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Conference Paper

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38th Congress of the European Regional Science Association: "Europe Quo Vadis? - Regional Questions at the Turn of the Century", 28 August - 1 September 1998, Vienna, Austria

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Strambach, Simone (1998) : Knowledge-intensive business services as an element of learning regions - the case of Baden-Wurttemberg, 38th Congress of the European Regional Science Association: "Europe Quo Vadis? - Regional Questions at the Turn of the Century", 28 August - 1 September 1998, Vienna, Austria, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

<https://hdl.handle.net/10419/113598>

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38th Congress of the European Regional Science Association
28 August - 1 September 1998 in Vienna

Knowledge-intensive business services (KIBS) as an element of learning
regions - the case of Baden-Württemberg

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ABSTRACT:

The paper focuses on the contribution of knowledge intensive business services (KIBS) to innovation from a qualitative perspective, using the systems of innovation approach. The main argument is that KIBS play an increasing role in the production and diffusion of knowledge under the current globalizing economy. The strategic significance of KIBS in the innovation systems stems primarily from indirect effects and positive feedbacks that in the long run can increase the capacity of the demand side to adjust and thus contribute to improving competitiveness. These effects are the results of successful interaction- and learning processes between KIBS suppliers and KIBS users, shaped and influenced by the institutional context.

The paper examines the specific development trends of KIBS in the regional innovation system of Baden-Württemberg and discusses the consequences of their developments for the adaptability and competitiveness of the region.

Knowledge-intensive business services (KIBS) as an element of learning regions – the case of Baden-Württemberg

0 Introduction

The growth and dynamic development of business services in the European countries has now been documented in numerous empirical studies. However, their significance and their role in the innovation process has received far less attention. A major reason for this is the difficulty involved in quantifying them at both the macro and the micro levels. There is no way this can be done at present, given the state of the statistics on services and innovations. From a qualitative perspective, the strategic significance of these services in the innovation systems stems from the fact that their use contributes to the change and learning processes in firms and institutions. Here the interaction with the demand side is of great importance. The interaction process gives an impetus to innovating and provides a means of transmitting innovations. Indirect effects and feedbacks can thus be the result. These effects, which increase both efficiency and competitiveness, are hard to observe because it is difficult to isolate the specific contribution made by knowledge intensive service firms from the network of intra and inter organizational exchange relationships in innovation processes. In the following it will be shown that KIBS influence the adaptability and flexibility of regions, as the globalization process accelerates and the production of knowledge is changing. They are therefore obviously worth studying especially when thinking about the institutional conditions for learning regions.

1 Initial research on innovation activities in the service sector

The serious limitations of the statistics for services and innovation explain why very little can be said about the innovative activities of the supply side in quantitative terms. Innovation research has concentrated on the manufacturing sector, for a long time service firms were not included in the regular national innovation surveys. Studies of the innovative behaviour of firms in the services area have only recently been undertaken following the revision of the guidelines for including innovation indicators in the OSLO Manual. Progress in

conceptualising and measuring innovation in services can be expected from current research projects within the TSER - target socio-economic research framework programme of the European Commission.

It is difficult to make quantitative statements about the productivity and innovativeness of business related services. Indicators and traditional tools used to evaluate productivity and innovativeness in the production system can only be used for services to a very limited extent.

The reasons for this are the following:

- The traditional R&D concept has been shaped by technological innovations in the manufacturing sector.
- The internal innovation and knowledge organisation is, as a rule, formalised only weakly in service firms.
- In contrast to manufacturing firms, most KIBS firms do not distinguish R&D activities in organisational terms: quantitative indicators of innovation inputs like investment and employment in the R&D area therefore cannot be used. As a result of the first attempt at capturing non-R&D innovation expenditure on a European scale, organized by the European Commission and Eurostat under the recent pilot round of the Community Innovation Survey (CIS), Brouwer/Kleinknecht (1997) emphasize that roughly half of the sample firms in five countries were unable to adequately answer the question about non-R&D innovation expenditures. They conclude from these results that 'obviously, firms are not yet accustomed to collect such information and to report it in postal surveys.' (Brouwer/Kleinknecht 1997: 1236)
- Patent applications are of limited use as output indicators for service firms. The reason is the extremely short innovation cycle for KIBS products. At present the innovation cycle is only six months in some areas of the software branch. On the other hand, the KIBS firms' advances in know-how are difficult to protect by patents, as they are to a very large extent personnel and context bound.

It has not yet been possible to show investment in intangible capital assets in the statistics. Meanwhile the results of the first large standardised study of the innovation activities in the service sector carried out in Germany between 1995 and 1996 by the Centre for European Economic Research (ZEW) and the Fraunhofer Institute for Systems and Innovation Research (ISI) are available. It must be stressed that these results clearly underline the fact that service innovations can only be compared with those in the manufacturing sector in a very limited sense. There are differences both in the input factors of innovations and in the

innovation processes themselves (cf. Licht/Hipp/Kukuk/Münt 1997). It is also evident that, because of the heterogeneity of the service branches, standardised surveys do not do justice to the complexity and the specific characteristics of the innovation processes of knowledge intensive business service firms.

2 Business services and knowledge-intensive business services: Towards a definition?

In general terms, business services are those services demanded by firms and public institutions and are not produced for private consumption. KIBS are the most knowledge intensive of the business related services. Thus, they do not include such services as cleaning and maintenance and repairs. These 'routine services' presumably play no role in stimulating innovation or producing qualitative spillover effects in the areas where they are provided. Despite every effort, uniform definitions of firms or activities that can be classified as providing knowledge intensive business services are not available at the European level. Definitions are time related and the enormous structural changes are taking place in this area of economic activities are partly responsible for the lack of transparency on the supply side. The institutional conditions make rapid market entry possible in wide sections of this segment. There are now many firms supplying kinds of services which a few years ago did not exist. Another reason for high rates of market entry is the lack of formal entry barriers in many branches of knowledge intensive services. However, firms which are new to the market are often unable to breach the informal barriers in the form of high problem solving competence and flexibility requirements.

Most of the analyses use a branch approach for the empirical identification of KIBS. In sectoral terms, the majority of KIBS are to be found in Nace area economic groups (72/73/74 and subgroups) of:

- computing – like hardware and software consulting and development
- technical services – like architectural and engineering activities or technical consultancy
- economic services – like economic and management consultancy, tax consultancy, accounting, marketing, advertising, legal services.

In view of the heterogeneity of this service segment, the high structural dynamics and the relatively short time intervals between developments, the common features of KIBS need to be emphasized.

There are two aspects which provide the links between KIBS. One is that the product of the firms is 'knowledge'. The firms for the most part provide non-material services. The use of the term 'knowledge intensive', in analogy with the terms 'capital intensive' and 'labour intensive', emphasizes the fact that for these firms knowledge is the most important of all the factors of production. However, while capital and labour can be expressed in measurable economic units, the knowledge factor is difficult to grasp and even more difficult to measure. Although I do not want to try to define knowledge precisely here, it is nevertheless necessary to consider knowledge as the common characteristic of the firms in more detail. It must be stressed that knowledge is far more than just information. Starbuck (1997) states that knowledge is a stock of expertise and not a flow of information. Only the goal oriented integration of information represents knowledge. Unlike pure information, knowledge contains judgements, interpretations, and experiences and it is context dependent. Knowledge takes on different values in different situations and is not in any simple sense 'objective'. The fact that distinctions can be made between different kinds of knowledge is also important. Polanyi (1966) was one of the first to draw attention to the implicit and tacit dimensions of knowledge which are very important in the current discussion of knowledge management and the theoretical debates about organizational learning.

Information and explicit knowledge can be systematically processed, transferred, and stored by organizing it, implicit knowledge cannot. The latter is difficult to formalize, communicate, and transfer because it is either embedded in the culture of the organization, in network relationships, or held only by particular individuals. These special features of knowledge make the standardization of the non-material products of KIBS very difficult.

The second aspect that KIBS have in common is the intensive interaction and communication which takes place between KIBS supplier and KIBS user and which is necessary for producing the services. The purchase of knowledge intensive services is not the same as the purchase of a standardized product or service. The exchange of knowledge products is associated with uncertainties and information asymmetries stemming from the special features of knowledge described above. The service and its quality are the result of a process which is influenced by the competence and experience of the supplier, and by the ability of the purchaser to use external knowledge and to integrate it into his own organization. The activity

of consulting, understood as a process of problem solving in which the KIBS adapt their expertise and expert knowledge to the needs of the buyer, makes up, in different degrees, the content of the interaction process between KIBS and their customers.

Given this background it is not surprising that no tools are yet available which would make it possible to determine and measure the degree of knowledge intensity of a firm. In the absence of such tools, the branch aggregation approach is the only way that can be used to identify knowledge intensive business services.¹

3 The contribution of KIBS to innovation within innovation systems: direct and indirect effects

More recent findings of innovation research have not only greatly changed the understanding of technological change and innovation, they have also thrown a different light on the role and function of KIBS in innovation.

Traditional ideas about innovation as a linear process of invention, innovation, and diffusion have been pushed into the background and the interactive nature of innovation has come to the fore. Innovation is the result of cumulative interaction and learning processes of different actors which make the emergence and transfer of new knowledge and new technologies possible. In particular studies of national innovation systems since the eighties have shown that technologies cannot simply be transferred across national borders. Technologies are rooted in country specific institutional contexts which include social and cultural factors as well as technological abilities and capacities (Dosi 1988, Freeman 1988). The country specific system of regulations, existing economic structures, and sociocultural frameworks influence innovation, the willingness to innovate, and the technological options. The strong influence of national innovation systems has been well established (Edquist 1997, Johnson 1992, Lundvall 1992, Nelson 1993, Patel/Pavitt 1994).

Researches into national innovation systems have made a major contribution to shaping a systemic understanding of innovation processes. Innovations not only depend on the decisions and competences of the firm. The way the production and reproduction of knowledge is carried out and the adoption of innovations by the actors are determined by the institutional

¹ The analysis in Baden-Württemberg is based on the branches mentioned above.

structures in the countries in which the firms are embedded. The interaction between the firms and the interaction between the firms and the environment, and thus the associated learning processes, that is, institutional learning also, are explanatory factors for national, and, in recent years, also for regional, innovative capacity. With the increasing internationalization and globalization of economic activities, the regional dimensions are becoming more important in the discussions about innovation systems (Braczyk/Cooke/Heidenreich 1997). The concepts of the national and regional innovation systems are not opposed to one another, they are complementary. On the one hand, regional innovation systems are tied into the national institutional contexts, and they thus contain elements of the national system but on the other they have developed their own specifically regional institutions. Although the element and relationships in national and regional innovation systems have not yet been identified in detail, it is uncontroversial today that the nature of an innovation system greatly influences the ability of an economy or region to produce and use innovations.

Research into both national and regional innovation systems has so far concentrated on the production system and on the emergence and diffusion of technological innovations and technological knowledge. The analyses of innovation systems mostly focus directly on institutions, organizations, and regulations connected with R&D. Suppliers of services in general, and of KIBS in particular, are not among the relevant groups of actors included in this research. The dynamic growth of knowledge intensive services in the present situation of structural change, however, appears to indicate that this segment is contributing to the production and diffusion of knowledge.

The focus here is on the question of the contribution KIBS makes to the innovation system. Analytically, this contribution can be divided into two parts. On the one hand, there are the direct effects of the innovative activities of the KIBS firms such as process, product or organisational innovations. The increasing tradability of knowledge intensive services in the last decade and the technological possibility of transmitting KIBS over long distances foster the internationalization not only of large KIBS firms but also of KIBS traditionally directed towards national and regional markets (O'Farrell/Wood/Zheng 1998). Thus, in the globalization process, knowledge products like management innovations or computer based

consultancy products are also becoming more important compared to technological innovations for value creation and competitiveness of national and regional economies.²

On the other hand, KIBS also have indirect effects and positive feedbacks on the demand side which can emerge through the use by clients of the services of KIBS firms. The role of KIBS in the national and regional innovations is closely tied to the 'products' these services supply to the market. Specialized expert knowledge, research and development ability, and problem solving know-how are the real products of KIBS. In innovation systems KIBS take on an important function in the **transfer of knowledge** in the form of expert technological knowledge and management know-how. As a result of the increasing differentiation and acceleration of the growth of knowledge and information and the vertical disintegration of the firm's functions, the more complex coordination of the changes in the firm's functions, production and sales requires specialized know-how not only in technological innovations but also in organizational changes. The growing national and international division of labour, the increase in knowledge, and the resulting concentration on the core competences of firms means that the competence of any individual firm is becoming narrower. Because the half life knowledge is becoming shorter, it will be increasingly difficult for firms to provide abundant intra organizational know-how in all the relevant areas and to keep up with the latest developments. On the other hand, independent KIBS firms which must establish themselves and ensure their survival with new products in the national and international markets are faced with innovation, time and quality competition which forces them to continually build up new competences in their fields of knowledge. It should be stressed that, as a result of this development, the integration of external and in-house knowledge and the integration and use of competences is becoming much more important for innovative changes and problem solving. KIBS firms as sources of external knowledge have, with their skills and their competences, become involved to a far larger extent than before in the modernization and rationalization of production, management and sales of firms. They also contribute to the diffusion of knowledge by spreading the knowledge gathered from experience and 'best practice' to firms in different branches.

The **integration** of different stocks of knowledge and competences is a major function which KIBS fill in innovation systems. Innovations and innovative problem situations in firms

² An example from Baden-Württemberg is the firm SAP which with its innovative product, a software solution called R/3, in a short time became the market leader in the international

normally affect more than one functional area and thus the integration of the service product in the organization of the customer firm of KIBS requires a high level of complementary knowledge as well as their own special core competences. The transfer of organizational innovations like the process oriented reorganization in particular requires not only the technological knowledge to analyse and evaluate the problem, it also requires management knowledge and social competences for following the process of change and for implementing successfully. Empirical studies in European countries show that for KIBS formal and informal networks and cooperations have a key function. Through these forms of working together they are able to cope with tension of having to be at the same time specialist and generalist and to unite depth and breadth of knowledge and to unite separate disciplinary fields of knowledge in the process of solving problems for their customers.

A further role played the KIBS in the innovation process is the **adaptation** 'of existing knowledge to the specific needs of the customer'. Cohen/Levinthal (1990) have shown that the successful use of external knowledge is influenced by the firms' existing knowledge structure. The changed competitive and market conditions have meant that more technological combination opportunities are available than in previous years and that organizational innovations cannot be implemented as all purpose models or as closed concepts. Successful transfer of knowledge is tied up with learning processes and the acquisition of new knowledge is smoother and less problematic when the innovative knowledge can be added to the knowledge structure already available within the organization. The fact that the relationships of KIBS have with their customers tend to be long term indicates their role in adapting the existing knowledge to the firm specific situation. They acquire explicit and tacit knowledge about the customer firm which makes it possible for them to adapt innovative problem solutions to the organization specific requirements and to integrate them into the corresponding firm structure and culture (Strambach 1995).

In innovative systems KIBS not only perform the functions of transferring, integrating, and adapting knowledge, they also **produce** new knowledge. Unlike material goods which are used up during consumption, consuming knowledge actually increases it. KIBS receive knowledge in the course of interaction process that takes place when the service is provided. This knowledge, which is created in the context of use, is not available with scientific

institutions and is to a large extent tacit knowledge. It is collected, rearranged, and organized by KIBS by turning it into new products.

4 Knowledge-intensive business services in the regional innovation system of Baden-Württemberg

Because of its long period of economic success, Baden–Württemberg, with its core–region Stuttgart, is one of the most robust and innovative industrial regions in Europe (Cooke/Morgan 1994). Like Emilia Romagna, it is considered to be a model of regional success. However, as the situation at the start of the 90s has shown, this view must be qualified. At the present time the capacity of the region to adjust is being put to the test by the current globalization and internationalization processes, the speeding up of technological change, and hard international competition.

4.1 Highly integrated industrial clusters and the institutional environment – the main strengths of the regional innovation system

The factors responsible for the long term success and the competitiveness of Baden-Württemberg have now been analyzed in numerous regional science studies. Two main aspects of the Baden-Württemberg innovation system can be determined from these. On the one hand there are highly integrated industrial clusters which are the engine of successful economic growth.

The region's economic growth, innovative strength and position as an economic location are very largely based on the efficiency of its industry. The main feature of its economic structure is the concentration on the industry branches of mechanical engineering, electrical engineering/ electronics, and vehicle construction. These branches can be grouped into two industrial clusters, one based on the automobile industry and the other on the mechanical engineering branch. The electrical engineering/ electronics branches are oriented towards these two clusters. The clusters make up the industrial core of the region and provide more than half of industrial employment. The vehicle construction cluster consists primarily of large firms, the mechanical engineering cluster of medium level firms, defined not so much in terms

of the firm size – many of these firms now have more than 500 employees –but rather in terms of the qualitative aspects of management structure and firm culture.

Large well known firms such as Daimler–Benz and Porsche in the automobile cluster, or Bosch in the electronics branch, have their origins in Baden-Württemberg and carry out their global operations from here. In the electronics industry there are, in addition to Bosch, numerous subsidiaries of multinational firms, such as IBM, Hewlett Packard, SEL/Alcatel, whose German headquarters are situated in the region. A further strength of the region is its many innovative medium sized firms, mostly family companies, which, although they are not so well known, are nevertheless leaders in their own markets. Simon (1996) calls these the 'hidden champions' of globalization. They include the firms Trumpf, Dürr, Märklin, Behr, Festo, Stihl, and Würth. The size structure of the industrial firms in the region is a mixture of a few large firms and many small and medium sized firms.

The relatively high proportion of exports –almost 40% – is an expression the strong competitiveness of the region internationally. Three quarters of these exports are produced in the three major branches and are concentrated on investment goods. The highly integrated structure, the stability of the supplier relationships, and the close cooperative relationships between the firms –vertical rather than horizontal – have been pointed to as the main features of the region which affect its competitiveness, particularly in regional science studies made at the end of the 80s/beginning of the 90s (cf. Sable/Herrigel/Kern 1987, Cooke/Morgan 1994, Schmitz 1992).

Studies of the competitive technological position of Baden–Württemberg show that this state has by far the largest concentration of R&D intensive industry branches.³ In 1991, 51 % of those employed in manufacturing in Baden–Württemberg were in R&D intensive branches, 40% of these in the 'higher grade technology' areas and 11% in the 'top grade' technology areas. These percentages are significantly higher than the equivalent West German averages of 35% and 9%.⁴ 24% of the industrial jobs in the higher grade technology areas in West Germany and 25% of those in the top grade technology areas are in Baden–Württemberg. Brecht (1992) concludes that one of the reasons for Baden Württemberg's high share in the

³ This holds both in absolute terms and relative to population size (Brecht 1992, p. 587). The R&D intensity in this study was defined as expenditures on internal and external R&D divided by the value of output of the respective product groups (Brecht 1992, p. 595.)

R&D intensive sector is the above average concentration on R&D intensive production areas within manufacturing. This is also a reason for the high, above national average, share of R&D intensive goods in total exports of almost 54%. In terms of the total exports of R&D intensive goods, Baden–Württemberg specializes in higher grade technology goods rather than top grade technology goods. Baden–Württemberg is a leader in terms of research and technology intensive goods both in the state and among other comparable regions.

The institutional environment is the second key element, which is considered as a crucial factor in regional innovation system. The particular institutional networks of relationships between firms and the long established links between firms and political actors are considered responsible for Baden–Württemberg's innovativeness and competitiveness. The supporting institutions and the regulation structure, which make possible flexible and efficient coordination within and between economy, politics, and science, are said to be among of the factors contributing to the success of the region. The interaction between four dimensions of the institutional landscape are important for the regional competitiveness. These are:

- the closely knit regional research infrastructure. Baden–Württemberg is the state with the highest density of universities under the German states (Landesforschungsbericht 1995). Besides universities and specialized technical universities, there is a large number of scientific–technological institutes and establishments which focus on applied research. Features of the research landscape are Max–Planck Institutes, institutes of the Fraunhofer Society, the Academy of Technology Assessment, the research headquarters of the German Aerospace Research Establishment (DLR), university bodies which carry out contract research, technology centres, and the numerous R&D departments of industrial firms.
- the occupational training and further education system which ensures that high quality diversified production can be carried out by highly qualified employees. By means of the predominant dual education system, overlapping and dovetailing qualification structures of skilled workers, technicians, and engineers have been developed which ensure the transfer of technological knowledge and technical or technological skills (cf. Naschold 1996).
- the decentralized knowledge and technology transfer structure for small and medium sized firms, which even in the 'Green Book on Innovation' is seen as exemplary. There is a long tradition of sponsoring innovativeness among SMEs in Baden–Württemberg. The growth of

⁴ R&D intensive goods are also divided into 'top grade technology goods' with an R&D intensity of more than 8.5% and 'higher grade technology goods' with an R&D intensity of between 3.5% and

the regional supply of intermediary consulting services had begun by the 70s. The most important intermediary institutions are the Chambers of Handicrafts, the Chambers of Commerce and Industry (IHKs), the German Rationalisation Board (RKW), and the Steinbeis Foundation for Economic Development with 220 technology transfer centres in Baden-Württemberg.

- the stable cooperative relationships between the employee and employer associations.

This institutional environment was an important precondition for the long period of prosperity enjoyed by the region. However, when international economic conditions changed at the start of the 90s, it was unable to prevent Baden–Württemberg coming up against limits to further growth.

4.2 Under-representation of KIBS in the regional innovation system and the loss of regional competitiveness during the globalization process of the 90s - a significant relationship ?

At the start of the 90s the industrial strengths of the region began to seem like weaknesses. The world recession was also affecting Baden–Württemberg. Saturation trends and intensified international competition in the predominant investment goods branches, particularly from the export oriented threshold countries in South East Asia, resulted in the loss of their traditional market shares. The characteristic key industries of the state and the Stuttgart region were caught up in a cyclical and structural crisis which caused a large fall in employment in the export intensive manufacturing branches. The structural changes led to a loss of 168,117 jobs (4.3%) in Baden–Württemberg between 1991 and 1995.

Increasing unemployment, falling export rates, and insufficient direct investment from the start of the 90s are further indicators of the limits to the competitiveness of Baden-Württemberg's regional innovation system. The discussion about Baden–Württemberg's competitiveness mainly concentrates on the weakness and lack of adaptability of the manufacturing sector and on the technological gaps that should be closed particularly in high tech areas.. It is very evident, however, that Baden-Württemberg is structurally weak in the area of services. Both at the end of the eighties and the middle of the nineties the share of employment in the Service sector there was below the national average. In Germany as a

whole over half of employees contributing to social security were working in the service sector but in Baden-Württemberg this share was only reached in 1995. The KIBS segment is also under represented compared to the national level. In 1987, 3.4% of those employed in Germany were in KIBS, in Baden-Württemberg only 2.3% were. Even in the middle of the 90s Baden-Württemberg was not yet at the national level, its KIBS share of employment of 4.7% was still a little lower.

Table 1: Changes in shares of employees in the service sector 1987–1995

	1987	1989	1991	1993	1995
	in %				
Germany	51.0	51.9	52.9	55.3	57.8*
Baden– Württemberg	43.7	44.7	45.7	48.5	50.6

*includes East Germany - the new German states

Source: Statistics of employees contributing to social security, Federal Labour Office, own calculations

The stagnation of the service sector in recent years is also reflected in its low growth rates. Between 1993 and 1996 annual growth rates were below 1%. KIBS, however, had an average annual growth rate of around 6% in these years. In Baden–Württemberg, as in Germany as a whole, the most dynamic growth was in this service segment. Between 1987 and 1995, 753,669 new jobs were created in business related services in Germany, 4,786,521 of them in the former West Germany. This corresponds to a growth rate of around 103% over the period as a whole. In Baden-Württemberg 77,344 new jobs were created a growth rate of 70% These figures show that the KIBS segment in Baden-Württemberg was smaller than the national average and that its rate of growth was also smaller.

However, it is argued that this structural underdevelopment is due to the fact that a considerable proportion of those employed in the secondary sector are in service occupations and not in industrial occupations. The 'institutional weakness' in the services area in general, and in KIBS in particular is a result of the particular 'Baden-Württemberg economic model' whose success in the world market is based on the strong core export industries of mechanical engineering, automobile production, and electrical engineering which produce technology-intensive and service-intensive products. The significant difference of Baden-Württemberg is not in its general services deficit, it is in the different institutional organisation of business

related service functions. It should be noted that these appear to be provided to a higher degree within the manufacturing firms themselves.

This structural difference must be taken into account when answering the question of why an economically successful region was unable to adjust to changes in the global environment. Two important implications can be derived from the functions KIBS perform for the innovation system outlined above.

On the one hand, fewer people are employed in independent services firms and KIBS in Baden-Württemberg. Consequently the negative developments in the industrial sector affect at the same time a large number of service employees working within industrial firms. On the other hand, the small share of independent KIBS limits the possible feedback and indirect effects that stem from their contributions to the production and diffusion of knowledge. KIBS make a major contribution to fostering the organisational learning processes at the firm level through their boundary spanning role. This role involves the integration of the different stocks of knowledge and competences available in different places and in different contexts, and adapting them to the requirements of the customers, they aid and participate in the innovation processes in various ways, for example by taking over a diagnostic role for customer firms, and act as catalysts for change. From this point of perspective, the delayed development of the supply of KIBS has presumably contributed to the lower adaptability and learning capacity of Baden-Württemberg. This will be looked at more closely in what follows.

4.3 The specific profile of KIBS in Baden-Württemberg - determined by the technical engineering KIBS

A detailed analysis of the KIBS shows that not all KIBS branches have below average aspects. The share of technical KIBS in Baden-Württemberg was 8 percentage points higher in 1987 than in Germany as a whole, and in 1995 it was 3.5 percentage points higher (cf. table 2). The specific profile of the service segment in Baden-Württemberg is determined by the technical engineering KIBS whose growth has been fostered by the industry determined demand side. The institutional conditions for the development of other branches of knowledge intensive business services, in contrast, have not been so favourable in the past. The 'Baden-Württemberg economic model' not only involved a strong export industry with high share of internal services, which produced technology-intensive and service-intensive

products. There was also a strong technical segment within the KIBS. These characteristics thus underline the significant influence of the institutional context.

Table 2: Share of employment in the individual) knowledge intensive business related service branches 1987 and 1995

Knowledge intensive business services	1987		1995	
	Germany %	Baden- Württemberg %	Germany %	Baden- Württemberg %
Legal services	11, 2	9, 9	8, 9	7, 5
Economic services	27, 8	26, 1	28, 6	29, 4
Technical services	32, 9	40, 9	32, 4	35, 9
Advertising	6, 5	6, 4	6, 2	5, 7
Other business services	21, 5	16, 7	23, 8	21, 5
All KIBS	100	100	100	100

Source: Statistics of employees contributing to social security, Federal Labour Office, own calculations

Looking back at the innovation priorities of the 80s it is obvious that these were strongly oriented towards technological innovations.⁵ The patterns of innovation are characterized by the concentration on technological innovations aimed at increasing the technical efficiency of products and processes and this has been seen as crucial for the competitiveness of the firms and the region (Paul/Ronneberger 1995). In these years the rationalization strategies of the industrial firms were primarily aimed at reducing costs and increasing efficiency by means of technological process innovations.⁶

An increasing need for specialised technical problem solving emerged in association with this innovation pattern and so too did a market for external KIBS suppliers who were able to provide innovative technological problem solutions for the industrial firms. The evolutionary development of a supply side consisting of suppliers of quantitative technical services in turn

⁵ The economic stagnation, which was triggered by the economic crisis and stagnation of the late 70s and influenced by the growing competition from Japan and the USA in key industrial areas and their market success with advanced technologies, was seen as mainly resulting from technological gaps in adaptation and deficits in the area of basic innovations (cf. Hauff/Scharpf, 1975)

⁶ The introduction of technologies like computer numeric control (CNC), computer aided design (CAD.), computer aided manufacturing (CAM), Product planning systems (PPS), and concepts of computer integrated manufacturing (CIM), are examples here.

provided the industrial firms with the opportunity to externalize this kind of service for cost or flexibility reasons. In the 80s interaction and learning processes between customers and suppliers led to increasing differentiation on the supply side of technological KIBS.

In Baden-Württemberg the orientation of the education and training system and the research infrastructure as described above was part of the favourable institutional framework which contributed to the development of exactly this technical service branch. Over the years this has been continually improved in order to ensure the transfer of technology related knowledge and technical and technological capabilities into production concepts and technical service products.

The political conditions were also more favourable for the development of the technical services branch in Baden-Württemberg than for other branches whose services are based on economic or sociological knowledge. In the 80s the scientific-technical knowledge produced acquired the status of a factor of production. The main aim of the national and regional strategies for the promotion innovation was to initiate technological innovations and to support the transfer of technological knowledge in the economy. Baden-Württemberg was the first German state, ahead of Nordrhein-Westfalen and Hamburg, to develop a technology promotion programme, and to develop a technology policy concept. It is obvious that the development and specialization of KIBS are a reflection of the interaction between supply and demand which is determined by the institutional background of the national and regional innovation systems.

4.4 Structural changes within the knowledge intensive business service branches

In the years up 1995, a major structural change took place within KIBS branches in Baden-Württemberg. The technical services branch became very much less important relative to the other branches. This is indicated by the continuously falling share of this branch in total business related services. In 1987 the technical services section included almost 41% of all business service employment. By 1995 this share had fallen by 5 percentage points despite further increases in employment. By contrast, since the end of the 80s computing services, market research, management and organisation consulting (which are included in the other business related services group), and economic services have clearly grown and were able to increase their share in the total business related services section (cf. table 2).

The catching up process of economic and 'other business related services', is also reflected in the figures for absolute employment. In both these branches the number employed more than doubled up to 1996. Nevertheless, most of those employed in the business related services segment in Baden-Württemberg are still in technical services where 68,000 people are employed.

The relative loss of importance of pure technological engineering know-how, measured by employment, in recent years also shows that the requirements on the demand side have changed in Baden-Württemberg. Technological engineering knowledge is without doubt still important – the growth of the segment shows this – but the share of this type of KIBS within the segment has been falling continuously in favour of integrated consulting services like, for example, management consultancies and human resource development consultancies.

4.5 Changing patterns of innovation in the 90s –a requirement for institutional change

In the 90s the pressure on firms to change has become particularly strong. The increasingly intense competition associated with globalisation, the rapid changes in the requirements of their clients, and the opportunities arising from new information and communication technologies have all contributed to the pressure on the firms to change. Under these conditions, organisational innovations like the introduction of decentralised organisational structures, total quality systems, lean management, team work, and process oriented re-engineering, are, becoming increasingly important for adaptability and productivity alongside technological innovations.

Although the crisis and the growth limits in Baden-Württemberg were seen as primarily technology and cost crises, the results of recent regional science studies indicate that it was mainly lack of organisational innovations at the firm level that led to loss of adaptability and productivity. In the 80s far less attention was given to organisational innovations than to technological innovations (cf. Braczyk/Scheinstock/Steffens 1996, Naschold 1996, Scheinstock 1997).

These findings support, the results of the analysis of the KIBS in the regional innovation system. Over the years the institutions which supported the regional innovation system made a major contribution to regional competitiveness, but in doing this they also helped reinforce the technical development path that was followed. Comprehensive structures and networks in

politics, science and the economy have been established for a long time. These are tailored to specific technological fields and branches of industry and this impedes innovative developments in other knowledge fields and branches. This can also be seen in the delayed development of the KIBS.

Organisational innovations which focus on fostering organisational and inter-organisational learning processes are connected not only with the technological restructuring of the firms but also with their structural and social restructuring. Most of them affect more than one functional area and for complete problem solving require the integration of different stocks of knowledge. The result is that, other fields of knowledge in economic and sociological areas are becoming important in addition to areas of pure technological competence. It is precisely in these areas of competence that the regional innovation system has 'structural weaknesses' in terms of both the institutionalised transfer of knowledge and the non-institutionalised production and diffusion of knowledge carried out by KIBS. It can be concluded that these deficiencies have retarded organisational innovation.

5 Conclusions

The development of KIBS in the regional innovation system of Baden-Württemberg shows that a particular institutional set up cannot promote innovative developments permanently because of the path dependence of learning processes and the resulting tendency towards rigidity. The political, economic, and scientific actors' awareness of the limits to regional growth and the role of these limits in the structural collapse and crisis in the 90s was a major factor in launching many new political and economic initiatives. The aim of these measures is to promote flexible adjustment processes in the region. A description and evaluation of the measures and strategies cannot be undertaken here. The challenge is to adjust the regional economic structures, which are still industry determined, in a way which will enable the region to survive in future by producing the services, information and knowledge crucial for competitiveness rather than investment goods.

To meet these challenges wide spread processes of change and adjustment in the institutional landscape are absolutely necessary. The challenge is not only to stimulate progress along the technology and industry oriented path which has been adopted. This will certainly continue to be necessary and is already happening through diverse bundle of measures. The challenge is

also to foster new fields of activity in the area of KIBS even though there is still little quantitative evidence, which can be used as a basis for decisions.

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