



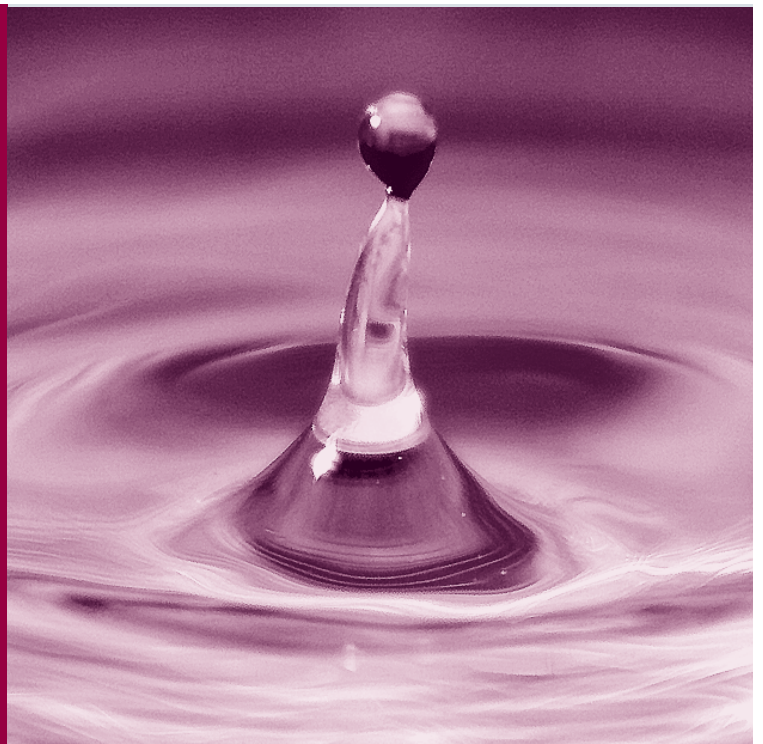
OFFICE OF TECHNOLOGY ASSESSMENT
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Academic spin-offs in eastern and western Germany and conditions for their success

Summary

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SUMMARY

Economic and innovation policy-makers expect especially significant structural impulses from company start-ups from the science area – so-called »university or academic spin-offs«. They are regarded as future-oriented, and should grow more rapidly than »normal« start-ups, thus contributing more strongly to the economic structural change. They act as a significant medium in the technology transfer process and could create considerably more new jobs in future than other start-ups. Due to its differentiated and densely packed research landscape, Germany possesses a particularly large potential for academic spin-offs, which has not yet been sufficiently exploited. The main question in this project was which influence certain pre-conditions have on the intensity of spin-off activities and on the (subsequent) commercial success of the new companies. Further, the question was posed whether academic spin-offs can possibly fulfil the innovation and structural policy expectations placed in them.

This policy benchmarking report by the Office of Technology Assessment at the German Parliament (TAB) on behalf of its Committee for Education, Research and Technology Assessment focuses mainly on the pre-conditions for the success of commercial spin-offs started by university graduates or scientists directly from universities and non-university research institutions. Equally, the effects of the different strategies and policies of the research organisations with regard to company start-ups are examined, and the differences between west and east Germany are investigated. Finally, conclusions will be drawn for new promotional approaches.

39 explorative case studies with in-depth interviews were carried out with academic spin-offs, as well as a written survey of a further 71 spin-offs from various scientific organisations. All in all, the total number of 109 usable cases enables us to derive statistically sound results.

SUCCESS OF SPIN-OFFS

The yardsticks for success frequently used in political circles such as employment growth or structural change are, taken alone, not entrepreneurial goals or success categories. Political targets differ fundamentally from those of entrepreneurs and industry as a whole. Besides, we must differentiate consistently between »success criteria« (also called »success indicators«) and »success factors«.

This TAB report focuses on the latter. In order to judge, however, whether a spin-off is successful or not means that appropriate success criteria must be de-



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terminated. The report discusses these concepts and proposes practical terminology/terms. In order to examine the factors influencing enterprises regarding their relevance for success, the companies investigated must firstly be judged on their business or commercial performance. Using six combined success indicators as scores, the 39 case study companies were assessed as follows:

- > Seven companies can already be characterised as successful today (in the following marked with the success symbol ++);
- > 21 promising firms are on the way to being promising (success symbol +);
- > ten firms are not yet successful; their success must still be confirmed, or their situation is still very unstable (success symbol 0);
- > one company can already be recognised as unsuccessful (degree of success -).

The current profit situation must be considered separately from the business success potential. The profit status of the case study firms is summarised as follows:

- > Seven enterprises are making big profits,
- > 16 other firms are making modest to middling profits,
- > six are expecting profits or at least a »black zero«in the current year, and
- > ten companies are not yet in the net income area or profit zone.

CHARACTERISTICS OF THE CASE STUDY GROUP AND SURVEY RANDOM SAMPLE

The enterprises are located today as follows:

- > 53 of the 71 companies in the survey sample and 23 of the 39 firms in the case study group have their headquarters in west Germany (OFS, for old federal states);
- > 18 of the 71 firms from the survey and 15 plus one with a secondary location of the 39 case study enterprises are domiciled in east Germany (NFS, new federal states) and Berlin;
- > one case study company re-located abroad which had previously been founded in west Germany.

If one considers the age of the spin-offs, it can be seen that the majority of the firms in both samples emerged during the New Economy and stock market boom between 1998 and 2001.

The turnover statistics for the year 2004 serve to further characterise the firms examined: 29% of the companies from the survey and 35% from the case study group achieved turnovers of over 1 m Euro and ca. 49% from both samples have a turnover of up to 1 m Euro. The individual turnovers in the calendar year 2004 fluctuated in a range between 0 to 58 m Euro, three companies had no or only very small turnovers. The average turnover for all enterprises amounts to 2.35 m Euro in 2004 (extremum-adjusted however only 1.09 m Euro). The turnovers of all firms together came to 221 m Euro.

At the time of observation, the companies were still quite small, with only few exceptions. The number of employees ranged between zero and 221. The average number of employees in 2004 (including the working founders) amounted to 18.7 for all firms (extremum-adjusted 13.6). Taken together, in all 109 enterprises of both samples 1,983 persons were employed. Over 56% of the companies in the survey and 49% of the case study group have less than ten, but 19% respectively 31% have more than 20 staff members (including working founders). The most frequent size in the survey group is 10 to 19, in the case study group three to five employees. Only nine enterprises have more than 40 employees (two in the survey group; seven in the case study group), thereof two with over 200 staff members.

SECTOR CLASSIFICATION

The spin-offs investigated were distributed across a wide spectrum of economic sectors. In the lead are medical, measurement, control and steering technologies, data processing/data bases and the provision of services. Striking is further the high share of firms in the research and development area, as well as in the chemical industry.

EMPIRICAL FINDINGS ON SUCCESS OR HAMPERING FACTORS

PERSONNEL-RELATED FACTORS AND SOCIAL CAPITAL

The age distribution of the founders support the theory that most start-ups take place in the so-called »free choice period«: in 30 case study firms the founders were between 25 and 40 years old.

The social network, also called social capital, was mentioned not only in the written survey, but also in the case studies. Differences were made between the



so-called »close circle« (the closer network of the family and intimate friends) and the »distant/not-so-close circle« (not such close friends, colleagues, business partners). All in all, the rather mediocre evaluations of the significance of social networks show that their benefits, at least as perceived by founders in the samples, does not have the great significance for the start-up process which the theoretical debate assigned it.

QUALIFICATION AND PROFESSIONAL EXPERIENCE

In the total of 109 companies participating in the survey and case studies, 393 persons took part in the actual founding, 206 thereof as full-time active founders (the other persons in an advisory, controlling and/or part-time function).

352 persons had a university degree; 223 had doctorates or had completed habilitation theses. Thus only 41 persons from the founder teams did not possess an academic degree. The high share of academics is a logical consequence of the choice of target groups and cases; it is one of the constituting features of academic spin-offs. The percentage of founders with university degrees is equal in east and west germany (89%, referring to the number of all original founders). Striking east-west divergences are only seen in the above-average share of doctorates and engineering sciences in the east German founders.

In 74 cases the disciplines natural sciences and/or engineering were exclusively represented in the founding teams, while in eight cases the team was composed of non-technical disciplines (e.g. economics, social science, law and the humanities). 25 founder teams on the other hand are multi-disciplinary in composition.

MOTIVATION FOR FOUNDING AND INFLUENCE OF THE PARENT ORGANISATION

The question about the motives for founding, respectively the initiators' reasons for founding the spin-offs played a crucial role in the explorative interviews in the 39 case studies.

Clearly leading the motives was the desire for independence, the wish for autonomous, entrepreneurial activity. The two second most frequently cited motives or reasons were »tempting offer ...« and »favourable moment ...«: here possibly a supposedly favourable opportunity was grabbed, either because familiar/trusted persons (a superior, a friend, a colleague) invited the founder to collaborate in a founding project, because an industrial partner articulated a need for

a certain product, process or a service missing from the market or because new/exciting and promising market opportunities open up, due to a technological trend. These are clearly market-driven impulses. Dissatisfaction with the previous work conditions or work climate hardly plays a role as stimulus or motivator. The two motives »fun, pleasure in experimenting in one's own special field« and »threat of unemployment, respectively work contract ending«. The motive »favourable financing opportunities« is very seldom mentioned.

ENTERPRISE-SPECIFIC SUCCESS FACTORS

INITIAL FINANCING OR FUNDING

The utilisation frequencies of certain types of financing in the start-up phase are depicted in the following overview. It must be emphasised that the citation frequencies say nothing about the finance volume; often utilised financing sources can be insignificant in terms of volume.

East German founders quite often make use of public promotional programmes which include promotion for company start-ups (e.g. federal programmes like FUTOUR, EXIST, Pro-Inno and InnoWatt as well as Länder programmes). In the interviews they frequently emphasised how essential these programmes were for the start-up, that without them in many cases a foundation would have been out of the question. In contrast, only a third of the west German founders took advantage of start-up promoting programmes.

FORMS OF FINANCING UTILISED IN THE FOUNDING PHASE

Financing Form	West (n = 76)	East & Berlin (n = 31)
founder's own capital	93%	97%
Promotional subsidies	33%	52%
promotional loans	11%	19%
Bank Loans	12%	13%
other loans	5%	19%
publicly promoted equity capital	9%	16%
private venture capital	16%	13%
Turnover proceeds, cash flow	25%	29%
other forms of financing	93%	6%



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Financing via loans is more utilised in east Germany than in the west. However, the share of banks/credit institutes involved in providing loans for young academic spin-offs could/should be increased.

Equity capital plays a different role in east and west according to different variants. (Partly) government promoted equity capital plays a greater role in east than in west Germany, whereby the reverse applies for private equity capital.

It is remarkable that, right from the beginning, over 25% of the firms can support a considerable share of the financing in the first months through turnover proceeds or cash flow, even if only at a low level, in both parts of the country. The founders exploit their market chances as early as possible and thus save capital.

FOUNDER TEAMS AND THEIR COMPOSITION

In the east German (respectively west German) sub-sample 132 (261) original founders started up 32 (77) enterprises, i.e. the team size was on average 4.1 (3.4) persons. In a number of companies some founders in the team are or were from the beginning only active part-time, in particular the co-founding heads of institutes and professors. Also earlier colleagues from the research team at the research institute or university chair have not always joined the spin-off. Reduced to the ultimately active full-time founders, the average team size was only half as large, in the east only 2.1 and in the west only 1.8. Spin-offs launched by individuals are rare in both samples. In the written survey, founder teams with two persons are most frequent, in the case study group teams with three persons. Founder teams of more than five people which can be regarded as rather detrimental for the company's development due to the associated increasing conflict potential, appear only in only ca. 13% or 8% of the cases.

Women participate in 20% of the founding teams (18% in the west, 24% in the east), numbers which give rise to the hope that the founding propensity is increasing among female scientists. However, no case is known in which a woman was obviously the initiator of and driving force behind the start-up. Nonetheless, women often assumed management tasks.

ENTERPRISE AND GROWTH GOALS

Admittedly, only two of the questionees in the case study group declared themselves unequivocally for the goal of future rapid growth (two very successful enterprises), but a further 15 companies are striving for a stable to medium growth and only four explicitly a low or no (further) growth. In 18 cases no data was supplied on the growth targets. It can be supposed that not only a lack of success can be the reason for modest growth goals, but actual success can also provide rational reasons for such reserve: so the attainment of a manageable company size and thus still controllable by the founder team is regarded as an important pre-condition for success, which must also be maintained in the future. If all the statements in the interviews are summarised into actual growth paths, the following distribution emerges for the case study group: circa 84% of all enterprises in the case studies display an unequivocal growth orientation, whereby however the stable, constant, but not rapid growth dominates at 57%. Nevertheless, 27% demonstrate fast expansion.

TYPE OF INNOVATION AND POSITION IN THE VALUE-ADDED CHAIN

The business models found in the case study enterprises were classified into four simple basic types: product, process or process innovations, software products and (innovative) services. Contract developments are also counted among the latter, which should ultimately also lead to products, processes or software.

Product and process innovations dominate ahead of providing services. Among the latter not only innovative services are found, which form the nucleus of the business models, but also classical, product-related services. The successful, respectively promising firms are most frequently to be found in the areas of process innovations and software, closely followed by services and product innovations.

German young technology enterprises or science-based spin-offs tend mainly to be manufacturers of capital goods or suppliers of system components or primary/intermediate products. They must therefore obey quite different market laws and also pursue quite different marketing forms and marketing strategies than companies which serve consumer goods markets directly or indirectly.



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POSITION IN THE VALUE-ADDED CHAIN ACCORDING TO DEGREE OF SUCCESS

Position in the value-added chain	Frequency acc. to degree of success				Total
	++	+	0	-	
System components or supplier parts	5 (23%)	1 (59%)	4 (18%)	0	22 (100%)
End product of a capital good	2 (15%)	5 (38%)	6 (46%)	0	13 (100%)
End product of a consumer good	1 (17%)	2 (33%)	2 (33%)	1 (17%)	6 (100%)
Service for private and public households	2 (17%)	7 (58%)	3 (25%)	0	12 (100%)
Services for enterprises	4 (22%)	8 (44%)	6 (33%)	0	18 (100%)
Others	0	1	0	0	1

It is striking that the chances of success are clearly highest for system components and supplier parts in the case study group, ahead of services for private and public households and ahead of services for enterprises. The largest share of unsuccessful start-ups or those still in critical shape (with the success symbols 0 and -) offer inputs in the category consumer goods, ahead of capital goods end products.

Suppliers and services for enterprises appear in the case study group most frequently; consumer goods the least. Services for private and public households are, measured against their high opportunity potential, somewhat under-represented. Founders do not exploit business possibilities optimally here; start-up promotional programmes should pay more attention to this fact.

The type of services or products offered (type of innovations) by the young enterprises correlates with the size and regional range of the target markets served. The following picture emerges: most of the case study companies move in restricted markets, whereby two thirds can be reckoned among the successful or promising enterprises. Ten of 13 companies are successfully active also in large markets, amongst them markets with and for industrial customers. Supplying smaller markets or even individual customers appears less promising.

ENVIRONMENT-SPECIFIC SUCCESS FACTORS

SUPPORT FROM PARENT ORGANISATION

Support offered and accepted

In the spin-offs from universities and non-university R&D institutions, the utilisation of university infrastructure (offices, labs, technical support, machines and plants) and university personnel (mainly student assistants, secretarial and lab personnel) is primarily cited. In the case of universities, the next most frequent support offered by the parent organisation are the use of their R&D results and the generally easier access to knowledge of all kinds. For the non-university R&D institutions this took sixth or third place. Spin-offs from non-university R&D institutions name the utilisation of industrial or client contacts of the parent institute to build up the spin-off contact network in first place; for the universities this aspect even assumes fifth place. A more important function for both types of parent institutes is their role as stimulus and sensitiser for the scientists. This role is usually bound to individual persons in the near work environment, often the head of the institute, department or project manager. It often depends on their personal attitude towards technology transfer and start-ups exploiting results from their research context whether they make spin-off options palatable for their staff, furnish them with attractive projects, R&D results, patents or licenses and offer or propose favourable exit scenarios. The quality and seriousness of this package, as well as the personal commitment and involvement of this superior are the key factors in the motivation and composition of the founder team, and ultimately for the realisation of a solid and promising start-up. Closely associated with this is also the advice which the founders receive from their bosses or from specialised bodies in the parent organisation. The non-university R&D institutions often offer their spin-offs medium-term cooperation agreements and the conduct of joint projects in collaboration. The bilateral/mutual or interdependent award of sub-contracts can also be included therein. These two aspects are found less often in universities, possibly because their resources or freedom to act are less (fewer third-party commissions which make it possible to award contracts autonomously).

Remarkable among the support measures offered and also utilised is the exploitation of licenses or even patents. This incentive instrument however is only taken advantage of in 22% of the university spin-offs in both samples. For the non-university institutions the rate of exploitation is ca. 32%. In view of the significance which the question of commercialisation and transfer of in-



dustrially protectable results of public research has in the public debate, these figures are rather sobering.

University spin-offs took advantage of assistance from their parent organisations in the expert examination of their founding idea or business model to the tune of ca. 27%, spin-offs from non-university institutions to ca. 20%. In talks with founders from universities, the impression did arise that in the universities either the qualifications of the persons carrying out these expert examinations are rather doubtful, or that from their technical or engineering perspective, only a very cursory examination of the commercial/business aspects took place. The situation is different for the non-university spin-offs: here the examination and expertise function is praised, particularly since they were often accompanied by active market analyses. The non-university institutions dispose – in contrast to the universities – of appropriate financial and qualified personnel resources for such tasks.

The very high esteem for the received support (with one exception) is positively surprising. The offer obviously qualitatively meets the subjectively felt needs of the founders. It must however be asked whether academic founders can really offer a sound judgement on this point, in view of their general lack of start-up experience (they are mainly first-time founders) and of possibilities for comparison.

Institute-specific support policy

The individual positions and policies of the institute directors or professors (or the department heads, in research institutes) on the subject of knowledge and technology transfer in general and of company start-ups in particular differ in practice greatly from the official line of the parent organisation. Thus in similar contexts a completely different work culture and consequently work climate can emerge, which inevitably affect the start-up propensity and motivation, and in particular the support offered to the potential founders. This is expressed in diverse strategy patterns. A model with four strategy patterns, developed during recent study, was applied to the 39 case studies. The following picture emerges:



FREQUENCY DISTRIBUTION FOR SUPPORT STRATEGIES				
Support Strategies		Frequencies		Success assessment of the cases
		West	East & Berlin	
Strategy pattern 1	minimum support in the founding phase, much depends on individual initiative of single researchers	12	7	3 x ++ 10 x + 5 x 0 1 x
Strategy pattern 2	Information, sensitisation, »incitement« to found, advice and coaching, and more, personnel support, use of rooms, equipment, wages, IPR management, low selectivity	5	5	2 x ++ 4 x + 4 x 0
Strategy pattern 3	Information, coaching, introduction in networks, systematic plan examination, IPR management, use of infrastructures, wages, partner capital, financial management, technological specialisation, medium selectivity	4	3	1 x ++ 5 x + 1 x 0
Strategy pattern 4	Preparation of products and markets for spin-offs via market-oriented R&D, close intermeshing of R&D, production and sales technological specialisation, high selectivity	2	1	1 x ++ 2 x +

Pattern 1 is most frequent and is typical for universities. 68% successful or promising cases are found therein. The next most frequent is pattern 2, in which 60% of the cases are successful or promising. But in the end all four patterns, as can be seen, offer good chances of success under certain individual constellations.

LOCATION FACTORS

The founders were requested not only in the written survey, but also in the case studies, to judge factors which were significant for their original choice of location. Remarkably in both parts of the country the job market argument »Availability of qualified personnel« ranked very high in the average assessment, ahead of »Proximity to possible R&D cooperation partners« and »Proximity to



parent institute«. Highly placed are also the individual, personal criteria such as »Proximity to family and to friends«, which confirms the strength of social ties, and the (subjectively experienced) »Quality of life in the region«. Hard location factors such as good promotional support offers, outstanding transport infrastructure, founder-friendly communal administration and others follow far behind.

These assessments suggest a clear and apparently rational preference structure. The personal interviews in the case studies, however, made clear that this is highly theoretical. Most interviewees were never faced with this type of decisions. The location decision was almost always very simple and unequivocal: one stays where one is, i.e. in the previous work location and thus, often, in the proximity of the parent institute and the private environment.

SUCCESS FACTORS IN THE TRANSFER AREA

FEASIBILITY OF THE SPIN-OFF PROJECTS

The ideal-typical picture of technology transfer via spin-offs is that a research or development result achieved in a scientific environment is exploited in the market via a company started by one of the scientists participating in the R&D project. The reality of the start-up processes is usually very different. The reasons are, among others:

- > The R&D results are far from ready for implementation or are not even mature enough for the market.
- > Often there are no concrete R&D results which could trigger off a spin-off.
- > Even a far-developed innovative product or a relevant new service does not find a market as a matter of course.
- > The company does not dispose of the necessary exploitation rights to the R&D results which it wants to realise.
- > The event sparking off the start-up comes from an external source (e.g. a technology offer from industry or an invitation to collaborate in a spin-out from an industrial corporation).
- > The interests of the founders and the parent organisation are not identical; conflicts of interest crop up.

MARKET MATURITY OF THE TRANSFER OBJECT

Overall, the empirical findings on the market maturity of the transfer projects present a diffuse picture. A considerable number of near-to-market transfer projects (or objects) can be determined (including prototypes), which not only the universities, but also the non-university parent organisations pass on to their founders. That the share of not yet near-to-market development results is also remarkable, reinforces on the other hand the necessity to promote the spin-off activities in order to further complete the value chain.

ENTERPRISE-STRATEGIC SIGNIFICANCE OF THE TRANSFERRED R&D RESULTS

Even supposedly near-to-market, developed transfer objects are no guarantee of a successful company development. Only in retrospect, after several years of company development can an entrepreneur judge this in a qualified fashion. The interviewed firms evaluated the strategic, i.e. long-term significance of the transfer objects for company development as follows:

- > In universities and non-university institutions equally the »transfer objects« were regarded with 56% respectively 58% as important to very important. This proves the correctness of the approach to support the emergence of academic spin-offs.
- > The share of totally 25% of the responses with less to not important expresses the still present market, technological and otherwise entrepreneurial risk.

SIGNIFICANCE OF INNOVATIONS WHICH WERE DEVELOPED FROM THE TRANSFER OBJECT

Assessment	Spin-offs non-university R&D institutions	University spin-offs	Total
	Frequency	Frequency	Frequency
very important	16 (30%)	17 (31%)	33 (30%)
important	14 (26%)	15 (27%)	29 (27%)
rather unimportant, less important	16 (30%)	2 (4%)	12 (11%)
not important	4 (7%)	11 (20%)	15 (14%)
no data	10 (19%)	10 (18%)	20 (18%)



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It is the rule that young enterprises develop further products, processes or services after their »founding product«, either in order to diversify or to replace a less than successful first product. Developments which take place independently of the transfer object which originally caused the spin-off can possibly attain a greater importance for the business/commercial development of the company, and the original founding product can possibly lose all relevance. In addition, there are spin-offs where the original product emerged without the assistance of the parent organisation or where a parallel product development took place, independently of the transfer project, from the beginning.

From the survey it emerged that the following or parallel emerging innovations were judged to 84% as important to very important, that means on average of greater significance for the sustainable company development than the founding product, which about 70% ranked as important to very important. The ability to develop a further product development »without assistance« from the parent organisation is also an indicator of innovative capability and emancipation from the mother institute and thus a crucial trial for autonomy in the market.

CONTINUATION OF CONTACTS TO PARENT INSTITUTE

With growing independence respectively emancipation from the parent institute, the occasions for getting into contact naturally diminish. The enterprise and the institute gradually go their separate ways; close cooperation only makes sense for a limited time period, for as long as the stock of common interests last. The length of this shared path depends among other factors on the diversity and intensity of the relationship which both partners enter into and maintain directly after founding the spin-off.

Informal contact to former colleagues – almost always connected with informal knowledge exchange – is all in all the most frequent form of keeping in contact, ahead of joint R&D projects and recruiting new members of staff. The occasions to keep in contact are somewhat more important in the east than in the west. It is remarkable that members of the founder teams frequently (25–28%) continue to work at the parent institute, either part-time or full-time (in the latter case, these are non-active founders). This is a form of knowledge and technology transfer, respectively of spin-off promotion which is regulated by the civil service law.

All in all, the available data permit a differentiation of the catalogue of critical success factors known from literature. The judgements contained therein are based essentially on the answers of the interviewees in the case studies and the

interviewers' assessment of their impressions from the talks. A comprehensive picture of hampering and success factors emerge from this (see full version of this report).

CONCLUSIONS

Spin-off types and reasons for founding spin-offs

Academic spin-offs do not only originate directly from universities and non-university scientific institutions, but also as spin-offs from teaching hospitals, institutes associated with universities (in Germany so-called An-Institute) or from earlier spin-offs («secondary spin-offs»), for instance. The reasons for starting up are equally very diverse. The classical, ideal type of spin-off reason (to further develop and market an existing R&D result) was indeed very frequently found in the case studies and surveys (in 89 out of 109 cases = 82%), but the ideas for products, processes or services to be developed were often generated in the founder's private environment or outside concrete project contexts. In some cases the idea was also broached to the scientists by external actors, e.g. by a company or by a »normal« founder outside the science system.

Business skills

It was observed that many academic spin-offs lacked commercially conceived enterprise strategies or even clearly defined goals from the beginning. Founders react however absolutely flexibly to emerging difficulties, they do not stubbornly insist on pursuing the course once decided on. We come across scientist founders who have taught themselves the necessary management skills, either on an autodidactic basis or with the help of advisors who were friends and were in a position to develop professional business strategies. There are obviously »naturally gifted entrepreneurs« among the engineers and natural scientists.

Market conformity of the products

The scientific and technological basis of the founding products was as a rule very ambitious and promising. However, the firms did not all develop successfully; these products or process technologies were not successful in the market, or they did not achieve sufficient returns to sustain or maintain the firm in the long term. The causes for this are diverse and complex, but in every case product- or market-related reasons also play a role, i.e. the »matching« of product and



market does not always succeed. This is a further indication of the necessity to improve the business skills of the management team.

Growth and impacts for the overall economy

The impact of academic spin-offs for the economy as a whole is not to be estimated as low, despite the lack of econometric data. The majority of spin-offs do not develop into large units, so that the structural effects on employment, gross domestic product and renewal of the economic structure will possibly remain low in the long run. These low measurable impacts of the academic spin-offs on the total economy are balanced however by non-material/ideal factors, e.g. motivational and knock-on/signal effects. Some cases however give rise to the hope that they will develop into real stars and leave recognisable economic traces behind. These will remain exceptional cases for the present, but their number could possibly be gradually raised by careful promotional policy.

Differences between types of scientific parent institutions

It can be seen that certain structural or institutional idiosyncrasies of the parent institution concerned influence the success of start-ups. These differences become particularly clear in the provision of specialised help, such as brokering relevant customer contacts, elaborating and checking start-up plans and business concepts, coaching and advice, market and technology analyses. Such inputs can only be made in a relevant and convincing manner by someone whose competences are based on own professional experience. As a rule, this is the case in highly specialised institutes with long-standing, relevant experience which are integrated in both science and industry. In institutions which are more broadly structured subject-wise, these pre-conditions which have repeatedly proved to be particularly relevant for success tend not to exist, particularly not in universities. Institutions which do not possess the specialisation and resource specificity should be conscious of the associated comparative disadvantages and should rather refrain from offering subject-specific help in favour of more general support measures, such as sensitisation and motivation, time off to prepare the spin-off, passing on the names of advisors and experts, assistance in procuring capital and with applications for promotional funds, but also and especially in applying for industrial property rights and in licensing. The guiding principle should be »rather no help at all than unprofessional help«.

The individual attitude and policy of the director of the institute or professor greatly influence potential founders and the emergence of attractive, well prepared spin-off projects. An academic spin-off must be understood as something

normal in the scientific institutions so that prospective founders can speak openly with colleagues about their plans and can ask for their advice, in order that the well-known inhibitions about making corresponding plans public too early and supposed disadvantages for the research group can be broken down.

Financing the spin-offs

The majority of spin-offs enjoy adequate financing for a sustainable development. However, the popular picture still remains that the financing possibilities are not optimally exploited; in particular the share of private equity capital and bank financing appears too low. The problem, too, of the financing gap in the very early phases of the spin-off projects remains unsolved.

Efficacy of previous promotional instruments

In west as in east Germany the existing promotional instruments were taken advantage of in a modest fashion, clearly more in the east than in the west. In east Germany, only the (earlier) promotional programmes available there made the emergence and survival of many spin-offs possible at all. On the other hand, the impression arises that such relatively easily accessible promotion on the individual level has led entrepreneurial efforts to deteriorate. On the whole, in view of the relatively low exploitation of the start-up promotion programmes, it appears that the market orientation of the founders in the west is more pronounced. More private capital was utilised here, and all the successful spin-offs in the sample were also found there too.

Starting points for (new) promotional instruments

Finally, the following suggestions for new promotional approaches are put forward for discussion:

- > To examine the existence of commercial or business knowledge and skills more thoroughly in the application and approval process of promotional programmes;
- > train potential founders before allotting funds by means of promoted qualification programmes;
- > give scientists keen to found a spin-off experienced businessmen as managers of the new firm;
- > take risk-minimising measures to make the credit decision of the credit institutes easier, like risk management tools in the firms, insurance tools to cover technical and market risks or expertise systems to reduce the uncertainties about



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- innovation plans;
- > couple public promotion to more own capital participation on the part of the founders;
- > make higher equity capital share in the start-up financing a pre-condition;
- > switch to more »hard« loan promotion in order to increase the entrepreneurial involvement and the self-commitment of the founders;
- > make public procurement more innovation-oriented;
- > increase measures to improve the understanding for the career option »self-employment and entrepreneurship« in scientific institutions.

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