

**Integrated technology transfer
- models and instruments for Slovenia**

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Integrated technology transfer - models and instruments for Slovenia

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1. Introduction

When taking stock of the present situation in Slovenia, it emerged that the public research institutions on the one hand (universities in Ljubljana and Maribor, national research institutes), and industrial R&D departments on the other - mainly concentrated in the large enterprises (ISKRA, Gorenje, TAM and Litostroj) - cooperate very little, but perform **research very largely for their own institution**. Research in the public sector has a strong basic orientation; R&D in industry is concerned only with the present product spectrum of firms and its further development. There is a lack of **coordinated linking of basic research and industrial R&D** in the form of cooperations or joint projects involving science and industry which, in view of the increasing science base of technology, is a prerequisite for the development of high and medium tech (cf. ISI's studies on technometrics and on technological change). Only this linking of science and industry enables the preliminary research necessary for the development of new technologies to take place in the scientific field (e.g. in microelectronics and biotechnology). The lack of a link between science and industry is particularly disadvantageous in view of the fact that the potential for research in high and medium tech, both regarding staff and equipment, is concentrated in the public institutes and universities (in Slovenia approximately 70% of scientists work in this sector; in Germany, about one third of all scientists), whereas only a few large enterprises such as ISKRA and Gorenje have highly qualified R&D departments, and the mass of small firms performs only limited development activities. Particularly the **small and medium industry** which is in the process of formation could urgently do with **well-directed support from public research institutions**; however at present these are not oriented towards the industrial need for R&D, but rather towards scientific reputation (publications, lectures etc.).

2. Integrated technology transfer models: the system and empirical samples

Against this background, **transfer institutions between science and industry** in Slovenia become centrally important for the support of technology development in industry. These transfer offices must ensure a continuous flow of know-how from basic research into industrial development and application and also, conversely, bring industrial R&D needs into basic research. The linking of theoretical and practically oriented research is the basis for the development of new technologies.

Figure 1 gives an overview of the complete range of measures for improving the links between research institutions and industry. The following survey concentrates on technology transfer and advisory institutions, and on public measures for innovation support (Figure 2).

2.1 Aims of the instruments

In view of the specific conditions and existing competitive advantages of Slovenia, technology transfer and innovation support measures should be directed towards achieving the following **aims**:

- Further development of sophisticated conventional technology ("medium tech");
- realisation of incremental innovations, support of development work in the final phase of innovation processes;
- ensuring an accessible offer throughout the country;
- addressing a large target group of enterprises which are in the process of adapting and "catching up" on innovation;
- division of tasks between public R&D and industry (R&D institutions as future-oriented problem-solvers for industry, further development and adaptive development within the enterprises);
- implementation of innovation-oriented routines in present firms and market-oriented re-structuring of existing enterprises;
- "soft" public control by face-to-face contacts, informal mechanisms, sensitisation, coordination of available resources and measures by government and industry;
- relocation and strengthening of existing firms.

2.2 Empirical examples from Germany

Technology transfer offices of this kind have been built up throughout Germany since the 1970s. Thus there is a network of specialised regional transfer offices in the Federal State of Baden-Württemberg, under the name "Steinbeis-Stiftung" (Steinbeis Foundation) (Figures 3-5). The Steinbeis-Stiftung has now been extended to other German "Länder" and also to other countries (Austria, Sweden). An example of another type of transfer institution is the Centre for Innovation and Technology in North Rhine-Westphalia (Figures 6 and 7).

These concrete examples demonstrate the importance of technology transfer and advisory services for industrial technology development.

2.3 Tasks of technology transfer and advisory offices

Transfer offices should take on **tasks** such as the following (Figure 8):

- General information and consulting (e.g. on founding and financing a firm);
- technology and market consulting, development of foundation concepts;
- research and development contracts in cooperation with the relevant research institution;
- training on technical and management topics (e.g. project management and marketing);
- assessment and monitoring of publicly promoted development projects (regarding level of technology, market chances, etc.);
- running and assessment of public support programmes;
- expertises in innovation projects financed by banks (reports on soundness of firm's technical position for banks and venture capital companies);
- planning and servicing of technology and incubator centres;
- technical monitoring, testing of standards, industry-wide quality control.

Transfer institutions need the following **basic prerequisites** in order to fulfill their functions:

- Back-up from existing research institutions in the area, and personnel links with these (via professors and their colleagues)
- flexible staffing and organisation structure (low staffing, pool of freelance consultants brought in to help with individual projects);
- self-financing through contract assignments for industry, after an initial start-up phase (initiation, support);
- mutual mediation of assignments by transfer offices, division of tasks according to expertise;
- close linking of transfer offices to industrial needs (with temporary cooperations);
- supply of specialist services with maximum geographical coverage, taking into account existing research institutions and sectors of industry.

The transfer offices should be planned bearing in mind the regional research institutions (supply) and industrial sectors (demand), and should be complementary regarding the specialist fields covered. Particularly important is the formation of a consulting pool offering **technological and management competence**, i.e. having direct experiences of technology development and the organisation of enterprises. To encourage the intensive exchange of information and experience between transfer offices, there should be regular meetings of the office managers, which should be organised by a **transfer headquarters**. This head office should also deal with the inter-office mediation of assignments, with the formation of new transfer offices and with general PR relations (presentation to the public). However, the headquarters should remain a

small service office, the actual transfer activities being carried out by the regional offices. Lastly, **international technology cooperation** between enterprises and research institutions should be mentioned: in view of the time and expense involved in the development of new technologies, this is becoming increasingly important, and one transfer office should be set up expressly to organise and service this aspect.

3. Innovation support instruments

As well as technology transfer, there would seem to be a necessity for a **coordinated bundle of measures**, taking into account both the requirements of individual firm types and the needs of firms generally. The support measures should be oriented towards conditions in Slovenia. These include the large numbers of firm foundations (3000 in the first half of 1993 - primarily in the service sector), good chances of survival for technology-based firms following the isolation of the domestic market from its previous context, and the use of contact/proximity advantages in a small country.

- 1) A bundle of measures of this kind should consist of support activities directed towards individual **firm types**:

Joint R&D:

These are R&D projects of mutual interest cooperation which are based on contracts (R&D-institutes and a group of enterprises incl. SMEs). Normally each party bears its own costs.

Contract R&D:

This implies R&D cooperation for the complementation of internal R&D capacities of companies in order to develop new or improved products or processes and to draw up feasibility studies. This is especially useful for SMEs to perform incremental innovations.

Industrial use of scientific equipment of R&D-institutions:

R&D institutes in natural sciences and engineering are usually equipped with high-tech instruments and facilities for experimental activities, testing etc. In many cases this equipment can also be used by industry at reasonable cost provided there are no restrictions on the R&D activities of the institutes.

Cooperative industrial research:

This comprises R&D for specific sectors, especially R&D in the fields of natural sciences and technology. The research work is available to companies belonging to some relevant sectors.

Promotion of New Technology Based Firms (NTBF):

This means the creation of favourable conditions for NTBFs, because these enterprises are expected to make an important contribution to the conversion of innovations into marketable products. Premise: the financing issue is the main barrier to the foundation of an enterprise and these founders will have deficits in the non-technical aspects.

Incubator centres are another form of support for NTBFs. Strong industrial impacts seem to be on SMEs, cooperation research and business system; also on developing new markets and social conditions for industrial innovations.

2) Support measures which are **important for all types of firms** include:

Innovation and technology consultancies:

The promotion of technology consultancy by university staff where state support could provide several hours free of charge per firm per consultancy period.

Further education/training:

Technological and structural change is compelling many companies to examine new technologies. To improve the firms' adaptability in regard to the latest technological developments and tendencies, training schemes can also be developed and carried out by R&D institutions in the field of innovation and technology management.

Exchange of personnel:

The placement of qualified employees by secondment of R&D-personnel or graduates to SMEs is an important aspect of cooperative R&D projects. Only if a company is provided with qualified staff it is able to be innovative.

A "**project mix**" also appears necessary (smaller projects as well as large ones); it also seems necessary to limit support to **selected fields of technology** - possibly coordinated with activities already running in Slovenia, e.g. with partners abroad (such as Austria) or with the European Communities. All measures should be both horizontally and vertically coordinated, irrespective of the organising bodies involved. Measures include not only support programmes for R&D, but also certification as well as tasks associated with quality assurance and the inspection of standards.

It should be borne in mind that the proposed measures may be delayed or impeded by traditional departmental thinking and passive waiting for public initiatives, by the current lack of organising bodies, and by the fact that at present existing bodies are in the process of re-structuring.

4. Putting project results into practice

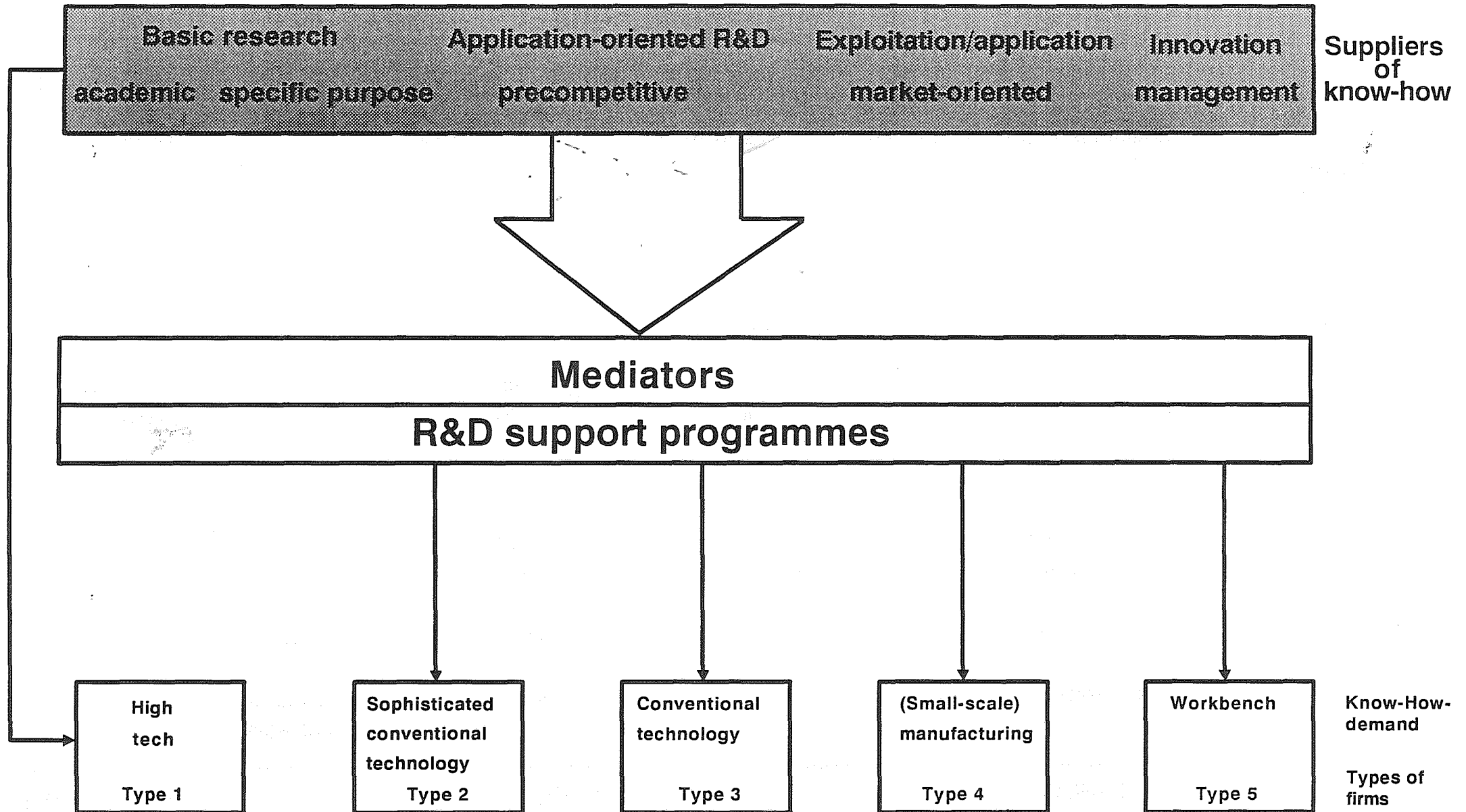
The complexity of the situation makes the necessity for a thorough **implementation** of the proposed concepts even more urgent. It is also important to make use of favourable factors such as existing personal contacts. As many of these relationships as possible should be included in future activities.

In coordination with the Federal Ministry for Research and Technology (BMFT), ISI and the KFA/IB therefore propose that following this workshop **implementation activities** should be commenced.

Taken as a whole, the purpose of these measures is to make use of the open attitude of Slovenian R&D towards world research, in order to achieve a **market-oriented development of technology** there. Slovenia can act as a technology centre and "Balkan" transit point for partners in the west, thus retaining its autonomy; in this way it will be easier to change frame conditions that are still unfavourable to technology development. This would involve the authorisation of real estate acquisition by non-Slovenians, the transaction of investment guaranty treaties, tax advantages, profit transfer, parity of treatment for domestic and foreign-owned enterprises.

Instruments	Aims, effects	Selected problems
Institutional arrangements		
Contract research institutes	High degree of user orientation	Time horizon of research may be too short-term
Cooperative research institutes	High participation of SMEs	For sector specific problems mainly
Network approach	Establishment of effective national or international R&D networks	Precondition: a well developed private and public R&D base
Financial incentives		
Tax reduction or subsidies for extramural R&D	Enforcing of existing internal or extramural R&D	Only small effects on initiating R&D cooperation
Subsidies for selected R&D cooperation projects	Establishment of strategic technology fields	Diverging interests of research and business systems
Technology transfer by		
Transfer units, innovation consultancies	High participation of SMEs; initiating R&D cooperation and start-ups	Low acceptance of newly established agencies by industry and host institutions
Exchange of persons	Increasing mobility of R&D personnel	Different career structure in universities and firms

Activity profile of research institutions in Slovenia



Steinbeis-Stiftung

Aims and tasks

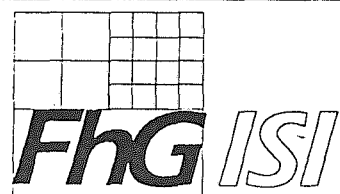
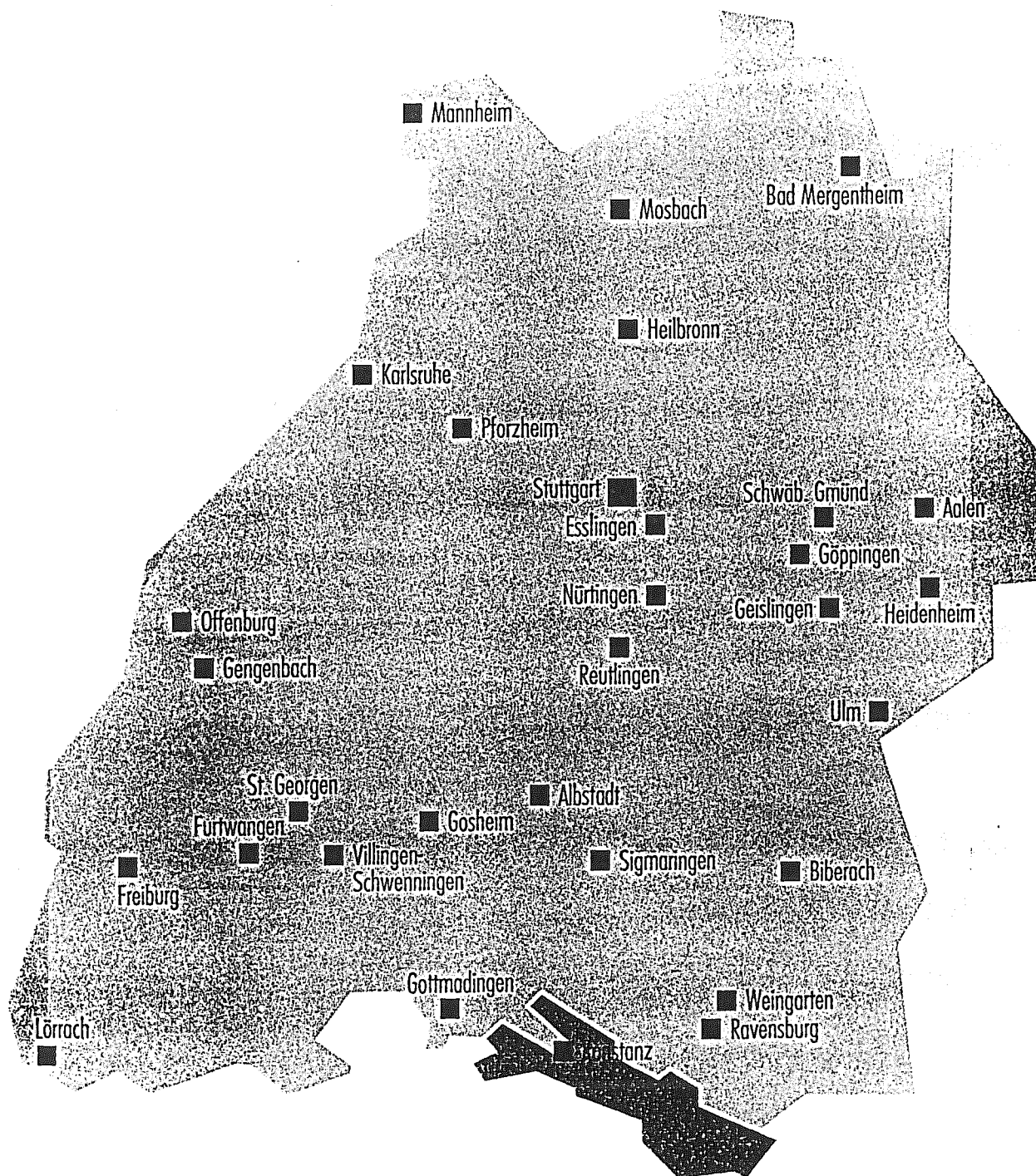
The support of industry, particularly small and medium sized firms

Clients and contacts

- Forward-looking firms
- diversified industrial structure

Role of the Foundation in innovative policy

- Technological competitiveness
- endogenous development strategy



**Steinbeis Transfer Offices
(Baden-Württemberg)**

1993

Steinbeis-Stiftung (Baden-Württemberg)

(Members from associations, chambers, research and higher education, government and industry)

Activities

- General advisory services
- technology and market consulting
- R&D for enterprises
- providing information for industry
- assessment and monitoring of promotion projects

2567 employees (some part time or subsidiary job)

62% academics, engineers, computer specialists

29% students

9% organisation and administration

Budget 1992 c. 92 mn DM

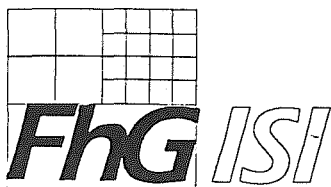
- c. 68 mn from R&D consulting

- c. 1.5 mn from subsidies

Residual financing from foundation funds and other sources

Partners

158 regional Steinbeis Transfer Offices



Steinbeis-Stiftung

1993

Zenit GmbH

Associates

Carrier association of c. 100 enterprises in North Rhine-Westphalia
Westdeutsche Landesbank-Girozentrale Land Nordrhein-Westfalen

Activities

- Information and consulting on new technologies and their markets
- management, financing and qualification
- patent searches, workshops, seminars
- project organisers for "Land" programmes
- carrying out structural and technology projects

Employees

Over 50 employees, half-being consultants with practical experience

- engineers
- natural scientists
- economists

Financing (1990)

Total budget: 8 mn DM, comprising

- 2.1 mn DM financing from associates
- technology and structural projects (financed from public funds
2.4 mn DM)
- income from services 3.5 mn DM

Partners

- Enterprises
- research institutes
- technology and incubator centres
- chambers, industrial associations
- credit institutes
- consultants

Zenit GmbH

Aims and tasks

Support of innovation and technology, particularly for SMEs in the manufacturing sector:

- Opening up new fields of technology
- providing demand-oriented services
 - o market research
 - o management support
 - o consulting for public promotion
 - o mediation of cooperations
 - o personnel transfer
- cooperation with communities, chambers, incubator and technology centres etc.

Clients and contacts

- Monostructural coal and steel industry
- old industrial region in process of structural change

Role in innovation policy

- "Re-polarisation" of mining region towards becoming modern industrial region
- endogenous development strategies, with approaches oriented towards mobility

Tasks of the transfer offices

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