analyzes a broad range of innovation-economic questions. Regulations of all types are included in our research. Thus, in addition to supply-side regulations – for example of research and development activities – demand-side regulations such as public procurement guidelines are increasingly becoming the focus of studies. In this context, the framework conditions favoring the emergence of new markets are explored: lead markets in particular require optimal coordination between regulations for supply and demand.

A main focus of our work is standardization research as a sub-area of technology regulation shaped by the actors. Among others, new standardization subjects should be identified and the impacts of standards investigated. Besides traditional technologies, the relatively new field of the standardization of services is analyzed.

A further major research topic is the economic analysis of intellectual property rights (IPR) and other protection strategies. In this context, patents and trademarks are utilized as indicators to characterize innovation systems, in order to facilitate further economic analyses. In addition, the scientists investigate theoretically and empirically the economic implications of the intellectual property rights regime.

The highlight of the year for the Competence Center Regulation and Innovation was the project “The Economic Significance of Intellectual Property and its Protection with a Focus on SMEs” (Die volkswirtschaftliche Bedeutung geistigen Eigentums und dessen Schutzes mit Fokus auf den Mittelstand). This study, which was carried out on behalf of the Federal German Ministry of Economics and Technology in cooperation with the Chair of Innovation Economics at the Berlin

Action plans to protect intellectual property rights are economically very important for small and medium-sized enterprises.



University of Technology, as well as KMU Forschung Austria, is based on a broad methodological approach, including a company survey among circa 300 large firms and small and medium-sized enterprises. The scientists were able to prove empirically that the majority of the companies surveyed considered immaterial values such as intellectual property rights, as well as human resources, structural and relational capital to be significantly more important for the success of the company than material values, and they expect a strong relative growth in importance for the coming five years. According to the calculations of this study, the total expenditures for intellectual property in Germany amount to approximately 154 billion euros annually, which corresponds to around seven percent of German GDP.

In addition, we showed that German companies are still being greatly affected by product and brand/trademark piracy, that is, unauthorized imitations of legally protected know-how: more than two thirds of the surveyed firms stated that this had happened to their firm at least once, whereby large concerns are more frequently hit than small and medium-sized enterprises. About twelve percent of the firms questioned quoted turnover losses of more than ten percent as a result of damages from infringements of intellectual property rights. With regard to qualitative impacts at the management level, companies with more than 500 employees reported an increased tendency to utilize formal property rights such as patents as a reaction to the threat of product piracy, and large concerns signaled increased efforts in their enforcement of IPR. However, as smaller firms can often not afford to do this, a further widening of the gap in utilizing patents between enterprises of different sizes can be expected.

The study proposes a number of recommendations for economic policy measures, for instance, to broaden the thematic range of the promotional programs to cover protective mechanisms not included in the patent system as well as stronger integration of (IPR-)relevant content in the curricula of economic-technical courses of study.

To counteract product and brand piracy with specialized programs supporting mechanisms outside the patent system which protect intellectual property.

ANNEX



ACADEMIC TEACHING

ACADEMIC TEACHING

Elisabeth Baier

Seminar
Angewandte Wirtschaftsgeographie
Gastvorlesung
Multinationale Unternehmen in regionalen Innovationssystemen
Leibniz Universität Hannover

Knut Blind

Vorlesung und Übung
Innovationsökonomie I
Technische Universität Berlin

Vorlesung und Übung
Innovationspolitik
Technische Universität Berlin

Vorlesung und Übung
Normung – ein strategisches Instrument in Wirtschaft und Gesellschaft
Technische Universität Berlin

Vorlesung und Übung
Strategisches Management
Technische Universität Berlin

Harald Bradke

Energiewirtschaftliche Aspekte der Energietechnik
Fachbereich Elektrotechnik,
Universität Kassel

Kerstin Cuhls

Hauptseminar
Innovationen in Japan: Akteure, Themen, Politik
Ruprecht-Karls-Universität Heidelberg

Ralf Isenmann

Vorlesung und Seminar
Roadmapping, Innovation, Strategie und Struktur
Universität Kassel

Projektmodul
Technologie- und Innovationskommunikation mit Roadmaps
Universität Bremen

Eberhard Jochem

Economics of technology diffusion – applied to new energy technologies
ETH Zürich

Energy economics and policy
ETH Zürich

Energiewirtschaftliches Doktorierenden-Seminar
ETH Zürich

Energiewirtschaftliches Kolloquium
ETH Zürich

Material Efficiency
ETH Zürich

Steffen Kinkel

Vorlesung und Seminar
Offshoring and innovation
Universität Hohenheim

Daniel Jeffrey Koch

Vorlesung
Dezentrales Wissensmanagement
Universität Kassel

Knut Koschatzky

Seminar
Angewandte Wirtschaftsgeographie
Innovative Regionalentwicklung in Europa zwischen Kohäsion und Wettbewerbsfähigkeit
Leibniz Universität Hannover

Seminar
Angewandte Wirtschaftsgeographie
Neue ökonomische Geographie im globalen Kontext
Leibniz Universität Hannover

Seminar
Angewandte Wirtschaftsgeographie
Methoden und Themen der aktuellen Innovationsforschung
Leibniz Universität Hannover

Henning Kroll

Seminar
Angewandte Wirtschaftsgeographie
Gastvorlesung
Regionale Innovationsdynamik in Europa
Leibniz Universität Hannover

Christian Lerch

Übung
Innovation
Wirtschaftswissenschaftliche Fakultät, KIT Karlsruher Institut für Technologie

Übung
Innovationsökonomik
Wirtschaftswissenschaftliche Fakultät, KIT Karlsruher Institut für Technologie

Ralf Lindner

Lehrforschungsseminar
Sozialwissenschaftliches Wissen und praktische Anwendung

Think Tanks in der BRD und Nordamerika
Universität Augsburg

Emmanuel Muller

Doctoral school
Knowledge intensive business services
Université de Strasbourg

Mastervorlesung
Systèmes nationaux d'innovation
Université de Strasbourg

Katrin Ostertag

Socio-economic aspects of development planning
KIT Karlsruher Institut für Technologie

Mario Ragwitz

Europäische Energiepolitik im Bereich Erneuerbare Energien
Universität Freiburg

Visiting Professor
RES School, University of Iceland and University of Akureyri

Thomas Reiß

Vorlesung
Management neuer Technologien
KIT Karlsruher Institut für Technologie

Hans-Dieter Schat

Vorlesung und Übung
Statistik für Betriebswirte
AKAD, Frankfurt/Main

Joachim Schleich

Associate Adjunct Professor
Virginia Polytechnical Institute and State Blacksburg University

Internationale Klimapolitik und CO₂-Emissionshandel
Fernstudiengang Energiemanagement, Universität Koblenz/Landau

Plenspiel Emissionshandel
Fernstudiengang Energiemanagement, Universität Koblenz/Landau

Michael Schleinkofer

Seminar
Angewandte Wirtschaftsgeographie
Gastvorlesung
Gründungsaktivitäten in regionaler Perspektive
Leibniz Universität Hannover

Ulrich Schmoch

Vorlesung
Innovation
KIT Karlsruher Institut für Technologie

Vorlesung
Hochschulforschung und Industrieforschung
Deutsche Hochschule für Verwaltungswissenschaften Speyer

Torben Schubert

Vorlesung
Innovation
KIT Karlsruher Institut für Technologie

Thomas Stahlecker

Seminar
Angewandte Wirtschaftsgeographie
Gastvorlesung
Methoden und Themen der aktuellen Innovationsforschung – Innovationen im Dienstleistungssektor
Leibniz Universität Hannover

Horst Christian Vollmar

Seminarreihe
Zukunft der Medizin
Universität Witten/Herdecke

Rainer Walz

Innovationsökonomik
KIT Karlsruher Institut für Technologie

Umweltökonomik und Nachhaltigkeit
KIT Karlsruher Institut für Technologie

Umwelt- und Ressourcenpolitik
KIT Karlsruher Institut für Technologie

Marion A. Weissenberger-Eibl

Seminar
Fallstudien des Innovationsmanagement
Universität Kassel

Seminar
Innovationsmanagement – Erfolgsfaktor in Wissenschaft und Unternehmenspraxis
Universität Kassel

Vorlesung
Innovation: Prozesse, Technologien und Transfer
Universität Kassel

Vorlesung
Innovationsmanagement: Konzeption und Methoden
Universität Kassel

Vorlesung
Unternehmensnetzwerke im Spannungsfeld von Hierarchie und Markt
Universität Kassel

ACADEMIC TEACHING | DISSERTATIONS | PRESENTATIONS

Seminar
Unternehmensnetzwerke und
Innovation
Universität Kassel

Martin Wietschel
Seminarveranstaltungen
Themenfelder Energie und Umwelt
KIT Karlsruher Institut für
Technologie

Stoff- und Energiepolitik
KIT Karlsruher Institut für
Technologie

Technologischer Wandel in der
Energiewirtschaft
KIT Karlsruher Institut für
Technologie

Quantitative Modelle zum Abbilden
des technologischen Wandels am
Beispiel der Energieanwendung
ETH Zürich

Peter Zoche
Innovation – Beiträge der Soziologie
Institut für Soziologie der
Albert-Ludwigs-Universität Freiburg

Erving Goffmans Beitrag zur
Analyse der Interaktion in Gruppen
Institut für Soziologie der
Albert-Ludwigs-Universität Freiburg

DISSERTATIONS

Inmaculada Fernández Diego
Development of a location model
and contribution to operation
design of sustainable industrial areas
Ralf Isenmann
Universidad de Cantabria,
Santander, Spain

Thomas Hillenbrand
Analyse und Bewertung neuer
urbaner Wasserinfrastruktursysteme
Harald Hiessl, Hermann H. Hahn
KIT Karlsruher Institut für
Technologie

Daniel Jeffrey Koch
Internationalisierung technolo-
gischer Dienstleistungsinnovationen
in der Investitionsgüterindustrie
Marion A. Weissenberger-Eibl
Universität Kassel

Michael Krail
System-based analysis of income
distribution impacts on mobility
behaviour
Werner Rothengatter
KIT Karlsruher Institut für
Technologie

Patrick Spieth
Wissenstransfer unternehmens-
kulturinduzierter Akteure – Eine
multidimensionale Analyse der
Unternehmenskultur als Einflussfak-
tor für den erfolgreichen Transfer
von Wissen in Unternehmen
Marion A. Weissenberger-Eibl
Universität Kassel

Diana Zülsdorff
Szenario-Technik mit einem Future
Warehouse – Ein Beitrag zur
Zukunftssicherung von Unterneh-
mensgründungen
Ralf Isenmann
Universität Bremen

PRESENTATIONS

EXAMPLES

Marlene Arens
Energy efficient technologies –
potential and experiences
Workshop on Green Recovery –
energy efficiency as a way to improve
economy and reduce GHG emissions,
The Manufacturers Association of
Israel, Tel Aviv, Israel

**Marlene Arens and Wolfgang
Eichhammer**
Modelling Tools for the Design of
Renewables Promotion Schemes
Seminar Renewable Energy in
Zhejiang – opportunities for coop-
eration, Asia-Pacific-Weeks,
Berlin

Elisabeth Baier
El Sistema de Innovación Chile-
no: gobierno y avances recientes
Segundas Jornadas de Integración
Latinoamericana, Berlin

The contributions of major city
regions towards overall European
innovativeness
Stavanger Innovation Summit –
Transforming City Regions,
Stavanger, Norway

Sabine Biege
A knowledge base of technical
guidelines for machines configu-
ration in innovative business
environments
16th CIRP International Conference
on Life Cycle Engineering,
Cairo, Egypt

Design for product-service systems
– a literature review
QUIS 11 – Moving Forward with
Service Quality, Wolfsburg

Innovative service-based business
concepts for the machine tool
building industry
1st CIRP IPS2 Conference,
Cranfield, Great Britain

Knut Blind
European studies on the economic
impact of standards: approaches,
results and future challenges
WTO TBT Workshop on Standards,
Geneva, Switzerland

Innovation laws, regulations
India-EU Workshop on Innovation
and Partnerships: Sectoral Innova-
tions, Delhi, India

Product piracy and counterfeiting –
empirical evidence from Germany
The IP Transatlantic Collaboration,
W. S. Chamber of Commerce,
Washington, USA

Harald Bradke
Developments in the expansion
of renewable energy in Europe –
future technology portfolio and
political and economic challenges
Branchen- und Exportforum Erneuer-
bare Energien, Hannover Messe,
Hannover

Kostensenkung durch effizienten
Energieeinsatz im Maschinenbau
Deutscher Maschinenbaugipfel,
Berlin

Technologiekooperation im interna-
tionalen Klimaregime: Die Rolle von
Energieforschung und -entwicklung
Block 1: Welche Energieforschung
wird gebraucht?
BMU, Wuppertal Institut, Berlin

Tasso Brandt
Evaluation in Deutschland – ein
Diskussionsbeitrag zu Optionen
einer Professionalisierung
12. DeGEval-Jahrestagung,
Münster

Bernhard Bührlen
Health care innovations: structural
and financial requirements
World Health Summit, Berlin

Innovations for more (better) health
5th World Ageing and Generations
Congress, St. Gallen, Switzerland

Supporting healthcare innovation
management by comprehensive
early assessment
Annual Congress of Health Tech-
nology Assessment International,
Singapore

Daniela Buschak
Business process management for
service-oriented business concepts
in the manufacturing industry
International Symposium on Servi-
ces Science, ISSS Future Lab,
PhD Student Workshop, Leipzig

Product service systems: oppor-
tunities to improve sustainability
Joint Actions on Climate Change
(JAOCC), Aalborg, Denmark

Kerstin Cuhls
Technikvorausschau: Was wir heute
über die Technik von morgen und
ihre Auswirkungen wissen
Die Zukunft der Lebensqualität im
Spannungsfeld zwischen Wirtschaft
und Arbeit, Salzburg, Österreich

Stephanie Daimer
Rationale und konstruktivistische
Ansätze in der Policy-Analyse
Forschungsklausur Policy-Analyse
im Fraunhofer ISI, Karlsruhe

**Stephanie Daimer and
Susanne Bühler**
Impact assessment
INNO Appraisal External Workshop
on Policy Implications, Brussels,
Belgium

Claus Doll
Long-term environmental effects of
mega-trucks
Workshop on Longer and Heavier
Commercial Goods Vehicles,
European Commission, Brussels,
Belgium

Mobilität Morgen – Wandel im
Zuge globaler und gesellschaftlicher
Trends?
Trend-Scout-Days, VDV-Akademie,
Berlin

Claus Doll and Michael Krail

Policy scenarios to meet Germany's GHG reduction targets
Reducing the environmental impacts of transport with behavioural change, London, Great Britain

Ewa J. Dönitz

Consistency Accelerator – teil-automatische Ausfüllung von Konsistenzmatrizen im Rahmen der Szenario-Technik
5. Symposium für Vorausschau und Technologieplanung,
Heinz Nixdorf Institut in der Berlin-Brandenburgischen Akademie der Wissenschaften, Berlin

Friedrich Dornbusch and Marianne Kulicke

Ausgründungen aus Forschungseinrichtungen – Angebote und Ansatzpunkte für eine stärkere Integration in das BMWi-Programm EXIST – Existenzgründungen aus der Wissenschaft
19. EXIST-Workshop Beteiligung von Hochschulen an Ausgründungen, Berlin

Vicki Duscha and Joachim Schleich

Effects of linking small and large markets under different auctioning regimes – an application to the EU ETS and Australia
International Workshop on Post-Kyoto Regime and Emissions Trading, Wittenberg

Wolfgang Eichhammer

Benchmarking the iron/steel sector – experience from the European emission trading scheme
EUEEP International Workshop on Energy Efficiency Benchmarking Beijing, China

Presentation of the study on the energy savings potentials in EU Member States, candidate countries and EEA countries
Workshop on the EU Energy Efficiency Action Plan, Brussels, Belgium

Making rapid transition to an energy system centred on energy efficiency and renewables possible
Erice International Seminars on Planetary Emergencies – essential technologies for managing the coupled challenges of climate change and energy security, Erice, Italy

Tobias Fleiter

Energieeffizienz in der Industrie – Bedeutung, Technologien und politische Instrumente
Ringvorlesung an der Universität Flensburg, Flensburg

Tobias Fleiter, Wolfgang Eichhammer, Markus Hagemann, Simon Hirzel and Martin Wietschel

Costs and potentials of energy savings in European industry – a critical assessment of the concept of conservation supply curves
ecee Summer Study, La Colle Sur Loup, France

Rainer Frietsch

Applications, grants and renewals. Legal status information and citations
Patent statistics for decision-makers
New technologies, patent quality and entrepreneurship, PATSTAT-conference, Vienna, Austria

Die wissenschaftliche und technologische Leistungsfähigkeit Chinas im internationalen Vergleich
Deutsche Botschaft/AHK, Peking, Guangzhou, Shanghai, China

Messung und Benchmarking von Innovationen aus systemischer Perspektive, DIFI-Tagung, Darmstadt

Carsten Gandenberger

Das Konzept der absoluten Knappheit und seine Implikationen für das betriebliche Stoffstrommanagement
Workshop Stoffstrommanagement, Universität Kassel

Rolf Gausepohl

Die Zukunft der Werkstoffe. Trends, Perspektiven und Vorausschau
Jahrestagung 2009 des Netzwerks Kunststoffe in OWL, Trends – Innovationen – Zukunft, Herford

Edelgard Gruber

Pinpointing the societal issues in DYNAMIS
DYNAMIS Dissemination Seminar, Oslo, Norway

Edelgard Gruber, Ottmar Wandel and Jürgen Müller

Projekt Energie-Effizienz-Botschafter – Impulse für die mittelständische Wirtschaft
Tagung Chancen und Risiken des Klimawandels, Berlin

Edelgard Gruber and Annette Roser

Was bedeutet eine Hightech-Energieeffizienz-Schule für Schüler, Lehrer, Hausmeister?
Symposium Energieeffiziente Schulen, Biberach

Inna Haller

The German innovation system: structure and some characteristics
RusNanoTech 2009, Moscow, Russia

Hitech market trends: two phases of development
RusNanoTech 2009, Moscow, Russia

Joachim Hemer

Methodological aspects of generating corporate spin-offs/spin-outs in Chile
Innovation Conference, Concepción, Chile

Joachim Hemer, Marianne Kulicke and Friedrich Dornbusch

Beteiligungen von Hochschulen an Ausgründungen – Ausgewählte Ergebnisse der Studie für das BMWi
19. EXIST-Workshop Beteiligung von Hochschulen an Ausgründungen, Berlin

Harald Hiessl

Decentralized urban water infrastructure system, DEUS 21
Presentation at the Fraunhofer Traveling Conference on Innovative Water Technologies: Peking, Ministry of Water Resources, Shanghai, Ningbo, Guangzhou, China

Technology as a global driver: trends, perspectives, and foresight
EIRMA Round Table Meeting
Developing Long-Term R&D Strategies in an Increasingly Uncertain Environment, Paris, France

Zukünftige Herausforderungen auf dem Weltmarkt für deutsche Anbieter von Wassertechnologie
Veranstaltung Innovationspartnerschaften für die deutsche Wasserwirtschaft – Akteure, Visionen und Konzepte, Wasser Berlin 2009, Berlin

Thomas Hillenbrand

Anwendungspotenziale für neue Systemkonzepte in Deutschland
Abwasserrecycling – Chancen und Risiken, 2. Internationales Symposium Abwasserrecycling 2009, Braunschweig

Determinanten der Wassernachfrage in Deutschland
14. Thüringer Wasserkolloquium, Erfurt

Dezentrale Wasserinfrastruktursysteme – Konzepte und praktische Beispiele
Deutsche Bundesstiftung Umwelt
15. Internationale Sommerakademie Zukunft Wasser, Ostritz, St. Marienthal

Miriam Hufnagl

Policy-Instrumente in der Innovationspolitik
Forschungsklausur Policy-Analyse im Fraunhofer ISI, Karlsruhe

Policy-Lernen im Bereich der Forschungs- und Innovationspolitik
Forschungsklausur Policy-Analyse im Fraunhofer ISI, Karlsruhe

Bärbel Hüsing

Individualisierte Medizin und Gesundheitssystem – Zentrale Ergebnisse des Zukunftsreports
Öffentliches Fachgespräch des Ausschusses für Bildung, Forschung und Technikfolgen-Abschätzung, Deutscher Bundestag, Berlin

Personalisierte Medizin – Grundlagen und Entwicklungstendenzen
4. IVMB-Symposium Personalisierte Medizin und Informationstechnologie, Dresden

Ralf Isenmann

Advanced corporate sustainability reporting – XBRL taxonomy for sustainability reports based on the G3-guidelines of the Global Reporting Initiative
European conference towards eEnvironment, Opportunities of SEIS and SISE: Integrating Environmental Knowledge in Europe, Prague, Czech Republic

Environmental ICT applications for ecoindustrial development
EnviroInfo 2009, Environmental informatics and industrial environmental protection, Berlin

KMU-Leitfaden zum Roadmapping – direkter Weg zur Zukunftsstrategie
Medien- und Filmgesellschaft Baden-Württemberg, Stuttgart

PRESENTATIONS

Eberhard Jochem

Energieeffizienz- und Klimaschutz-Netzwerke – beschleunigte Energiekostenreduzierung in der mittelständischen Wirtschaft
13. Hessisches Klimaschutzforum, Kassel

Gesellschaftliche Chancen ökonomischer Krisen mit Fokus auf Energie und Verkehr
AK Infratech – Krise als Chance, Alpbacher Technologiegespräche, Alpbach, Österreich

Regional responses of energy use and generation to climate change in European countries – adaptation and mitigation
Open Days: Global Challenges, European Responses, Brussels, Belgium

Steffen Kinkel

Motivation and pitfalls in global production activities
Global Manufacturing Board Meeting der Siemens AG, Munich

Opening the black box: antecedents for the back-sourcing of production activities from offshore locations
AIB-Jahreskonferenz, San Diego, USA

Produktionsverlagerungen und Rückverlagerungen – Lernen für erfolgreiche Standortentscheidungen
Deutscher Manufacturing Gipfel 2009, Montreux, Schweiz

Eva Kirner

Innovation in non-R&D intensive firms
University Autonoma Metropolitana, Mexico City, Mexico

Innovationsfähigkeit messen und steigern
Management Center Innsbruck, Innsbruck, Österreich

Innovationspfade nicht forschungsintensiver Unternehmen
Dortmunder Dialog, Dortmund

Oliver Kleine

On the necessity of quantitative strategy evaluation in combating industrial counterfeiting and product piracy. A system dynamics approach, EURO XXIII, Bonn

Fabian Kley

Elektromobilität – ist das zukünftige Verkehrskonzept bezahlbar?
VDE Konferenz – Elektromobilität der Zukunft, Berlin

The future of e-mobility
Infraday 2009, Conference on Applied Infrastructure Research, Berlin

Marian Klobasa

Integration of offshore wind generation in future electricity markets
European Offshore Wind Energy Conference, EOW 2009, Stockholm, Sweden

Integration of wind energy in Germany's electricity system, Spring of research – moving towards energy storage operators
EDF-Research Workshop, Clamart, France

Substitutionsbeziehungen der erneuerbaren Energien im Stromsektor
BMU Workshop Emissionsbilanzierung erneuerbarer Energien, Dessau

Jonathan Köhler

Agent-based modelling for transitions in transport
Seminar on Complexity Economics for Sustainability, Bozen, Italy

Dynamics of socio-technical change in the transport sector: an application of transition theory to environmental policy
DIME Workshop Environmental Innovation, Industrial Dynamics and Entrepreneurship, Utrecht, Netherlands

What is a niche?
ESRC Complexity and Sustainability workshop, Leeds, Great Britain

Knut Koschatzky

Regional clusters of the German innovation system – or: economic forces shaped by public administration
WZB Workshop on Reinterpretation of National Systems of Innovation, Berlin

Regional ties in research driven clusters: the Fraunhofer Innovation Clusters as a new strategic approach to strengthen regional competitiveness?
Triple-Helix-Conference, Glasgow, Great Britain

Wissensbasierte Regionalentwicklung und räumliche Innovationspolitik
Geographisches Kolloquium, Eberhard Karls Universität Tübingen

Henning Kroll

Regional patterns of co-patenting by technological fields, a Europe-US comparison
Atlanta Conference on Science and Innovation Policy, Atlanta, USA

Marianne Kulicke

Beteiligungen von Hochschulen an Ausgründungen – Ausgewählte Ergebnisse der Studie für das BMWI
Jahrestagung der Arbeitsgemeinschaft der Transferstellen Bayerischer Universitäten, Wildbad Kreuth

Cluster- und Netzwerkevaluation – Herausforderungen und Beispiele
Evaluation von Clusterpolitik, Stuttgart

Gründungsförderung und -betreuung in anderen Bundesländern
Prämierungsveranstaltung des VentureCup MV 2009, Rostock

Gunter Lay

Ganzheitliche Produktionssysteme – Ein Überblick
Seminar für Betriebsräte der Siemens AG, Berlin

Verbreitung von Typen der Gruppenarbeit in der Produktion
Workshop Arbeitsorganisatorische Leitbilder, GfA Frühjahrskongress, Dortmund

Von industriellen Dienstleistungen zu dienstleistungsbasierten Geschäftsmodellen
71. Jahrestagung des Verbandes der Hochschullehrer für Betriebswirtschaft e.V., Nürnberg

Timo Leimbach

From the flow of materials to the flow of information
IT in Shaping Organizations Workshop, Copenhagen Business School, Copenhagen, Denmark

Christian Lerch

Life cycle costing to identify win-win potentials of service-based business models
16th CIRP Life Cycle Engineering Conference, Cairo, Egypt

Ralf Lindner

Politikberatung in der Forschungs-, Technologie- und Innovationspolitik
Lehrstuhl für Politikwissenschaft, Universität Augsburg

Using social networking tools to promote e-participation initiatives
EDem 2009, Conference on Electronic Democracy, Vienna, Austria

Frank Marscheider-Weidemann

Beurteilung der Gesamtumweltexposition von Silberionen aus Biozid-Produkten
Clustermeeting Nanosilber-Herstellung, Charakterisierung und Anwendung, Nürnberg

Rohstoffbedarf für Zukunftstechnologien
Global Challenges II: Ressourcenkonflikte, Darmstadt

Rohstoffe für Zukunftstechnologien
BDI-Ausschuss Rohstoffpolitik, Hamburg

Yu Meng

Postdoctoral training and gender differences in academic scientists' research productivity
Atlanta Conference on Science and Innovation Policy, Atlanta, USA

Emmanuel Muller

Knowledge angels: how creative people foster innovation in KIBS – observations from Germany, France and China
DIME Workshop Technology, Skills and Geography, SPRU, Sussex University, Brighton, Great Britain

Peter Neuhäusler

Formal vs. informal protection instruments and the strategic use of patents in an expected-utility framework
European Sociological Association 9th Conference, Lisbon, Portugal

Julia Oberschmidt

Effizienzanforderungen für Elektromotoren & Ventilatoren vor dem Hintergrund der EU-Ökodesign-Richtlinie
Tagung Stromeffizienz: Druckluft, Pumpen und Antriebe des O.Ö. Energiesparverbandes, Linz, Österreich

Ein modifizierter PROMETHEE-Ansatz zur Lebenszyklusorientierten Bewertung der Strom- und Wärmeversorgung
Workshop der GOR-Arbeitsgruppen Entscheidungstheorie und -praxis und OR im Umweltschutz, Göttingen

Entscheidungsunterstützung zur Auswahl von Energietechnologien unter Berücksichtigung zeitlich

veränderlicher Präferenzen
6. Internationale Energiewirtschafts-
tagung an der TU Wien – IEWT
2009, Wien, Österreich

Katrin Ostertag

Handelbare Flächenkontingente
– Ein Ansatz zum Flächensparen?
Flächen sparen – Jetzt handeln
Veranstaltung der Kommission
Bodenschutz beim Umweltbundes-
amt zum Internationalen Tag
des Bodens, Berlin

Projekt Spiel.Raum – Erfahrungen
mit Flächenausweisungszertifikaten
in der Simulation
Unendliche Weiten? Optionen zum
Flächensparen
Evangelische Akademie Loccum

Benjamin Pfluger, Frank Sensfuß and Martin Wietschel

Agent-based simulation of the
effects of an import of electricity
from renewable sources in Northern
Africa into the Italian power market
6th International Energy Economics
Conference TU Wien, Vienna,
Austria

Mario Ragwitz

Evolution of support schemes after
adoption of the Climate Change
Package
6th Green-Power-Marketing-
Conference
The future of green power – achie-
ving an energy revolution in chal-
lenging times, Geneva, Switzerland

Policy and regulatory aspects of
concentrating solar power scale-up
in MENA countries
World Bank-Conference, MENA
Regional Concentrating Solar
Power Scale-up Program, Tunis,
Tunisia

Mitigation through deploying
renewables
Side-Event at the 15th Conference
of the Parties to the UNFCCC,
Copenhagen, Denmark

Thomas Reiß

Ecosystems for innovation
Workshop Entrepreneurship,
ComplexEIT Project, Strasbourg,
France

Implications of personalised
medicine for the health economy
symbiosis
14th European Congress on
Biotechnology, Barcelona, Spain

Karoline Rogge and Volker Hoffmann

The impact of the EU emission
trading scheme on the sectoral
innovation system for power
generation technologies. Findings
for Germany
6th European Meeting on Applied
Evolutionary Economics, Jena

Karoline Rogge et al.

Corporate climate technology strat-
egies in response to international
market-based climate policies – the
case of the power sector
The IARU International Scientific
Congress on Climate Change,
Copenhagen, Denmark

Christian Sartorius

Diffusion of decentralized urban
water management in the Elbe
region – a niche approach
DIME-Workshop Environmental
Innovation in Infrastructure Sectors,
Karlsruhe

Impact of supply and demand
on the price development of phos-
phate (fertilizer)
International Conference on Nutrient
Recovery from Wastewater Streams,
Vancouver, Canada

Klimafolgenmanagement in
Unternehmen – Hindernisse und
Erfolgsfaktoren
Herbsttagung Klimawandel – eine
Herausforderung für die BWL,
Dresden

Wolfgang Schade

Principles of ASTRA modelling
approach – Future net employment
and growth impact of RES
Employ RES final conference
The impact of renewable energy
policy on economic growth and
employment in the European
Union, Brussels, Belgium

Reaching 2°C: consequences for
Europe – preliminary results of the
detailed EU analysis
4th CEPS/ADAM Science-Policy
Seminar, Brussels, Belgium

Results of the Bali/Poznan confer-
ences and challenges for the Post-
Kyoto framework
WCTRS-SIG11 International
Symposium, Nagoya, Japan

Hans-Dieter Schat

Anerkennungs- und Vergütungs-
systeme im Ideenmanagement und
KVP Seminar der Schweizerischen

Arbeitsgemeinschaft für Verbesse-
rungsprozesse SAV/ASP
Lake Zürich, Switzerland

Erfolgreiche Innovation mit älteren
Belegschaften
Jahreskongress der Gesellschaft für
Arbeitswissenschaft, Dortmund

Veränderungsprozesse in Unter-
nehmen: Erfolge und Misserfolge
bei Prozessinnovationen – lessons
to learn
2. Transfer-Workshop im Rahmen
des Projektes BMInno, Hamburg

Joachim Schleich

Effects of linking small and large
markets under different auctioning
regimes – an application to the EU
ETS and Australia,
IAEE 10th European Conference,
Vienna, Austria

How low can you go? Price respon-
siveness of German residential
water demand
European Association of Environ-
mental and Resource Economists
(EAERE), 17th Annual Conference,
Amsterdam, Netherlands

Label it and they will buy? The
case of energy-efficient class-A
appliances
ecccc Summer Study,
La Colle Sur Loup, France

Michael Schleinkofer

Academic patents in Germany
Triple-Helix-Conference, Glasgow,
Great Britain

Barbara Schlomann

Energieeffiziente IT – Einspar-
potenziale durch neue Geräte und
Anwendungen
ICTM Forum 2009 – Green IT: Von
politischem Hype zur unterneh-
mensnotwendigen Realität,
TÜV Rheinland, Köln

Energy consumption for informa-
tion and communication technol-
ogies in German households –
present state and future trends
EEDAL 2009, Energy Efficiency in
Domestic Appliances and Lighting,
Berlin

PC & Co. – Die versteckten Strom-
fresser
Seminarreihe Energie sparen –
Geld sparen, Handwerkskammer
Stuttgart

Ulrich Schmoch

Indikatoren der Technischen
Leistungsfähigkeit
Tagung Innovationsfähigkeit:
Theorien und Indikatoren, Berlin

Reporting on national systems of
innovation – contents, form, target
groups
Workshop Advances in R&D Moni-
toring, Leuven, Belgium

Ulrich Schmoch and Peter Neuhäuser

Changing pattern and functions of
applications and citations at the
European Patent Office
Conference Patent statistics for
decision-makers 2009, Vienna,
Austria

Ulrich Schmoch and Torben Schubert

Möglichkeiten und Grenzen indi-
katorgestützter Leistungsmessung
Workshop Neue Governance-
formen, ihre Umsetzung und die
Folgen für die Forschung, Speyer

Marcus Schröter

Implications of the organisation and
internationalisation of knowledge-
intensive services on innovation
XIX. International RESER Conference
Public and private services in the
new global economy, Budapest,
Hungary

Service-based business concepts for
assembly: how do solutions affect
total cost of ownership?
42nd CIRP Conference on Manufac-
turing Systems, Sustainable devel-
opment of manufacturing systems,
Grenoble, France

Von industriellen Dienstleistungen
zu dienstleistungsbasierten
Geschäftsmodellen
A&D Management Roundtable
Monetarisierung von Mehrwert-
Leistungen, München

Torben Schubert

Kreativität und Innovation
BIBB-Konferenz, Bonn

Marketing and organisational
innovations
Druid Conference, Copenhagen,
Denmark

Testing restriction in production
analysis
Statistische Woche, Wuppertal

PRESENTATIONS | PROJECTS

Frank Sensfuß and Mario Ragwitz

Entwicklung eines Fördersystems für die Vermarktung von erneuerbarer Stromerzeugung
6. Internationale Energiewirtschaftstagung, TU Wien, Wien, Österreich

Oliver Som

Innovation patterns of non-R&D intensive manufacturing firms. An evolutionary approach to heterogeneity in innovation behaviour
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Sonia Gatchair

Georgia Institute of Technology, School of Public Policy, Atlanta, USA
February 2009

Li Liu

Tsinghua University, Center for Science, Technology and Society, Research Unit for Science, Technology, Innovation and Policy, Beijing, China
January to March 2009

Xin Luo

Beijing Research Center for Science of Science, Beijing, China
June to August 2009

Marcelo Matos

RedeSist – Instituto de Economia da UFRJ Urca, Rio de Janeiro, Brazil
January to August 2009

Wan Qu

Institute of Policy and Management Beijing, China
July 2008 to July 2009

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Fraunhofer Institute for Systems
and Innovation Research ISI
Breslauer Straße 48
76139 Karlsruhe, Germany

Phone: +49 721 6809-0

Fax: +49 721 689152

E-Mail: info@isi.fraunhofer.de

Internet: www.isi.fraunhofer.de

Editors

Head

Dr. Kathrin Schwabe

Ulrike Aschoff

Sabrina Bulk

Katja Rische

Dr. Sebastian Ziegauß

Layout and Illustrations

Jeanette Braun

Sabine Wurst

Translations

Gillian Bowman-Köhler

Christine Mahler-Johnstone

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