Know How Transfer in Dortmund

Dr. Norbert Jesse

Department of Computer Science, TU Dortmund University

Email: norbert.jesse@udo.edu

Executive Statements: 10 Lessons Learned

"10 criteria for success" – lessons learned from the presentations and discussions during the meeting in Dortmund, June 2010:

1. The early consensus between all regional stakeholders – in particular: City, TU Dortmund, and Chamber of Industry & Commerce – about the overall transfer strategy and the most promising activities has been fundamental ("Dortmund consensus").

2. Universities (TU, FH) and numerous research institutes are at the centre of the change process. Their impact on the climate of innovation, human resources and entrepreneurial activities is essential.

3. Starting point is a fair analyse facts and figures; avoid the wishful thinking-trap.

4. It is of paramount relevance to identify those competences that offer prospects of growth and competitiveness and to follow a cluster approach while strengthening these strengths.

5. The city-run start-up competitions ("start2grow") encourage entrepreneurship and are worth the considerable efforts and investments.

6. Cluster initiatives on a federal and state level offer considerable financial perspectives (subsidies) for innovations. They complement local activities and leverage local potentials.

7. Financial partners (Venture Capital, Sparkasse Dortmund) bring in money and experience.

8. Improve the quality of life ("Phoenix-West" etc.) attracts and bonds high-skilled (knowledge) workers.

9. Investments in infrastructure radiate an atmosphere of dynamic and encourage private investments.

10. Knowledge transfer and change management is a process and needs time to unfold (evolutionary perspective). It is essential to find the right balance between firmness and adaptability to changing requirements.

1. LOOKING BACK

1.1 Economic Decline

In the beginning of the 20th century, the economic wealth of Dortmund and the whole Ruhr-Area were based on coal and steel. During the reconstruction period following WWII, Dortmund's economy was propelled by considerable dynamism again, although in the long run it proved unable to cover up the problems caused by the structural changes at the end of the Fifties, particularly in its two basic pillars, the coal and steel industries. The first redundancies in the coal mining industry were determined in late 1958, marking the beginning of a continuous downward trend in this sector. 1987 saw the closure of Dortmund's last coalmine. The steel crisis, which began in 1975, was another shock to the region. The fusion of the steel manufacturers - Hoesch, Krupp, and later Thyssen - brought a temporary halt to this economic development. Dortmund's position as Europe's no. 1 beer-producing city, which dates back to the decade between 1950 and 1960, has also suffered from setbacks and mergers. Plain figures show how difficult it has been to compensate these structural changes: 90,000 jobs were lost in Dortmund between 1960 and 1994, the number of industrial employees decreased from 127,000 to 37,000.

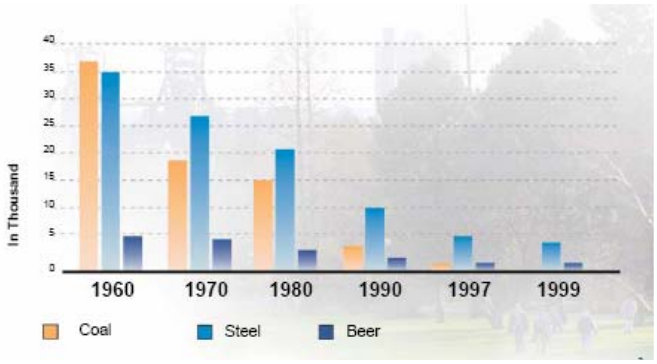

Fig. 1. Job losses in the former lead industries

1.2 The Road to Transition

Dortmund's decision-maker initiated the structural transition at an early stage. One forward-looking signal was the foundation of Dortmund University towards the end of 1968. Together with the College of Education, opened in 1971, it numbers average of around 22,000 students. The University of Applied Science, founded in 1971, and the College of Music have another 9,000 students and contribute to Dortmund's character as a scientific city. In total, Dortmund's TU and FH have more than 35,000 students and over 600 professors. A strong academic focus is on technologies like IT, chemical technology, mechanical engineering, automation, and logistics. This academic profile, which is geared to the requirements of Dortmund's new leading industries, was supplemented by courses in Microsystems technology and Bio-technology. For years, the IT faculty at Dortmund University is one of the biggest in Germany. Institutes like Fraunhofer Institute for Materials Flow and Logistics (IML), Fraunhofer Institute for Software and Systems

Engineering (ISST), Institute for Analytical Sciences (ISAS) and Max Planck Institute of Molecular Physiology add significantly to the scientific character of Dortmund.

1985 saw the initial steps towards the foundation of DortmundTechnologyCentre (Technology Centre) and DortmundTechnologyPark (Technology Park) – situated in close vicinity to the University.

During this process Dortmund's decision-makers have identified leading industries in order to select the thematic direction of Technology Park and Technology Centre. The overall goal was to create a prominent European centre for certain innovative technologies. The specific action plan referred to a multi-dimensional strategy:

- setting up new leading industries: information technology, Microsystems technology and e-commerce / e-logistics
- strengthening local companies
- expanding training, qualification, science and research opportunities
- developing Dortmund into a modern business metropolis offering a high quality of life and leisure time
- one-stop-shop for those starting up a new business or settling in Dortmund, and – last but not least
- a considerable increase in the level of employment.

Technology Centre and Technology Park were regarded as cornerstones with respect to these challenging goals.

Today, the roadmap for change in Dortmund is embedded in a strategy for the whole Ruhr-Area (Initiativkreis Ruhr, 2007) – with "Meta-Competence Fields" focussing on Energy, Material Sciences and Logistic.

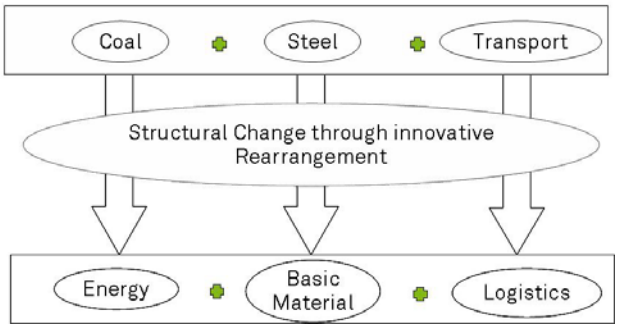

Fig. 2. Roadmap for the economic transition

These competence fields are not able to stand on their own but require a solid foundation on industries like IT and Chemical Industry.

2. TECHNOLOGY CENTRE DORTMUND

Since its foundation in 1985, the Technology Centre has become one of the biggest and most successful centres of its kind. Today, approx. 180 small companies have their offices in the buildings with an overall surface area of 81,500 sqm in 2005.

The centre supports new businesses and existing small- and medium-sized companies in transforming business ideas into market-ready solutions, offers individual consulting services during the foundation and set-up phase, an excellent infrastructure for product development and subsidies to help establish a company.

One essential precondition for the settlement in the Technology Centre is a competitive product concept with a convincing business plan. This postulated the Technology Centre is designed to operate as a development centre and laboratory where prototypes and pre-production batches are tested, based on technologies pooled from Dortmund's existing scientific potential:

- Microsystems technology
- Software / telecommunications / multimedia
- Electronics / electromagnetic compatibility (EMC)
- Quality assurance
- Logistics / material flow / packaging
- Environmental technology
- Automation / robotics
- Biomedicine / proteomics.

The efficiency of the Technology Centre is based to a large extent on its vicinity to the TU Dortmund and research institutes, fostering an intense and comprehensive climate of dialogue between science and industry (for instance indicated by numerous local committees and meetings. The objectives are manifold:

1. Promoting the establishment of businesses
2. Providing infrastructures for start-ups
3. Co-operating between science and economy
4. Trapping regional development potential
5. Promoting regional economic development
6. Imparting and qualifying information
7. Initiating promotional projects and co-operation
8. Installing technical early warning systems
9. Developing business concepts
10. Improving the innovative climate

Since the beginning, numerous companies have been settling in Dortmund's Technology Park and Technology Centre realising considerable growth, even under difficult economic conditions. *A flexible co-operation between research, development, industry and service industry is a very special added value for the companies*.

3. TECHNOLOGY PARK DORTMUND

The Technology Park has been developed in synergetic perspective with the Technology Centre and is for many years a national showcase of a successful cluster of attractive technologies. International studies list it among the leading and most successful technology parks, alongside Sophia Antipolis, the Research Triangle Park, MIT University Park and Cambridge Science Park. On a plot area of 40 ha a total of 12,672 jobs were created (8,448 directly and 4,224 indirectly), including those at the Park till 2001. 9,504 of these employees live in Dortmund (for new data see 6.).

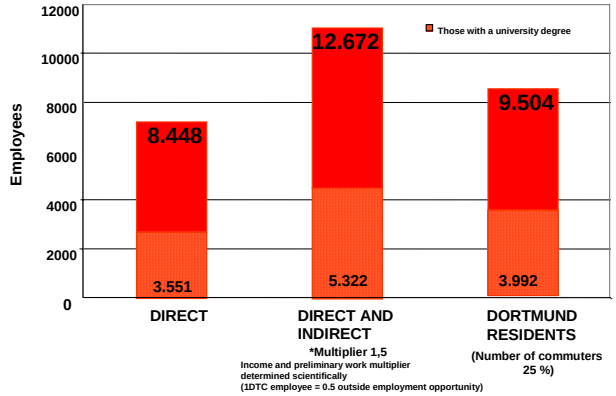

Fig. 3. Employees at Technology Park in Jan. 2001

Today, the Technology Park is a hub for newly founded companies and a location for companies coming from other regions of Germany. The proximity to the university and scientific institutes is regarded as a significant option for these companies to maintain or further increase their innovative product or service portfolio.

Fig. 4. The Technology Park in 2003

From the beginning, the focus was on fields and industries with a strong research core at TU Dortmund.

a) Information Technology (IT)

IT companies grew faster in Dortmund than in other comparable German locations, to a large extent thanks to Technology Park with its sophisticated profile, which attracts companies specializing in the IT services and telecommunication services segments in particular. There are currently 819 IT companies with 12,800 employees approx. in Dortmund. Between 1999 and 2002 alone, Dortmund's IT companies increased their number of employees at a rate of 8.5 per cent per annum – almost 3 per cent above the average per annum rate in the German IT sector –, making the city one of Germany's leading IT locations.

b) Microsystems Technology (MST)

Dortmund has succeeded on an international level in defining itself as a Microsystems technology (MST) location in terms of innovation and production. As a cross-sectional technology for user innovation in different sectors like sensor technology, telecommunications, optics, laser technology or medicine, Microsystems technology has revolutionized day-to-day life. Microsystems technology components from Dortmund can be found everywhere, from the electronic features of a car through asthma inhalators to space satellites.

Dortmund has around 1,400 specialists in 20 Micro technology companies, over half of them at the Technology Park and Technology Centre, where they have found a supportive infrastructure, including

- Zentrum für Aufbau- und Verbindungstechnik (Centre for Structural and Connecting Technology)
- Zentrum für Mikrostrukturtechnik (Centre for Micro technology)
- Zentrum für Umweltmesstechnik und Chemosensorik (Centre for Environmental Metrics and Chemosensory), and
- Interessengemeinschaft zur Verbreitung von Anwendungen der Mikrostrukturtechniken (IVAM NRW e.V.) (Association for the Promulgation of Applications of Micro technologies). A "virtual company" with over 100 international member companies, the IVAM NRW promotes Microsystems technology.

c) Logistics

Dortmund's logistics industry is path-breaking in the German logistics services and logistics research sector, while TU Dortmund University being the first university to offer a degree course in logistics. Fraunhofer Institute for Materials Flow and Logistics (IML) was successfully moving ahead. Next to classic logistics, Dortmund has seen the advent of e-logistics at the interface of operative logistics and e-commerce as a complementing cluster. More and more, Dortmund has established itself as a favourite location for e-logisticians working on customer-oriented and innovative solutions in specialized fields like

- packaging logistics,
- transfer mode systems,
- traffic flow systems and telematics,
- operating systems for logistics and distribution centres.

d) The BioMedical Centre (BMC)

The launch of Dortmund's BioMedical Centre in spring 2002 is an example of the agile approach to invest in new and trend setting technologies – starting with a critical mass of researchers in the universities and research institutes. The BioMedical Centre is positioned as a competence centre specialising in the sectors of bio-medicine, bio-informatics, proteomics and bio-microtechnology. It aims at young companies that develop and promote products, processes and services, and new or growing businesses with a high market risk and high capital requirements. Following its completion at the end of 2003, the BMC offers over 6,000 sqm, featuring state-of-the-art laboratory and production installations, and has included the ProteomCompetenceCentre, with its School of Proteomics, since mid-2004. Biotechnology is the basis of a new technology cluster in Dortmund, featuring an extensive synergy potential in direct interaction with the established growth sectors.

4. FINANCIAL IMPACT

The direct impact of Technology Park and Technology Centre can be figured out by the number of employees and companies. However, in financial terms, there is a much broader influence due to indirect and multiplication effects and impacts resulting from tax increases that enable the local government to extend investments and social activities (Malina, 2008).

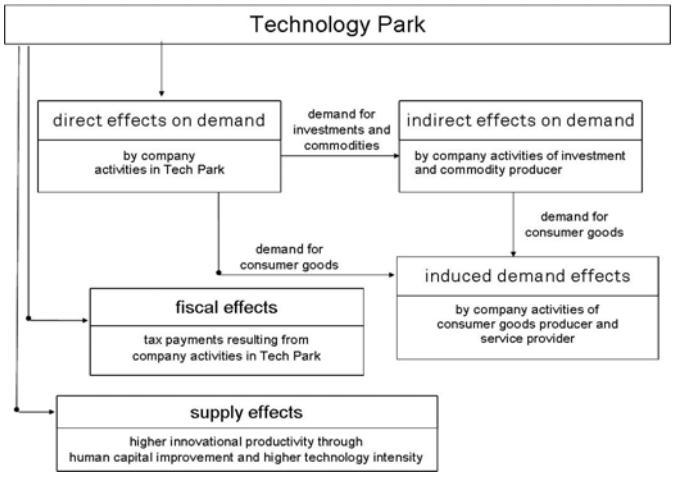

Fig. 5. Financial Impact of Technology Park and Technology Centre

According to this analysis, more than 16,000 jobs were created, more than 8,200 within the Park and almost 11,500 in the city. Per year the GDP increased around 900 Mio. Euros.

	Direct Effects	Indirect Effects	Induced Effects	Total
GDP				
.- national		335.182.380	131.556.661	**904.651.881**
.- local	437.912.859	106.629.355	82.422.433	**626.964.647**
Employees				
.- national		5.417	2.416	**16.048**
.- local	8.216	1.743	1.513	**11.473**
Salaries				
.- national		140.754.574	47.750.217	**451.299.277**
.- local	262.794.486	44.133.600	29.916.304	**336.844.390**

Table 2. Financial Impact

While the salaries sum up to 336 Mio. Euro (almost 40,000 per job) the impact on the national level (and GDP accordingly) is more than double.

6. CHALLENGES OF THE FUTURE

Although Technology Park and Technology Centre have proved to be a surprising success Dortmund still has to face considerable economic problems:

- a still high unemployment rate
- the integration and education of migrants
- high governmental budget deficits
- a demographic change and a foreseeable deficit in high-quality work force.

In a recent analysis of the economic situation in the Ruhr-Area three fundamental problems were stated (Bonse-Geuking, 2010):

- economic growth too weak
- structural economic change too slow
- new companies and business models too fragile.

Furthermore, the globalised economy affects all business models. Political initiatives on a local and regional level are necessary to react to the growing international competition. This in mind, a high-ranking commission was implemented by Initiativkreis Ruhr to discuss the economic growth potentials for the Ruhr-Area. This document identifies four main influential criteria (Fig. 6) helping to sort out local strengths and weaknesses as well as opportunities and threads.

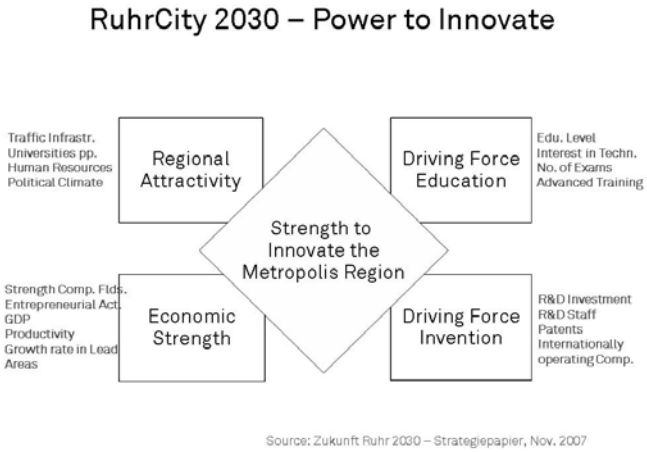

Fig. 6. Innovation Life Cycle (Initiativkreis Ruhr, 2007)

The past has demonstrated the complexity of a regional transition. The "Dortmund Consensus", i.e. the cohesive and co-ordinated efforts of the city administration, the universities and the chamber of industry has proved to be the essential (complexity controlling) key to the successful implementation of Technology Park and Technology Centre. However, what seems to be a harmonic triad turns out to be web of actors with diverse interests (Fig. 7).

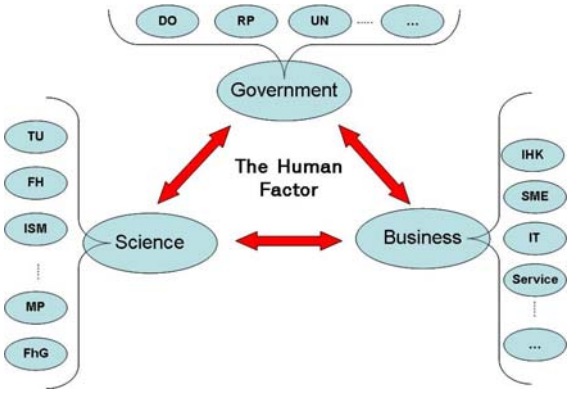

Fig. 7. Local actors and stakeholders

Looking back, the harmonisation of these interests gave Dortmund an advantage in the competitions with neighbouring municipalities and metropolitan areas in Germany.

7. CONCLUSIONS

Many companies who have settled in Dortmund's Technology Park and Technology Centre have managed to survive and growth. The rate of insolvent companies during 25 years in the Technology Centre, for instance, is less than 5 %. This positive balance results from the cluster building approach and the focus on core competencies in the field of IT, Microsystems technology and logistics. Technology Park and Technolgy Centre have proved to be relevant driver of economic transition, encouraging and fostering academics to start a business instead of looking for a "safe heaven" in one of the bigger companies in

Germany. Without doubt, TU Dortmund University was the spark that ignited this process of economic recovery and transition. Complemented by scientific institutes, a critical mass could be established that serves as a substantial breeding ground for entrepreneurial activity.

Not discussed in the previous chapters has been the role of federal and state policies. Here it can be referred to the attachment outlining some case studies. Obviously, a constant flow of financial support encourages local actors to go to market with innovative ideas or to initiate cluster building activities.

A variety of studies show that there still much more potential for future collaboration between companies and universities. In Dortmund, an evaluation has led to some new ideas that still need to be transferred into a concrete political action plan.

Attachment: Brief Summary of the Talks of the Meeting dated June 24, 2010

We refer to the presentations available on the KnowTS-website. Here we only briefly summarise some central statements of the presenters.

Dr. Norbert Jesse, Department of Computer Science, TU Dortmund: Technology Transfer and Knowledge Transfer: Introductory Remarks

See the summary above. The presentation also emphasises the outstanding economic development in Asian countries.

Fritz Krieger: Transfer Agency, TU Dortmund: „The Transfer Agency at TU Dortmund: Impact and Potentials“ (including also information about the Patent Scout activities)

The main tasks of the transfer agency at TU Dortmund are to support the exploitation of know-how and research results, to foster cooperation with companies and to encourage start-ups and spin-offs building.

Furthermore, the transfer agency pursues the goal to promote entrepreneurship within TU Dortmund by trying to create an entrepreneurial culture and to identify and encourage potential business founders. To achieve this, a network between Dortmund's universities, regional technology centres and the City of Dortmund was founded ("G Dur"). Various teaching courses for entrepreneurship were installed at TU Dortmund and contests were tendered. As a result of this, 70 university spin-offs could be realised since 2002 and the entrepreneurship courses were attended by more than 600 students.

In the field of patent marketing the transfer agency cooperates with ProVENDIS, a state run service provider, to ensure exploitation of patents and to create awareness at university level. The goals are to generate revenues through licensing and to form strategic contacts to companies. The instruments to achieve these goals are a good information flow between all parties and a high efficiency in decision making. Results of this process are a rising number of patent applications and revenues.

According to an open evaluation, the transfer agency excels in project development; acquiring funds and developing structures in IPR management and entrepreneurship promotion; however, still to be improved are the coherency in work and the cooperation with companies.

Angela Märtin, Transfer Agency TU Dortmund, Project Coordinator "kultur.unternehmen.dortmund": "Supporting student start-ups in the creative industies"

„kultur.unternehmen.dortmund“ is a 3-year project coordinated by the transfer agency of TU Dortmund to support start-ups in the creative industry. The activities are clustered into four subprojects: qualification, coaching, workshops and incubator.

The qualification subproject consists of interdisciplinary courses, projects, seminars and expert talks. Students of various departments can attend these events and receive a certificate.

The goal is to impart knowledge about key competences for successful business start-ups and to support entrepreneurial thinking.

The coaching is provided by experts who mentor and advice students interested in starting up their own business and inform about certificate and start-up support programmes.

Workshops are held for development and elaboration of business ideas. Project groups work together with experts and evaluate business ideas with regard to customer value and marketability. The workshops lead to a business-plan competition.

The incubator is supported by regional technology centres and companies of IT sector and arts and creative industry. It provides free fully equipped office space for three months, infrastructure and local networks.

Diego Atienza, Technology Centre Dortmund: "The Impact of Technology Centers: The Dortmund example"

Technology centres are located all over Germany but about a quarter of the 400 centres are in the state of North Rhine-Westphalia. The Technology Centre in Dortmund was founded in 1984 and supported about 430 companies since then. The rate of insolvent companies is below 5%. Within the technology park, approx. 280 companies with 8,200 employees are located on 40 hectares. The incubator space has developed rapidly and almost doubled within the last ten years. The Technology Centre is divided into various competence centres which are located at different sites around the city of Dortmund. These competence centres offer infrastructure for the different fields of technology.

A good example of structural change is the project at Phoenix West and Phoenix See. A disused industrial site is transformed into a business area and a lake. This holds a big potential for development and the Technology Centre has already located new competence centres in this area.

Thorsten Hülsmann, Excellence Cluster Logistics: "Cluster Policy in Dortmund – From Theory to Implementation"

The Federal Ministry of Education and Research is fostering long-term cluster activities to encourage innovative products, processes and services. This initiative is a core element of the high-tech strategy of Germany. Essential is the cooperation of companies, scientific institution and politics. A consortium lead by institutions from Dortmund succeeded in propagation a logistics cluster, comprising numerous scientific institutions from Dortmund, more than 60 SMEs and some strong companies like Deutsche Post AG, Deutsche Bahn AG and the like. This "EffizienzCluster LogistikRuhr" is managed by the "EffizienzCluster Management GmbH (ECM). Mr Hülsmann, one of three Managing Directors, outlined the Excellence Cluster Competition, selection criteria and the seven lead topics and fields of innovation of this logistics cluster.

Nomo Braun, Agiplan GmbH: Cluster Policy Made in North Rhine-Westphalia and the AUtoCluster.NRW

In this presentation the 16 state clusters were introduced. The scope and results of Innovation Contests were sketched and the funding activities on this state level outlined. AutoCluster.NRW is one of the 16 clusters within NRW's cluster policy. Referring to this cluster, numerous activities and objectives were discussed.

Birke Jantz, Economic Development Agency, City of Dortmund: "The future of Technology Transfer in Dortmund"

Dortmund's Triad once consisted of steel, mining and brewery. Structural change has lead to a decline from 50% to about 20% of the industrial sector within the last 30 years. About 600 hectares of former industrial sites are now available as development areas.

In 2000, the dortmund-project was founded as a public-private-partnership between the City of Dortmund, the economic development agency, ThyssenKrupp Steel and McKinsey&Company. Goals of the project are to improve infrastructure, to create an innovative environment, to support people and their skills and to raise capital.

Milestones in the process of change were to establish a new location for high-tech companies and living ("Phoenix-West"), to encourage the foundation of start-ups in certain fields and to foster companies to follow a growth path. The main objective has been to increase employment by 70,000 and, incidentally, to change the image of the city. The competition of locations consists of competition for markets and competition for people. In the competition for markets, Dortmund aims to become an internationally acknowledged technology and business location in a creative environment. The goal in the competition for people is to offer high living and working quality.

Strategic themes reaching till 2018 include interlinking technologies and sectors, supporting companies, interlinking knowledge ("Der Innovationsstandort") and further develop working and living quality at the city of Dortmund.

„The Location for Innovation" initiative ("Der Innovationsstandort") is a new concept to overcome obstacles in the process of modernization. All regional stakeholders are members of the network – state institutions, universities and research institutes, the two chambers and unions, to name the most important partners. The network consists of various working groups for communication science, network cooperation and marketing, transfer of human resources, funding projects, advanced education and coordination.

Birke Jantz, Economic Development Agency, City of Dortmund: "Start2Grow Competitions: How to Encourage Entrepreneurship"

„start2grow" is an initiative of the Dortmund Project and arranged as a founders' contest to encourage entrepreneurship. Since 2001, 27 „start2grow"-contests have taken place with about 700 participants and 2,500 reviewed business plans. These contest have lead to the founding of about 600 start-ups, about half of them in Dortmund. More than 3,100 jobs have been created. 1,100 jobs and 80% of the companies still exist.

Although „start2grow" is open to all sectors, it focuses on information technologies and further "new" technologies. Technological orientation is emphasized by special prizes in these

fields, sector-special events in cooperation with competence centres and open events between the contests supported by third party.

The process of the founders contest starts with a kick-off event and continues with creation of a business plan and a founders‘ seminar and leads to the founding of the company. Coaching and sector special events advance the networking. Prizes are awarded at the different stages of the contest along with special prizes.

„start2grow“ is a public-private-partnership network for founders with about 600 coaches from all different sectors. It offers best contacts to capital providers and financial institutions. The quality management system is certified. It also offers support after contest participation.

Kai Neuschäfer, Faculty of Business, Economics and Social Sciences, Chair “Innovation and Entrepreneurship Management”, TU Dortmund: Transferring Innovations by University Spin-offs

There are many ways to transfer knowledge from research institutions into economy. There are four main alternatives: transfer of protected intellectual property like patents, transfer of knowledge „in the head of individuals who leave university, transfer of knowledge from joint research projects between university and industry and transfer of knowledge which is disclosed and widely spread by publications or transferred within interactions and occasional conversation among scientists. Technology can be transferred formally for example by a patent which is sold, licensed or assigned to the startup or informal by university staff who create a startup.

Newly founded companies based on intellectual property **originated** within a university or research center are named “academic spin-offs”. The absolute number of university spin-offs is rather low compared to other start-up, nevertheless it is a topic of high interest because these spin-offs are considered to be of high value as they stimulate economic development. In fact, studies support that they are more successful than other start-ups. They create more jobs, especially knowledge intensive jobs; they outperform other companies in a way that they have a higher survival rate and generate higher revenues.

Spin-offs are considered an effective way to transfer technology. They are often based on patent or other forms of protected intellectual property. Another advantage compared to high tech startups is the fact that the inventor of the technology often plays a role in the new enterprise and is able to continue the development. It needs the know-how and the belief of the inventor to bring the invention to a stage of applicability. Spin-offs are of interest especially for local politicians because they are often located to the mother-organization to maintain the ties which can be helpful in its development so they can be a mean of regional economic development. Most of the successful spin-offs come from the bio-medical sector and the IT sector.

There are clearly identifiable determinants, which influence the venture creation rate of a university. Most spin-offs with growth potential originate in engineering sciences. Universities need to build up technology transfer infrastructure. Scientists who conduct research at a high level are more likely to establish new ventures, because they are aware of

the extraordinary economic value of their research. Regional availability of venture capital is of high importance as venture capitalists not only provide funding but also management support.

University spin-offs can lead to a conflict of interests. Involved staff could neglect their academic duties. The use of public resources for commercial interest could also lead to conflicts among university members. Scientific independency has to remain intact as there are potential conflicts of interest.

Universities can support spin-offs by offering qualification programs for venture management and individual consulting and support. They can provide infrastructure, support the creation of incubators and science parks, develop networks and provide capital.