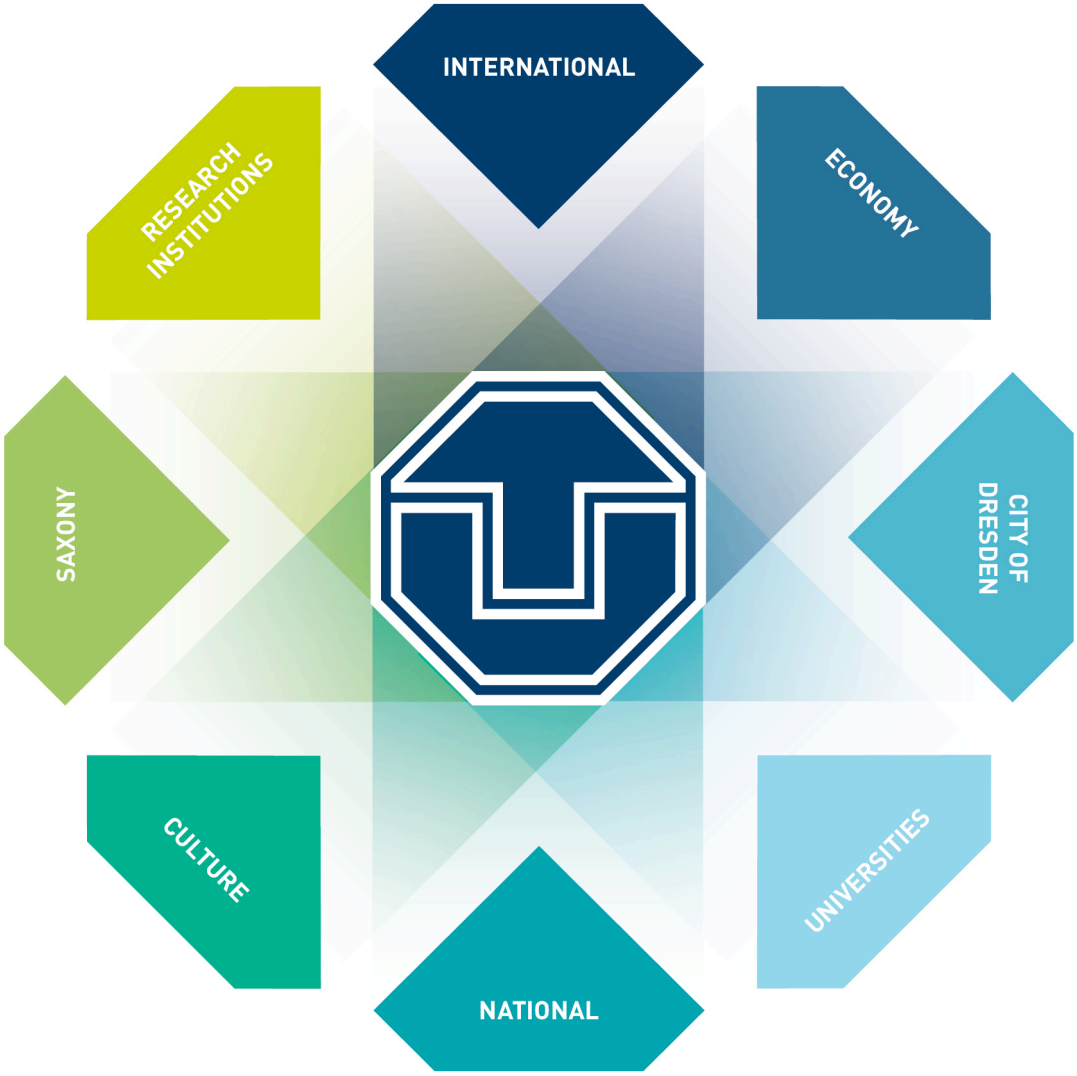
TECHNISCHE UNIVERSITÄT DRESDEN



Institutional Strategy to Promote
Top-Level Research

THE SYNERGETIC UNIVERSITY

Technische Universität Dresden | Second Programme Phase
Funding Period 2012-11-01 – 2017-10-31

DRESDEN concept

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1 Overview

Abstract

The **Technische Universität Dresden (TUD)** is the largest of the Technical Universities in Germany and – in terms of its profile – the most comprehensive. Having successfully managed unprecedented changes in staffing, structure and organizational culture following the German re-unification in the early 1990s, TUD has since been developing with a continuously steep upward gradient with regards to all accepted academic performance indicators. It now **exhibits excellence in all four principal scientific disciplines**: Engineering, Natural Sciences, Medicine as well as Humanities and Social Sciences. Yet, in order to move into the international premier league of universities, TUD must recruit students and staff at an even higher standard, and develop means to allow top-performance of its existing and future members. Four key measures will be implemented to achieve these goals: (1) novel modes of recruitment to trigger innovation across the entire university and customized support to unleash the existing potential; (2) effective structures by combining the 14 Faculties into 5 Schools; (3) de-centralization and strengthening of support processes to meet the demands of an internationally competitive university; and (4) the *DRESDEN-concept*, a uniquely intense partnership between TUD and outstanding non-university research and cultural institutes in Dresden, to maximize synergies in research, teaching and infrastructure.

With its concept of a **Synergetic University**, TUD will exploit its excellent potential by providing conditions and initiating processes where its already successful academic activities will become world-class and translate their success to the university as a whole. In this context, the term "synergy" means the **"mutually beneficial co-operation of people and organizations to generate achievements significantly higher than what could have been reached by them acting individually**" – and is NOT a synonym for cost-cutting.

Complemented by measures to promote gender equality, interdisciplinarity, internationality, knowledge transfer and research-oriented teaching, the ***Institutional Strategy* will initiate a new era in the development of TUD**, in which the already high standards and growth dynamics will be raised substantially and sustainably. The *Institutional Strategy* is not limited to individual aspects of the university – it **is THE central instrument for realizing its overall long-term development plan and will transform the university in terms of strategic approach, structures and culture of organization**, to eventually become competitive with the best universities of the world.

To maximize the benefits from the external funding for the *Institutional Strategy*, TUD will additionally provide 30.4 Mio € from its own resources to fully finance several measures concerning *Research-oriented Teaching* (see 2.4 and 3.4*), Organizing the 14 Faculties in 5 Schools* (3.3.2) and the reorganization of its *administrative procedures* (3.3.3), and to contribute to the other proposed measures as required for the success of the overall strategy.

2 Status Quo

2.1 Research profile

2.1.1 Mission of Technische Universität Dresden (TUD)

Since its founding in 1828 as a highly acclaimed “technical” university in the narrow sense, TUD has proven its commitment, determination and outstanding potential in education, science and research throughout historical and political changes and even disasters, such as its almost complete destruction in World War II. The German re-unification process in the early 1990s with its unprecedented political, social, cultural and economic implications imposed enormous challenges on the University, but also provided it with a unique opportunity to completely reassess its mission and research profile, and to initiate the necessary measures to develop into a top-university. Thus, TUD integrated several existing academic institutions, created new faculties and scientific centers, and completely re-organized its academic and administrative structures and processes. It successfully completed this profound, complex and highly dynamic transformation process due to the competence and motivation of its staff, and a culture of academic and organizational innovation at all levels of the University, which is still characteristic of TUD today.

In the past two decades, TUD has transformed itself into a **comprehensive university** covering all academic areas of research and education (“Volluniversität”). With over 36,000 students and 500 professors in 14 Faculties, it is now Germany’s largest and - in terms of academic disciplines and programs - most comprehensive technical university. While retaining its traditional strengths in the Engineering and Technological Sciences, TUD now additionally exhibits international visibility and excellence in many areas of the Natural Sciences, Medicine, as well as the Humanities and Social Sciences, according to recent academic performance indicators. This places TUD into an excellent position to tackle the complex challenges of the 21st century through interplay of all disciplines, working together to raise the right questions and develop appropriate solutions. To do so, TUD needs to maximize its potential and output, which requires more than straightforward interdisciplinary cooperation or joint use of resources.

Based on strengths and achievements outlined in detail in the following chapters, TUD has now reached the point where it is in a position to develop into an internationally leading university. Five decisive commitments underline TUD’s determination:

(1) Commitment to a comprehensive university with excellence in the four principal scientific disciplines, i.e. Engineering, Natural Sciences, Medicine, Humanities and Social Sciences. Only transdisciplinary excellence and synergy across Faculty borders will ultimately result in innovation and scientific breakthroughs.

(2) Commitment to trans-institutional research including strong synergetic cooperation in defined priority topic areas, linking all cutting-edge research institutes and organizations in and around TUD and the local cultural and economic resources into one coherent network.

(3) Commitment to teaching excellence at all levels, involving the best researchers and resources, to attract, promote and advance the best and brightest.

(4) Commitment to efficiency, transparency and synergy by creating structures and administrative processes that reduce barriers to motivation, innovation and excellence.

(5) Commitment to the transfer of knowledge and technology to TUD's stakeholders in industry, society and politics in a lively process of intellectual interaction.

2.1.2 Research Priority Areas (RPAs)

Five Research Priority Areas (RPAs) characterize the current research profile of TUD:

- **Health Sciences, Biomedicine and Bioengineering**
- **Information Technologies and Microelectronics**
- **Smart Materials and Structures**
- **Culture and Knowledge**
- **Energy and Environment**

Their mission and content is described in this Section, their quality in Section 2.1.3. The five RPAs reflect the existing major strengths, established excellence, the international visibility, and the potential of TUD for innovative long-term development. The RPAs cut across all 14 Faculties of TUD (Fig. 1) and complement their respective resources, research topics and agenda. They are designed as open and flexible strategic topic platforms; they are also interconnected, permeable, and most collaborate strongly with each other, thus compiling top-level resources, infrastructure and scientific excellence of the TUD and its collaborative environment. 85% of TUD´s overall third-party income (see 2.2.2) is generated in the five RPAs.

The definition of these strategic RPAs dates back to the year 2004 and the respective agreements with the State of Saxony. The five areas were not established top-down and in isolation but reflect an ongoing, highly dynamic process. In this process the 14

Faculties with their discipline-specific profile of culture and competencies have been strengthened without ignoring the importance of diversity and the right of individual professors to freely select their research activities.

	TUD Research Priority Areas (RPAs)				
Faculties	**Health Sciences Biomedicine Bioengineering**	**Information Technologies Microelectronics**	**Smart Materials and Structures**	**Culture and Knowledge**	**Energy and Environment**
Architecture	●			●	●
Civil Engineering			●	●	●
Forest, Geo and Hydro Sciences				●	●
Transportation and Traffic Sciences					●
Computer Science	●	●	●	●	●
Electrical and Computer Engineering	●	●	●		●
Mechanical Engineering	●	●	●		●
Arts, Humanities and Social Science				●	●
Business and Economics	●			●	
Education				●	
Law				●	●
Linguistics, Literature and Cultural Studies				●	
Science	●	●	●	●	●
Medicine	●		●		

Fig. 1: Contribution of Faculties to Research Priority Areas (RPAs)

Health Sciences, Biomedicine and Bioengineering comprises three interconnected fields at the interface of basic and translational research: (1) *Stem Cells* and *Tissue Formation,* which directly leads to *Regenerative Therapies* (CRTD, Excellence Cluster); (2) research uncovering the causes of, and developing therapeutic approaches for, major diseases of modern societies, i.e. *Cancer* (OncoRay), *Diabetes* (DZD), and *Neurodegeneration* (DZNE) as well as other *disorders of the brain*, notably those tackled by the *Psychological and Behavioral Sciences*; and (3) *Molecular Bioengineering,* which provides an interface between biology and engineering (B CUBE, BIOTEC, Max Bergmann Center of Biomaterials). In addition to these three established fields, an additional, emerging research area is *Systems Biology*, where experimental and theoretical science meet. A particular strength of this RPA is the transdisciplinary networking of basic and translational researchers within TUD and its local non-university partners such as the MPI of Molecular Cell Biology and Genetics. These research foci constitute a fertile ground for the advancement of young researchers, as exemplified by the *Dresden International Graduate School for Biomedicine and Bioengineering* (DIGS-BB), awarded in the 1st program phase of the Excellence Initiative.

Information Technologies and Microelectronics is an area of utmost importance as the largest microelectronics hub in Europe is centered in Dresden, with over 1,500 companies growing at an average rate of well over 1,000 jobs/year, expecting to reach approx. 50,000 in 2011. As a result of strategic appointments over the past decade, TUD´s scientific competence now covers the full spectrum from basic and applied research on information processing and communication, to developing and testing innovative materials (Nanotechnology, Bionics). There are strong ties with several regional Fraunhofer Institutes as well as multiple joint ventures with industry's global leaders, e.g. reflected by acquiring and steering the German Leading-Edge Cluster "CoolSilicon". Based on research excellence, TUD has been invited to submit a full proposal for an Excellence Cluster *Advancing Electronics Dresden*.

Smart Materials and Structures play a decisive role in providing solutions to global mega-challenges such as energy, resources and mobility. Fundamental scientific research activities at TUD focus on understanding the principles of structure-property relations and interactions of materials in various environments, on nanotechnology concepts, new functional and smart materials and corresponding technologies, advanced surface engineering, high performance multifunctional lightweight materials, materials for energy, and new design concepts with adapted sensors and actuators. TUD competences are complemented by intense collaboration with local Leibniz-, Fraunhofer- and Max Planck Institutes and a network of strategic cooperations with prestigious industry partners.

Culture and Knowledge focuses on the transformation of culture and knowledge with regard to social and political systems, urban and regional developments, as well as cultural institutions, museums and libraries: In this old capital of culture, where the cultural sector also accounts for a well-above average importance in the regional economy and job market, a range of interdisciplinary research programs and intense networks has been established, in particular with (1) the Deutsches Hygiene Museum Dresden, a unique museum of science, culture, and society, (2) the prestigious Saxon State and University Library with its internationally renowned collections of manuscripts, documents, maps, and photographs, (3) the Dresden State Art Collections, one of the oldest and most important museum networks in Europe (consisting of 13 thematically different museums) that enjoys a worldwide reputation, and (4) the Leibniz Institute of Ecological Urban and Regional Development.

Energy and Environment is an emerging RPA, which is already clearly visible across the full spectrum of TUD Faculties and Institutes. A recent survey showed that 25% of the approximately 500 TUD professors are involved in this area and that 16% regard it as a focus of their research. Existing competences cover topics such as adaptation to climate change, bio-geo-chemistry, biomass, combustion engines, electrochemistry, energy economy, energy efficiency, energy law, energy systems analysis, electricity generation, environmental monitoring and geo-information techniques, forestry, hydrology, limno-physics, mobility, regenerative energy systems, risk management and water resources management. Hence, TUD is in an excellent position to tackle not only core research topics, but also inter- and transdisciplinary research themes, which increasingly are moving into the focus of large environment- and energy-related projects. In June 2011, the 30 Mio Euro research building for the new Center for Energy Technology was opened.

2.1.3 Impact on the advancement of young researchers

The quantity and quality of the research at TUD, notably in the five *RPAs* (see 2.1.2), has provided an excellent environment for the advancement of young researchers, with substantial impact on career development opportunities for post-graduates. Representative examples across TUD as a whole are the following *Graduate Programs*:

- The *Dresden International Graduate School for Biomedicine and Bioengineering* (DIGS-BB), awarded in the 1st program phase of the *Excellence Initiative*, which offers three interfacing PhD programs for about 230 doctoral students.
- The Natural Sciences established four *DFG Graduate Programs*.
- The Engineering Sciences established two *Integrated DFG Graduate Programs*, and an *International Graduate Schoo*l (IGS), at the interface of *Smart Materials and Structures* and *Energy and Environment,* is currently being established with ECEMP.
- The Humanities and Social Sciences established the first *International Graduate Program* in this area as well as one *Integrated DFG Graduate Program.*

In addition, several other graduate programs, funded by foundations and non-university research organizations, as well as numerous Spring/Summer/Winter Schools, provide a broad spectrum of career development opportunities for post-graduates working at TUD (for more details, see Annex 10). The interaction of TUD with the non-university research institutes in Dresden (see 2.3.4 and 3.3.4) has boosted the attraction of international PhD students, and in some *RPAs* almost one-third of the doctoral students are involved in trans-institutional collaborations.

2.2 Research quality

2.2.1 Scientific quality of Research Priority Areas

Scientific excellence in RPA **Health Sciences, Biomedicine and Bioengineering** is documented by

- REGENERATIVE MEDICINE: *DFG Research Center for Regenerative Therapies Dresden* (CRTD) and *Excellence Cluster "From Cells to Tissues to Therapies"* awarded in the 1st program phase of the Excellence Initiative
- TISSUE FORMATION: *SFB 655 "Cells into Tissues"*
- NEUROSCIENCE AND DISORDERS OF THE BRAIN RESEARCH: TUD is one of the sites of the *German Center for Neurodegenerative Diseases*. In the Psychological and Behavioral Sciences, documented international visibility exists focused on cognitive-affective Neuroscience (DFG *Research Group 1617,* positively evaluated)
- CANCER RESEARCH: *OncoRay*, a BMBF *Center for Innovation Competence;* in addition, TUD is one of the sites of the *German Consortium for Translational Oncology*
- DIABETES RESEARCH: the *Paul-Langerhans-Institute* of TUD is one of the sites of the *German Center for Diabetes Research*; in addition, there are two DFG Research Groups (KFO 252, FOR 1586) in the field of endocrinology
- MOLECULAR BIOENGINEERING: *B CUBE*, a *Center for Innovation Competence* of the BMBF, the TUD *Biotechnology Center* (BIOTEC), and the *Max Bergmann Center of Biomaterials*, a joint institute of TUD and the *Leibniz Institute for Polymer Research*
- *Dresden International Graduate School for Biomedicine and Bioengineering* (DIGS-BB) awarded in the 1st program phase of the Excellence Initiative (see 2.1.3)

RPA **Information Technologies and Microelectronics** is exceptionally strong with world-leading experts and cutting-edge infrastructure as a hub for innovation. This is underlined by

- the invitation to submit a full proposal for the 2nd program phase of the Excellence Initiative (Cluster of Excellence “Center for Advancing Electronics Dresden, cfAED)”
- the existence of “Cool Silicon – Energy-efficiency Innovations from Silicon Saxony ” (one of Germany’s 10 “Spitzencluster”)
- numerous major DFG programs (SFB 287, 609, 639 and recently awarded SFB 912, the RTG 1401, SPP 1355, FOR 520)
- *Wissenschaftsrat* approval for funding for a new High Performance Computing and Storage Complex (HRSK-II)

- projects from several other funding programs (e.g. EU-IPs and STREPs, and BMBF projects)

Scientific excellence and international visibility of RPA **Smart Materials and Structures** are documented by

- "*Cool Silicon – Energy-efficiency Innovations from Silicon Saxony* " (see above),
- *European Center for Emerging Materials and Processes Dresden* (Saxon Initiative of Excellence) with its International Graduate School
- *Dresden Innovation Center Energy Efficiency*, together with Fraunhofer Society,
- Innovation Cluster "nano for production"
- DFG Collaborative Research Centers: "*Electromagnetic Flow Control in Metallurgy, Crystal Growth and Electrochemistry*" (SFB 609), "Textile-reinforced composite components for function-integrating multi-material design in complex lightweight applications" (SFB 639)
- SFB-Transregios: *"High-volume production-compatible production technologies for light metal and fibre composite-based components with integrated piezo sensors and actuators",* SFB-Transregio (SFB-TR 39) and *"Thermo-energetic design of machine tools"* (SFB-TR 96),
- Research Group *"Fracture mechanics and statistical mechanics of reinforced elastomeric blends"* (FOR 597)

Scientific excellence and international visibility in RPA **Culture and Knowledge** are documented by

- Collaborative Research Centers *"Institutionalität und Geschichtlichkeit /Institutionality and Historicity"* (SFB 537, 1997-2008) and *"Transzendenz und Gemeinsinn/Transcendence and Common Sense"* (SFB 804) with its Integrated Research Training Group
- International Research Training Group *"Institutional Order, Script and Symbols"* (IGK 625) jointly with Sorbonne (Paris)
- Dresden Leibniz Graduate School (TUD, Leibniz Institute of Ecological Urban and Regional Development, Academy for Spatial Research)
- Image Atlas: Art in the German Democratic Republic (BMBF, coordinator TUD)
- Development and Testing of an Integrated Regional Climate Change Adaptation Program for the Model Region of Dresden (REGKLAM) (BMBF, coordinator: TUD)
- Particle World Network (BMBF, coordinator: TUD)

- *Monasteries in the High Middle Ages: Innovation Laboratories of European Conceptions of Life and Order Models* (Union of the German Academies of Sciences and Humanities, with Heidelberg Academy of Sciences and Humanities)

In the emerging RPA **Energy and Environment**, scientific excellence and international visibility already exist:

- STREP *"Holistic Energy Efficiency Simulation and Lifecycle Management of Public Use Facilities"* (HESMOS)
- *"Thermo-energetic design of machine tools"* (SFB-TR 96), Development and Testing of an Integrated Regional Climate Change Adaptation Program for the Model Region of Dresden (REGKLAM) (BMBF, coordinator: TUD)
- Excellence Initiative Saxony „*International Water Research Alliance Saxony I&II"*
- *Innovation Center Energy Efficiency Dresden* (10 joint projects of TUD and FhG)
- Helmholtz Interdisciplinary Graduate School for Environmental Research
- UNU Institute for Integrated Management of Material Fluxes and of Resources
- Coordination of DFG Priority Program *"Organic Photovoltaics"*
- Graduate College *"Public acceptance of large energy-related Infrastructures"* approved for funding by the Boysen Foundation and involving 10 doctoral students from Engineering, Natural Sciences, Philosophy, Sociology, Business and Economics, and Communication Sciences

In this emerging RPA, activities in the past have been largely uncoordinated and focused on individual Faculties or Institutes. As a result, the existing strength of TUD has not been exploited to its full potential and the external visibility in this area has been limited. TUD is determined to raise this RPA to the same high standard as the previously described four other RPAs, by fully exploiting synergies through internal cooperation and cooperation with non-university research organizations, both within *DRESDEN-concept* and beyond.

2.2.2 Quantitative indicators of research quality

The most impressive overall characteristic of TUD's research performance is an **exceptionally strong and consistent UPWARD GRADIENT,** particularly since 2005. In several recent comparisons and with respect to several performance indicators, TUD has now reached prominent positions.

Publication and Citation Impact. According to state-of-the-art comparative bibliometric analyses (In-Cites, ISI, Thompson- Reuters, 2011), the number of peer-reviewed

publications by TUD, and more importantly their citation impact, showed a greater increase than those of the other *TU9* (the 9 leading *Technische Universitäten* in Germany). With a **37% increase in publication numbers** in 2009 as compared to the average 2001-2005, TUD now ranks as number 2 of the German TU9 universities (Fig. 2).

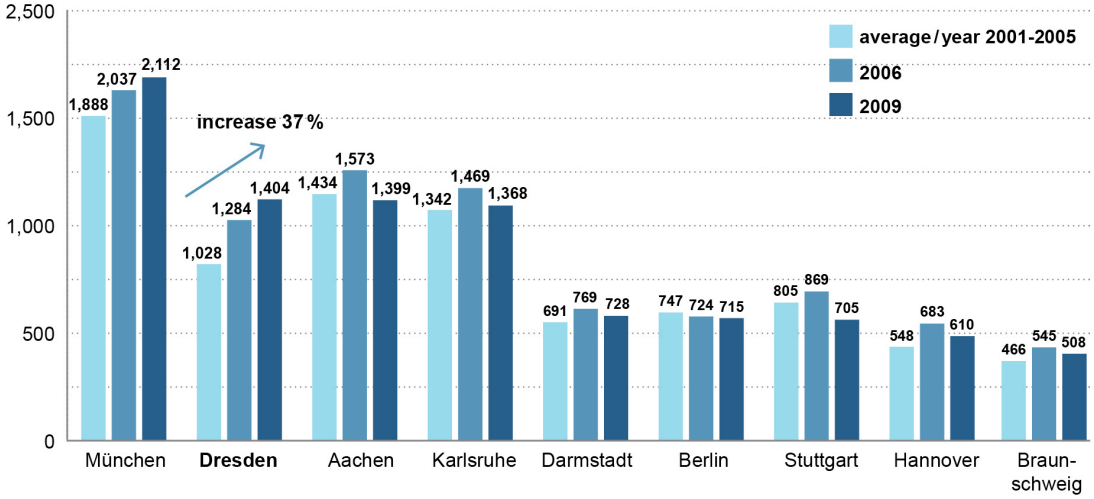


Fig. 2: Number of Web of Science (WOS) publications of TU9 universities (Thompson-Reuters, 2011), listed from left to right according to publication numbers in 2009

The **citation impact** almost **doubled** from an average of 4.9 (2001-2005) to an average of 9.05 (2006-2010) (Fig. 3). When considering only data from 2008 onwards, TUD progressed further to reach rank 2 of all *Technische Universitäten*. A breakdown by academic subjects reveals particularly strong increases and high proportions of papers in high-impact journals reflecting TUD's Research Priority Areas (RPAs).

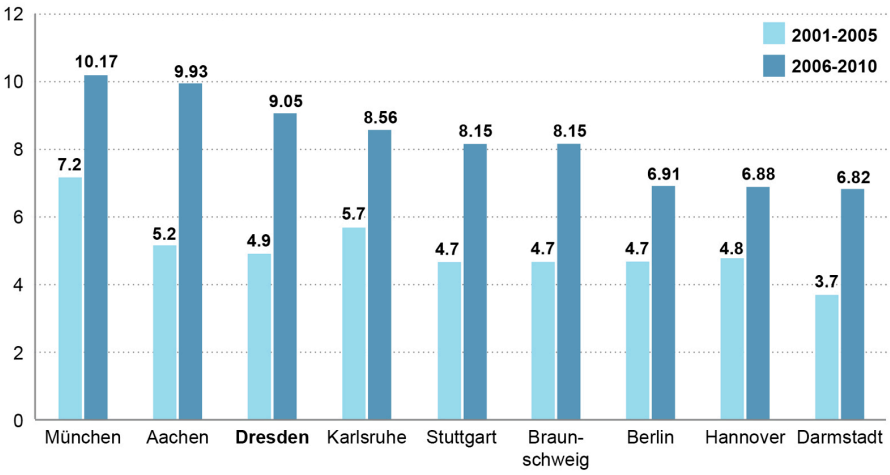


Fig. 3: Average number of citations per publication in the five-year period of its appearance; TU9 universities (Thompson-Reuters, 2011)

Third-Party Funding increased by a factor of 10 between 1991 and 2010, and by a factor of 2 during the period from 2005 to 2010 (Fig. 4), placing TUD in top positions nationwide.

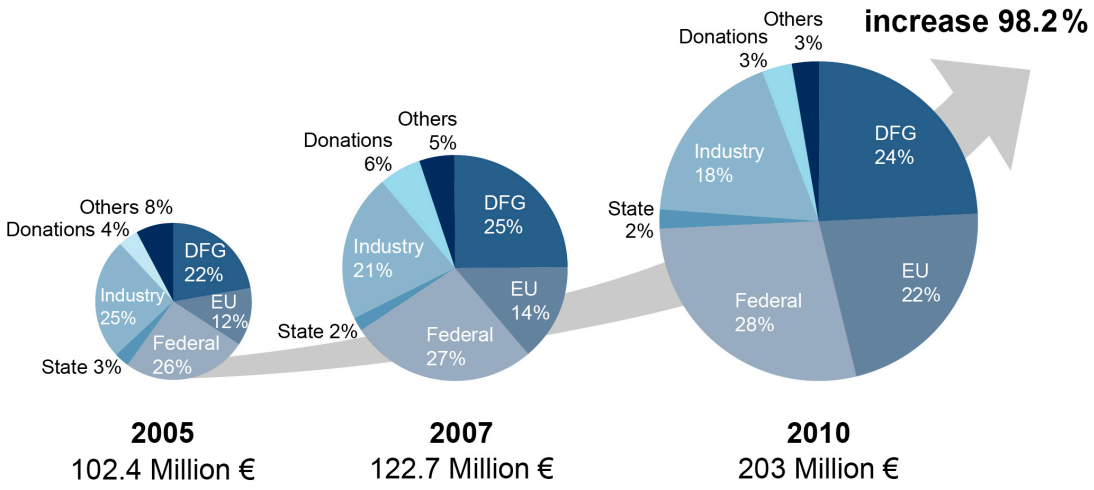


Fig. 4: Overall competitive third-party income of TUD

With a well-balanced portfolio of funding sources, strongest increases occurred for competitive EU research funding (increase of 245%), putting TUD into a leading position among German universities. This reflects TUD's strong commitment to international research programs and international collaborations.

Overall, **the external funding adds more than 79% to the regular TUD State budget** of 257.7 Mio € in 2010. In terms of overall third-party income relative to basic funding, TUD presently ranks number 4 of all German Universities and 3rd among TU9 universities for the years 2005-2007 (DFG 2009) (Fig. 5). Due to TUD's dramatic increase in third-party funding, this position is likely to increase significantly in updated statistics. While the benefit of financial breakdown according to academic discipline may be limited due to different funding standards, it nevertheless shows that success in competitive research funding is observed across all academic disciplines of TUD.

Direct industrial income of 36.5 Mio € in 2010 (Fig. 4) is already an impressive achievement. Importantly, this value is an underestimate as it does not include the turnover of more than 30 Mio € in 2010 of the *TUDAG group*, the commercial transfer arm of TUD.

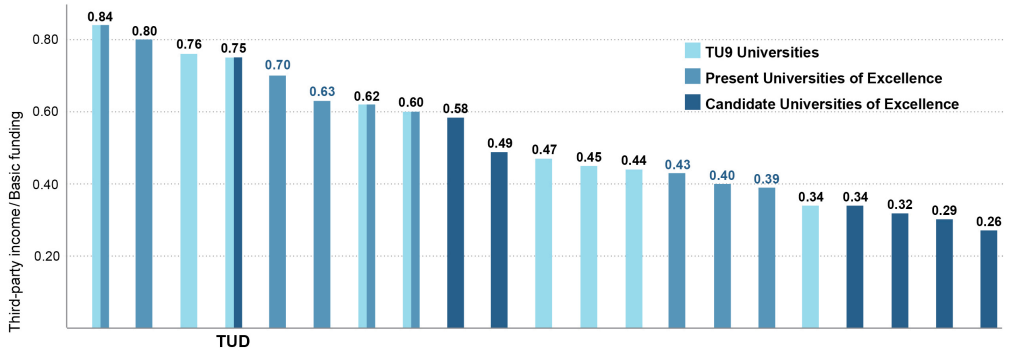


Fig. 5: Third-party income relative to basic funding 2008 (Statistisches Bundesamt)

Ranking positions in specific funding areas display an exceptional rate of improvement given that TUD only entered the peer review funding mechanism of DFG by the mid 1990s. Overall DFG ranking improved continuously from No. 24 (before 2001), No. 20 (2002-2004) to No. 18 (2005-2007), with a significant further improvement to be expected according to recent, unofficial information, due to the substantial increase in funding over the past 5 years.

Funding Source	TUD or TUD Area	Ranking 2005 - 2007
Total DFG funding	TU Dresden	18
DFG SFBs	TU Dresden	8
DFG peer review projects (*"Normalverfahren"*)	Engineering Sciences	8
	Regional sustainability, construction and transport	2
	Energy research and technology	6
	Sustainable energy systems and transport	8
	Material sciences and technology	9
Federal funding	Information Technology	1
	Health and Medicine	Top 5
	Material Sciences	Top 5
	Regional Sustainability	Top 5
	Environmental Technology and Economic Sustainability	Top 5
Federal funding (IGF, PRO INNO)	Engineering	3

International research performance and impact are exemplified by ranking No. 1 for EU funding (DFG 2009). EU funding mechanisms and programs have been particularly instrumental in extending and sharpening TUD's **international profile**, overcoming the historical disadvantage of having been detached from the leading international scien-

tific centers for several decades. For example, TUD has recently been ranked as the most successful European university in the EU program *"Asia-link"* and as the most active German university in the EU-program *"Tempus 1999-2010".*

Patents and transfer are central to the strategy of TUD, which is by far the most active German university with regards to registered patents and one of the leaders in successful start-up companies. 31% of all TU9 university patent publications between 2002 and 2009 (604 out of 1957) originated from TUD. Since 2006, TUD promoted over 100 start-ups. The *Stifterverband der deutschen Industrie* rated TUD's transfer activities repeatedly as being "best-practice". The Federal program "Forschungsprämie", identified TUD as No. 1 with respect to co-operations with German SMEs, accounting for more than 15 % of all funded university projects.

2.3 Existing framework for top-level research

2.3.1 The attractiveness of Dresden

When considering the overall framework and conditions that determine whether a university is successful in attracting and retaining top researchers, a crucial aspect is the city and its surroundings in which the university is located. In this respect, TUD is very fortunate, for two reasons. First, in terms of **quality of life**, Dresden ranks among the most attractive locations in Germany, notably with regard to its flair, culture, infrastructure, schools, child care, housing, leisure time facilities, and surrounding countryside. Second, in terms of **scientific environment**, Dresden has become an internationally visible research campus due to the quantity and quality of the institutions on-site, as is described below (2.3.4 and 3.3.4). The latter development has profited from the healthy economic status of Saxony and, importantly, from TUD being a central driving force.

2.3.2 Structures and processes

During the past 15 years TUD has integrated several previously independent academic institutions, and created new Faculties and scientific centers. This has been accompanied by a significant turn-over in academic and non-academic staff in accordance with the new RPAs, but also by fundamental improvements in governance, management and institutional culture.

In 2001, TUD negotiated an innovative pilot model for "a *global budget approach*" with the State of Saxony, granting the university the autonomy and flexibility needed to master the forthcoming challenges. This successful model was subsequently extended to

all universities in Saxony. In addition, **performance-based resource allocation** was introduced to reward outstanding areas. Along with significant changes to increase efficiency and flexibility of governance, these measures were instrumental for the management of TUD´s remarkably successful development.

2.3.3 Infrastructure

During the past two decades, the State of Saxony has invested more than 1.3 billion € in establishing new teaching and research facilities at TUD, and refurbishing its existing buildings. In addition, substantial funds have been provided for the infrastructure of the Faculty of Medicine, numerous minor projects and individual equipment grants. TUD presently occupies building space of 353,185 m^2 (about 25% exclusively for research), of which over one-third (122,813 m^2) have been built after 1990. This development will continue according to the agreed campus development plan which includes additional investments for buildings of approximately 250 Mio € until 2015. The **new laboratory / office buildings and central infrastructures** were established based on sophisticated conceptual planning and design and offer top-class working conditions. Prominent examples are:

The Saxon ***State and University Library Dresden*** (SLUB) is the result of a merger of the former Saxon State Library with the University Library of the TUD. The new landmark building was completed in 2002 and now houses libraries and numerous literature treasures collected over four centuries, which had previously been scattered over almost three dozen locations throughout the city. With more than 7 million volumes, the SLUB is **one of the biggest libraries in Europe** and one of the main public archival centers in Germany, also hosting the Deutsche Fotothek.

The ***Center for Information Services and High Performance Computing*** (ZIH) was the outcome of a strategic merger (2005) of the “University Computer Center” and the “Center for High Performance Computing (HPC)”. Subsequently, the first large HPC facility in the *Neue Länder* was installed as a computational and intellectual resource for all universities and non-university research organizations in Saxony. ZIH is currently building an integrated Data-Center infrastructure (3 Mio Euro) for all its users, and the *Wissenschaftsrat* has approved an investment of 21.8 Mio € to renew the existing HPC facilities by installing a new computational infrastructure in the range of one PetaFlop.

Numerous **large-scale transdisciplinary research centers** have been established, which combine the competence of different scientific areas both within TUD and with

several non-university research institutions in Dresden, including the Biotechnology Center (BIOTEC), the Max-Bergmann Center for Biomaterials and the brand-new Center for Energy Research.

2.3.4 Cooperative partner platform: DRESDEN-concept

The ***DRESDEN*** (***D****resden* ***R****esearch and* ***E****ducation* ***S****ynergies for the* ***D****evelopment of* ***E****xcellence and* ***N****ovelty*) –***concept*** is a further cornerstone of the existing framework for top-level research at TUD and at the same time a major measure of the *Institutional Strategy* described in Section 3. However, there is a recent history to the development of the *DRESDEN-concept* and significant progress has been made in its implementation since submission of the Draft Proposal on September 1, 2010. Hence, both history and present status of the *DRESDEN-concept* are described here as they are of relevance for the *Status Quo*.

Due to the establishment of numerous non-university research institutes on, or close to, the TUD campus over the past 20 years, Dresden today is the largest Fraunhofer location in Germany, the largest Max Planck Society location in the *Neue Länder*, and one of the major Leibniz Association locations in Germany. TUD capitalizes on the unique opportunities of collaborating with the local non-university research institutes, as exemplified by the successful applications of TUD for a *Graduate School* and an *Excellence Cluster* in the first program phase of the Excellence Initiative, which include cooperation with the *MPI of Molecular Cell Biology and Genetics* (MPI-CBG). Taking this as a paradigm, the partnership of TUD with the non-university research institutions in Dresden has developed, over the past 5 years, into a comprehensive concept, the ***DRESDEN-concept***. This concept is without precedent and unique, embedding TUD in an impressive synergetic network, the *DRESDEN-concept* partnership. Besides TUD, this comprises not only the Dresden institutes of **all 4 major non-university research institutions in Germany** (4 Fraunhofer Institutes plus 6 other Fraunhofer Facilities, 1 Helmholtz Center, 3 Leibniz Institutes, 3 Max Planck Institutes), but also the **research-active cultural institutions** *(Staatliche Kunstsammlungen Dresden, Deutsches Hygiene Museum Dresden, Sächsische Landesbibliothek – Staats- und Universitätsbibliothek*) situated in Dresden (see Annex 8).

The *DRESDEN-concept* partners started their joint activities in January 2009. Five types of measures have been implemented since then:

1. **The "*Verein" DRESDEN-concept e.V.*** was founded in August 2010 and provides a common forum for the presently 14 *DRESDEN-concept* partners. *DRESDEN-concept e.V.* defines the roles of the *DRESDEN-Board*, the *Scientific Area Committees* (SACs) and the *Administration and Infrastructure Committee* (AIC) (see below and 3.3.4).

2**.** ***DRESDEN-Board*** represents TUD and its 14 non-university research partners as the major body of governance overseeing the joint activities of the *DRESDEN-concept* partners. Its core role is to serve as an advisory board to the TUD Rectorate, developing specific suggestions with regard to synergies in research, teaching and support processes between TUD and its non-university partners. In doing so, the *DRESDEN-Board* interacts with the currently four *Scientific Area Committees* (see below).

3. ***Scientific Area Committees***. As one of its first activities, the *DRESDEN-Board* in 2009 revisited the existing five *RPAs* of TUD in a wider context, that is, with regard to mutually beneficial interactions between TUD and its *DRESDEN-concept* partners. Four scientific areas were identified where the joint performance of TUD and its non-university partners has reached international visibility, (1) Biomedicine and Bioengineering, (2) Information Technology and Microelectronics, (3) Materials Science for New Technologies and Energy Efficiency, (4) Culture and Knowledge. To raise this performance even further by maximally exploiting the synergies between TUD and its non-university partners, four *Scientific Area Committees* (SACs) were formed, which consist of the major representatives at TUD and its non-university partners in the respective research area (see 3.3.4 for roles and tasks).

4**.** An ***Administration and Infrastructure Committee*** (AIC) was implemented by the *DRESDEN-Board* in 2009, consisting of the Head of TUD Administration (*Kanzler*) and similar representatives of the non-university partners. The main task of the AIC is to identify areas of potential synergy between TUD and its non-university partners with regard to (i) administrative processes (e.g., *International Welcome Center*) and (ii) the mutual use of existing, and the establishing of common novel, infrastructure (e.g., *Genome Center*) (see 3.3.4 for details of AIC activities).

5. ***Cooperation Agreements***, based on the *Letters of Intent* signed in 2009, specify and formalize the legal basis for the cooperation between TUD and its non-university partners with regard to research, teaching, administration and infrastructure. Further, a cooperation agreement between TUD and the City of Dresden as “City of Science” was signed in April 2010.

2.3.5 Technische Universität Dresden Aktiengesellschaft (TUDAG)

A further significant cornerstone in the transformation of TUD was its decision to realize an innovative and comprehensive concept for (i) **transfer of knowledge and technology**, (ii) **strengthening complementary fundamental research and teaching** activities, and (iii) **generating revenue** for the University. The commercial TUD organization *TUDAG* and its subsidiary companies cooperate closely with industry and other organizations, offering a wide range of services from IP management to R&D contracts and projects to teaching. *TUDAG* also assembles under its roof the *Dresden International University DIU* (offering a multitude of post-graduate professional programs outside the TUD teaching portfolio) and the *TUDIAS Institute* (language courses for German and international students). To-date, the TUDAG-group comprises more than 16 companies and had an overall turn-over of 30 Mio € in 2010.

Together with several smaller, more focused transfer mechanisms within the University, such as *Dresden exists, HighTech Startbahn*, *Output4Business*, *ZuP* and *CIMMT*, *TUDAG* is largely responsible for the exceptionally strong transfer profile of TUD. It also provides a stimulating and supportive environment for commercial spin-offs for upcoming entrepreneurs, and increases the flexibility for TUD, by covering topics that otherwise would lead to fragmentation and loss of strategic focus within TUD.

2.3.6 Attractiveness for doctoral and undergraduate students

There is no research excellence without sufficient numbers of highly qualified doctoral and undergraduate students. With this in mind, TUD aims to provide an environment which is both attractive and supportive to young high-potentials.

Doctoral students: As a result of the combined effects of increased research funding, mentoring and external marketing, there has been a notable increase in the number of doctoral dissertations from 496 in 2006 to 667 in 2010 (42,3% female) and habilitations (average: 48 per year). Due to its broad range of scientific competence, its partner network and its strong research infrastructure/environment, TUD offers ideal conditions for doctoral students. Examples of TUD's attractiveness are the *DIGS-BB*, one of the largest International Graduate Schools in Germany which receives about 1,000 applications per year, and the International DFG Graduate Program IGK 625. Both serve as role models for other international PhD programs at TUD.

Undergraduate students: Fortunately, TUD and the Dresden area are particular attractive to potential students, leading to application numbers which widely exceed available places of study. Despite a sharp drop of 40% in the number of East German

high school graduates over the past 5 years as a result of demographic changes following the German re-unification process, applications to TUD have continued to increase every year (i.e. by 30% for the 2011 intake alone). Furthermore, TUD has implemented numerous programs to attract students in particular to the strategically important MINT (Mathematics, Informatics, Natural Sciences and Technology) subjects. Because such career decisions are initiated early in life, TUD offers these activities already in primary and secondary schools, and even kindergardens. Within the *Dresden Technical Collections*, TUD has installed a "Mathematical Landscape" and the DLR_TUD_School_Lab. To support the increasing interaction between TUD and the schools, a full-time coordinator is jointly funded by TUD and the City of Dresden.

2.3.7 Internationalization

In addition to the **recruitment of international top-level researchers** and the aim of establishing an **international reputation** as a premier science and research location, TUD considers increasing **internationalization of its undergraduate and post-graduate student cohort** as a high priority. Coordinated by the *Vice-Rector for Academic and International Affairs*, the process itself is designed to be reciprocal aiming at both attracting international students to TUD as well as encouraging German students to participate in exchange programs with foreign countries. In this, TUD capitalizes on the already existing network of international partnerships and exchange programs of TUD and its *DRESDEN-concept* partners with some of the world's most important regions and scientific centers. The remarkable success of this strategy is documented by the following listing which originates from a recent *AUDIT* report to the *Hochschulrektoren-Konferenz* (2011):

- Since 2001, the number of international students has doubled.
- TUD has two international graduate schools. Moreover, it offers 16 bi- and tri-national, nine English-language and four ERASMUS-MUNDUS curricula. With its number of curricula focusing on developing countries (four of which are DAAD-supported) TUD ranks highest among German universities. Strongly increasing numbers with regard to student mobility (exchange semesters) within DAAD, LEONARDO etc.
- Recent DAAD reports rank TUD consistently among the TOP 5 positions with regard to exchange funding (3.5 to 5.5 Mio €/year). TUD offers students over 1,000 exchange slots in over 300 international partner universities.
- TUD ranks number 2 with regard to European projects in the TEMPUS III program and ranks No. 1 with regard to structural measures.

- Coordinated by the European Project Center (EPC), TUD participated as coordinator in 11 and as participant in 67 projects of the EU 7th framework program, associated with a strong shift to international networking and exchange.

This AUDIT Report has also identified several weaknesses and barriers to international recruitment, such as the unusually high German language skill requirements for enrolment, which will have to be reconsidered to increase the still low proportion (12%) of international undergraduate students, considerably. In contrast to the situation with undergraduate students, master students and doctoral students are already highly international, principally due to the new Master Programs and the existing international research networks.

2.3.8 Gender equality

Gender equality has been included in the Mission Statement of TUD and is a declared responsibility of the Rectorate. Furthermore, a Sub-Committee of the Senate has been established in 2010 for Gender Equality and Diversity Management. A Gender Web Portal is in preparation which will provide a substantial data collection regarding the state of gender mainstreaming.

With its Gender Equality Concept (TUD Website), TUD has succeeded in a BMBF competition for additional professorial positions for women and has contributed to the DFG project Research-Oriented Standards and Gender Equality. On a scale of "4", the DFG Experts Committee ranked TUD's gender equality endeavors as "3", confirming a "convincing general concept which has already been largely implemented". TUD is determined to improve on this ranking before this DFG program is completed.

TUD takes part in the quality audit of "berufundfamilie gGmbH", and has been certified as a "familiengerechte hochschule" in 2005 and 2010, an outstanding attest of the “family friedly” philosophy of TUD. Recently, TUD has initiated the "Studying with Children" program (in cooperation with business partners and the student union) with a campus office offering support and consulting services. The City of Dresden supports this approach by offering the widest coverage of child care requirements in Germany, and granting priority access to TUD staff and students.

The proportion of women in the MINT disciplines is still disappointingly low, despite active recruitment measures. For this reason, TUD – together with the three other major German universities, participates in "tasteMINT" - an assessment program aimed at identifying the potential of female high school graduates. TUD is also involved in MINToring (sdw –

Stiftung der Deutschen Wirtschaft) and in the Femtec.Network - a university career-building center for women in the Engineering and Natural Sciences.

While the overall proportion of female doctoral graduates has now reached a share of 42%, significant disparity still exists on the level of habilitations by women - only 29% - and especially regarding professorial appointments. Here women only occupy 14% of all professorships at the W2/C3 level and 7% at the W3/C4 level. TUD introduced the Maria Reiche Program to support women working on a Habilitation and female post-doctorates. With this program the number of women shall significantly increase at this level of qualification over the next few years. The approved plan for the advancement of women aims to raise the proportion of female doctorates to 50% by 2015, female post-doctorates and female professors to 15% by 2020.

2.4 Research-oriented teaching

TUD is committed to the principle **"no excellence in research without excellence in teaching"**. This intimate and strong interrelationship is the basis for TUD´s **Bachelor, Master, Diploma and "Staatsexamen" curricula, which all involve** - with different focus according to discipline - various levels of **scientific research** modules from early on, and require the completion of independent research projects for graduation. These projects are frequently performed in the context of existing research programs of TUD or its partner institutions. They also involve special training for transferable skills (e.g. presentations, report writing, etc.) and cutting-edge research techniques. Face to face teaching, mandatory laboratory visits and "research internships" are established in many programs of study. In addition, special lecture series by TUD top researchers as well as the *DRESDEN-concept* partners are provided to stimulate students' curiosity and interest in research. In 2010/2011, TUD introduced a structured and coordinated "Quality Assurance Management System", which defines research-oriented teaching as a core principle for all levels of teaching. The *Gesellschaft der Freunde und Förderer* of TUD sponsors an **annual award for excellence in research-oriented teaching**.

At the **postgraduate level,** numerous disciplinary and transdisciplinary Graduate Colleges and structured PhD programs as well as spring, summer and winter schools have been established, emphasizing the direct involvement in cutting edge research, structured curricula, access and contact to top scientists, and mentoring (see Annex 10).

The remarkable impact of TUD's approach to research-oriented teaching is documented by the substantial number of TUD graduates continuing with a research career.

2.5 Governance and decision-making

Within the framework of the Law for Higher Education Institutions of Saxony and the TUD-Constitution, the relevant TUD central authorities are the Rectorate, the Senate, the Extended Senate, and the University Advisory Board. Details are provided on the TUD website. The Saxon State Ministry for Higher Education, Research and the Arts oversees development planning, financing and accounting as well as legal aspects of all universities in Saxony. Within the new University Development Plan, TUD has been granted more flexibility in managing its budget, which it has already used to a substantial extent. Until recently, TUD´s governance and decision-making followed the traditional pattern of German universities; i.e. a clear division between academic and non-academic management duties, the latter being the responsibility of the *Kanzler*. Since August 2010, the three Vice-Rectors hold full-time appointments with responsibilities and access to administrative staff. Resources are allocated by the Rectorate to the individual Faculties based on agreed targets, workloads and performance. The Deans of the Faculties are then responsible for the allocation of resources to individual institutes and chairs. The two principal bodies of decision making are the Rectorate for strategic university-wide decisions and the Faculty Boards for discipline-specific decisions, with approval by the Senate and the University Advisory Board.

2.6 SWOT analysis

Strengths:	**Weaknesses:**
• Successful record for major structural and conceptual innovations; strong team spirit and pioneering attitude • Comprehensive profile with proven research excellence in all 4 principal scientific disciplines • Continuing dynamic development over past 2 decades • Steep positive gradient in all rankings with increased listing among the top 10 German universities • Existing Excellence Cluster and Graduate School; proposal for additional Excellence Cluster invited	• Proportion of top-PIs and top-students not yet at the level of an international premier-league university • Low proportion of female full professors • Lack of tenure-track career options • Low proportion of female graduates in MINT disciplines • Incomplete exploitation of potential due to synergy-hindering structures • Fragmented Faculty structures • Unsatisfactory student drop-out rates in some disciplines • Unfavorable ratio of students to academic teachers

• International Master Programs • Central position in one of the strongest research campuses in Germany, cooperating with local institutes of all 4 major non-university research organizations • Lead position in patents and technology transfer (TUDAG group) • Highly attractive location and socio-cultural environment	• Lack of coordination and synergy between structured doctoral programs • Unsatisfactory administrative support processes • Historical laboratory buildings on main campus in need of major refurbishment to comply with modern requirements
Opportunities: • Developing novel modes of recruitment to attract the best students and PIs, improve gender balance, and foster internationalization • Modernizing structures (e.g. 5 *Schools*) and support processes to unleash the potential in research and teaching • Exploiting the strengths of the Dresden research campus with regard to (i) spectrum of research, (ii) potential synergies in research, teaching and infrastructure, (iii) recruitment of students and PIs • Developing a highly attractive city campus with a stimulating combination of historical and modern buildings	**Threats:** • Loss of top-performing PIs to Excellence Universities • Recruitment and retention problems due to non-competitive salaries and pensions • Internal disharmony due to perceived split into PIs supported and not supported by the Excellence Initiative • Lack of opportunity of the "not-yet-excellent" to reach this status • Potential cuts in State funding in case of unsatisfactory outcome in the Excellence Initiative

3 Institutional Strategy – project description

3.1 Goals

The *Institutional Strategy* of TUD is consistent with all aspects of the philosophy behind the German *Excellence Initiative*. Based on the already existing strengths of TUD and the scientific environment of the Dresden area as a whole, its goals are:

- to implement the inherent **consequences of the SWOT analysis** (see 2.6) by developing further strengths, exploiting opportunities, abolishing weaknesses, and meeting threats
- to increase the **attractiveness** for high-performers and high-potentials in research, teaching and administration
- to provide a **framework** where these individuals can work, produce and progress
- to promote **structures** that facilitate leading research and the transfer of research excellence into academic education and into all sectors of society
- to produce added value by harvesting intellectual and infrastructural **synergies** within the university and within the scientific community of the Dresden area
- to create spaces and structures in which **innovation** can flourish and new centers of excellence may develop and
- to affect, encourage and enable **all sectors of the University** to become excellent

The *Institutional Strategy* includes measures to optimize the system "university" and its interaction with other research institutions, as well as measures to improve the performance within this system itself. To achieve lasting improvements, its focus is on **strengthening enabling processes and structures**, rather than on temporary investments in individual staff or infrastructures.

3.2 Strategic approach

In light of the *Status Quo*, what should be the steps that will move TUD into the international premier league of universities? How does one sharpen TUD's profile as a *Synergetic University*, and how can one fully explore its strengths and potential to maximize chances of success, reduce weaknesses and minimize existing risks? And which measures will provide TUD with the possibility to react to the continuously increasing - both in volume and complexity - demands on a modern university? These were the strategic questions that needed to be addressed in the conception of TUD's *Institutional Strategy*.

Due to its already outstandingly successful development over the past 20 years, the *Institutional Strategy* of the *Synergetic University TUD* is not perceived as a paradigm shift, but as a boost to the already highly dynamic development to provide the activation energy required to ascend permanently to a significantly higher level. Based on its *Status Quo* and *SWOT Analysis*, TUD will focus on two important, yet interrelated aspects: **people and structures**.

Focusing on excellent individuals. With regard to the measures relating to people, the approaches that will be taken by TUD are based on the credo that the lead parameter to achieve excellence in research should be the **recruitment**, and - once recruited - the **optimal support**, of **individual researchers who excel**, rather than the implementation of seemingly "timely" research programs or "politically correct" networks. This results from the conviction that excellence of the institution presupposes excellent scientists at all levels of the academic career path. These people have to be provided with an environment enabling them to unfold their excellence to a maximum. Best people produce best results, and best results produce the highest visibility in the global academic and scientific competition for talent and funds. Consistent with this view, university structures and processes must encourage and support synergies between these researchers, nurture their creativity and boost their productivity.

Measures to achieve these objectives are described in 3.3.1; most of them are closely linked and interrelated, as they are individual pieces of an overall strategy for the future development of TUD.

Individual excellence nourished by organizational culture. The *Institutional Strategy* affects all activities and communities of TUD; its complexity is intentional and its integrative approach the key to a successful and lasting implementation of the proposed measures. Information, communication, motivation and participation are, therefore, of prime importance. A representative poll with more than 6,000 TUD participants shows that over 90% are pleased with their place of work or study, and that over 80% support the university's participation in the *Excellence Initiative*. More than 500 staff and students have been involved in the elaboration of various aspects of the *Institutional Strategy*.

A detailed roadmap for the implementation of the various aspects of the *Institutional Strategy* is provided in Section 3.5. Structural measures have already been agreed upon with the Deans of all 14 Faculties, and are continuously elaborated further. By introducing a comprehensive university-wide tool for monitoring, assessment and con-

trol of “Project Excellence Initiative” (see 3.5) it will be ensured that strategy, structures and institutional culture are continuously harmonized.

TUD has already proven its outstanding capacity to manage and accommodate fundamental changes in the 1990s – it is ready to do this again to realize its *Institutional Strategy*.

Balancing priorities and posteriorities. It is obviously of utmost importance to detect and avoid undesirable side-effects of the *Excellence Initiative*, such as imbalance between teaching and research, de-motivation of unsuccessful applicants, frustration in those communities which do not see the immediate benefits of the excellence efforts, as well as the loss of top-performing academic staff in an increasingly competitive transfer market. This requires enhanced communication with the University as a whole and in particular with representatives of the different academic and non-academic communities. Funding for this additional communication activity has been approved by the Rectorate in March 2011.

Measures elaborated within the *Institutional Strategy* will benefit all activities and academic quarters within the university, including those which, to date, have not participated or been successful in the *Excellence Initiative*. DFG comments on the TUD draft proposals which did not pass the selection process of the *Excellence Initiative* have been analysed to elaborate ways to realize those aspects where feed-back was positive. Examples, where this will immediately be possible due to already existing or newly approved research programs, are the establishment of the *Dresden International Graduate School on Materials for Energy Efficiency*, the *Dresden Center for Cultural Research* and the *Dresden Center for Urban Transformation and Environment*. Furthermore, TUD is actively promoting transdisciplinary research cooperations to stimulate the exchange of research expertise and experience, as for the field ”Energy and Environment”, in which 25% of all TUD professors are active.

The *Institutional Strategy* of TUD also respects the key recommendations evolving from discussions in the context of the new *Development Plan for Higher Education Institutions in Saxony*, as well as the present *Law for Higher Education Institutions* and its announced modifications. The Government of the Free State of Saxony and the Mayors of the City of Dresden strongly support the measures outlined in TUD’s *Institutional Strategy.*

3.3 Measures and expected effects

As outlined in the 2010 Draft Proposal, TUD proposes **four major measures**:

- *Recruiting and Supporting Outstanding Individuals* (3.3.1) describes a coherent set of measures relating to TUD people;
- *Organizing the 14 Faculties into 5 Schools* (3.3.2) describes the main measure relating to TUD structures;
- *Optimizing administrative and support processes* (3.3.3) describes the main measures relating to TUD processes;
- *The DRESDEN-concept* (3.3.4) describes a coherent set of measures that aim at maximizing the synergies between TUD and the local non-university research institutions with regard to research, teaching and support processes.

In addressing the advice by the *Joint Commission* of March 22, 2011, the measure *Recruiting and Supporting Outstanding Individuals* (3.3.1) has been extended to cover all academic career levels. This section also includes the requested information on how TUD intends to deal with its "weaker" parts and to support emerging research areas. Moreover, the requested detailed information concerning the measures *Organizing the 14 Faculties into 5 Schools* (3.3.2) and *The DRESDEN-concept* (3.3.4) are now provided, as is the case for the issue of Transfer (3.3.5). Project management (3.5) is also described in detail, as requested. The advancement of TUD's *Institutional "Culture"* is addressed throughout this *Institutional Strategy*. It is **important to note** that the focus on the **strategic major measures**, which are decisive for the development of TUD into an internationally leading university, has not changed. However, a number of additional, **associated measures** have now been included in TUD's *Institutional Strategy* to render it truly comprehensive.

3.3.1 Recruiting and supporting outstanding individuals

An overview of the innovative measures to recruit outstanding individuals to TUD, as well as of the essential measures to support the very best individuals after their recruitment to TUD at all career levels is provided by Fig. 6, with strategic measures in dark-blue and associated measures in light-blue.

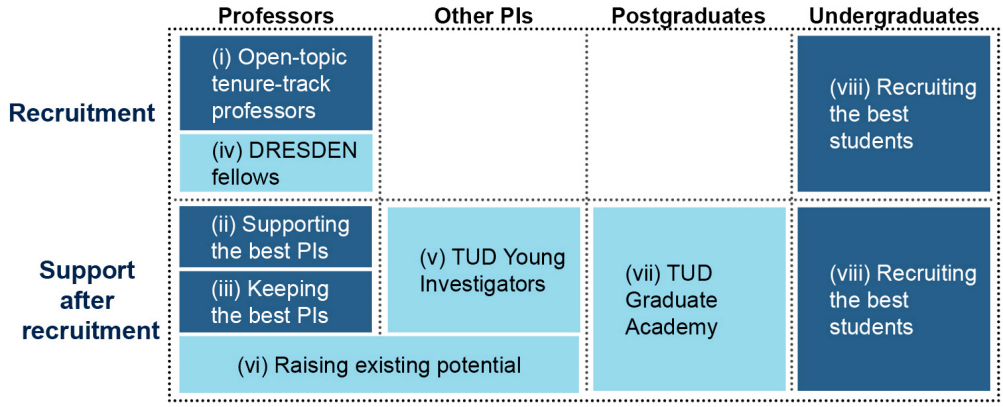


Fig. 6: Strategic and associated measures relating to people

(i) "Open-topic" Tenure-Track Professorships

TUD proposes a novel **approach to attract and retain the very best and most innovative researchers world-wide** as Principal Investigators (PIs): the *"Open-topic" Tenure-track Professorships*. The idea is to identify top-notch researchers early in their career, that is, after their post-doctoral training or first industrial career stage, as these individuals move on to take up their first faculty positions, and to offer a long-term perspective at TUD if their performance meets the expectations. The long-term perspective will be provided by a **stringent tenure-evaluation**, applying procedures and criteria that are customary at the very best universities in the world.

ANNOUNCEMENT, IDENTIFICATION OF INDIVIDUALS. **The key feature of this recruitment process is that the field of expertise of these *"Open-topic"-Professorships* is NOT specified.** Traditional recruitment of professors defines an area in which the candidate should have made significant contributions. This curtails, to a variable degree, the extent of innovation that is associated with such an appointment. By not defining the research field of these *"Open-topic"-Professorships*, in other words, by encouraging researchers from ANY scientific discipline or discipline interface to apply, and by involving the *DRESDEN-concept* partners in the search, a maximum degree of innovative research activities will be brought to the attention of the TUD committees selecting these professors.

The **first round of recruitments** of *"Open-topic" Tenure-track Professorships* is planned to be initiated in the spring of 2012. This novel mode of recruitment is likely to be perceived by potential candidates as somewhat unusual. For it to become a success, it is therefore important that "the ground is well prepared". To this end, TUD professors and PIs from the *DRESDEN-concept* partner institutions of TUD (see Annex 8)

who have a track record of excellence will use their **international networks** and bring the upcoming *"Open-topic" Tenure-track Professorship* advertisements of TUD to the attention of internationally leading researchers in their respective fields worldwide, so that these in turn can encourage their very best junior colleagues to apply.

SELECTION. The next step in the recruitment process is to identify those applications that are of the highest quality, have the greatest potential of innovation, and are likely to generate the highest degree of synergy within TUD. This challenge will be met by a **novel type of selection committees**, which – while ensuring compliance with TUD regulations – are characterized by two major features. First, these selection committees will be composed such that the decision-making process is dominated by TUD professors who have a recent track record of excellence. Importantly, to ensure that interdisciplinary applications are adequately evaluated, TUD professors from several faculties and more than one *School* (see 3.3.2 and Annex 9) will be members of the committees. Second, to further maximize the spectrum of expertise in these selection committees, PIs with a recent track record of excellence from the *DRESDEN-concept* partner institutions are also members of the selection committees. The fact that most of the latter PIs are Professors at TUD with full rights and duties should ensure that the necessary legal requirements for their participation in the selection committees are met. An important task of the selection committees for the *"Open-topic"-Professorships* is to find the right **balance of innovation in TUD's core areas of excellence *versus* innovation in emerging fields**. The participation of both TUD professors from the 5 *Schools* (see 3.3.2 and Annex 9) and from the *DRESDEN-concept* partner institutions should ensure that such balance is achieved. The final appointment decision will be made by the Rectorate, who may seek independent advice by eminent international scientists.

TENURE-TRACK. Already at the beginning of their independent career, the most promising high potential researchers are courted by international top-universities. To have an edge over competing universities, TUD will not simply offer a *Junior Research Group Leader* position (EG15 or W1), as is typically done by German universities, but – depending on individual circumstances – will offer a **W2- or W3-position** (plus research group package) **from the start**, with the initial employment being a temporary 6-year contract. A stringent tenure-evaluation will be carried out after 5 years of employment. One of the criteria for tenure that must be met will be that 10 peers from internationally leading universities or other research institutions confirm that the candidate under consideration would qualify for a tenured professorship at their home institution. If the ten-

ure-evaluation is successful, the candidate will be employed on a permanent W3-position, with a substantial increase in salary.

GENDER BALANCE. One of the chronic weaknesses of German universities, and of *Technische Universitäten* in particular, is the lack of female scientists in full professorial positions (see 2.3.8). Observing the quality of applications and the balance between TUD's core areas of excellence and emerging fields, **TUD will therefore strive to fill as many of these *"Open-topic" Tenure-track Professorships* as possible, ideally half of them, with young female researchers.** Indeed, the very fact that the field of research of these *"Open-topic"-Professorships* is not specified makes it a realistic endeavor to achieve this goal. Traditional recruitment criteria of professors for defined research fields, especially at a Technical University, tend to have an intrinsic bias towards male researchers. This will be overcome by the innovative approach of the *"Open-topic" Professorship* mode of recruitment.

INTERNATIONALIZATION. The *"Open-topic" Professorship* mode of recruitment also provides an opportunity of attracting **international PIs** to TUD. At least some of these professors may be exempt from the stipulation to be able to teach in German, and their teaching commitment may be earmarked for International Master Courses that are always taught in English, as well as for Graduate Schools.

PRESENT *VERSUS* FUTURE AREAS OF EXCELLENCE. In addition to promoting a fair gender balance with regard to full professors, the *"Open-topic" Professorship* mode of recruitment has the intrinsic advantage that **existing *versus* emerging fields of excellence at TUD** have an equal chance of becoming strengthened. Hence, this recruitment procedure is an **opportunity for TUD as a whole,** including also those areas which so far have not been part of the Excellence Initiative.

(ii) Supporting the best PIs

Top-notch young professors recruited to TUD on their first faculty position may require an increase in their core support as their research performance goes up. The same may hold true for TUD professors with an excellent track record who were recruited before the second program phase of the Excellence Initiative. The typical German approach taken by these PIs to meet this demand is to apply to another university, get an offer, and use this to negotiate with their home university. This approach is often counter-productive for the PIs´ research performance and carries the risk of losing "rising stars".

As an alternative, TUD proposes to create a ***"Support the best"*–Pool** of 11.5 Mio € to support its outstanding PIs (referred to as *"Fund-if-justified"*–Pool in the 2010 draft proposal). The *"Support the Best"*–Pool is for TUD as a whole, that is, any successful PI of TUD can apply. Decisions about funding will involve a high-ranking TUD-internal committee, which – as a first criterion to be fulfilled – will determine whether the recent research performance of the applicant was truly outstanding. If this criterion is fulfilled, the prime criterion for receiving additional funding is a convincing justification that this funding is needed by the PI. Note that funding from the *"Support the Best"*–Pool typically is not for research projects as such – there are plenty of potential sources of funding for this in Germany and the EU – but rather for the core support that is required by a PI to successfully obtain external project funding. There is complete flexibility as to the type of support the PI may apply for, e.g. personnel, consumables, investments, outsourcing, travel, etc. Funds are typically granted for a 5-year period, with the possibility of renewal depending on the above criteria.

RESEARCH *VERSUS* TEACHING COMMITMENT. The TUD is, of course, committed to research and teaching being an entity at the level of the institution as a whole. However, this does not necessarily imply that every single professor is engaged to the same extent in research and teaching. Rather, as an additional means of support, PIs who excel in research may have a **reduced teaching commitment** (but no "zero" teaching), with a focus on research-oriented teaching (see 2.4 and 3.4). Conversely, TUD will accommodate professors with a focus on teaching, according to the recommendations of the *German Council of Science and Humanities* (*"Empfehlungen zu einer lehrorientierten Reform der Personalstruktur an Universitäten"* 2007). The latter professors are also expected to engage in research, albeit to a lesser extent, since they have an increased teaching commitment.

(iii) Keeping the best PIs

Although the various measures described in this institutional strategy to recruit and support PIs with outstanding research performance are likely to greatly reduce the risk of these investigators leaving TUD for a position elsewhere, this risk can never be completely eliminated. However, to further minimize this risk, TUD proposes to use resources from the ***"Support the Best"*–Pool** (see above; *"Retain-the-Best"*–Pool in the 2010 draft proposal) also to counter attractive offers made to its leading PIs by other institutions, and thus to keep them at TUD. Allocation of additional funds from the *"Support the Best"*–Pool to PIs with external offers is decided on a case-by-case basis

by the *Rector* in consultation with the *Vice-Rector for Research*, the responsible *Head of School* and the TUD professor who chairs the relevant *SAC*. There is complete flexibility with respect to the type of support a PI may receive.

(iv) The DRESDEN Fellowship Program

To prepare the ground for the **recruitment of top-level PIs**, and to **strengthen its international networking**, TUD proposes to establish the Visiting Scientists program *DRESDEN fellows*. In this program "rising-star" junior scientists (*DRESDEN junior fellows*) and established international top scientists (*DRESDEN senior fellows*) will be invited to Dresden to participate in research and teaching at TUD for a period of up to six months. Junior Fellowships offer young aspiring scientists and their TUD hosts the opportunity to get to know each other and to explore future potential recruitment (e.g., for open-topic tenure-track professorships). Importantly, this will facilitate recruitment not only in the current RPAs, but also in emerging research fields with the potential to develop into future RPAs of TUD. Senior Fellowships serve two main purposes, (i) to intensify collaboration with established top scientists and to establish long-term strategic cooperation with outstanding international partner institutions, and (ii) to bring role models to TUD. The latter is particularly relevant as part of TUD's efforts to promote gender balance, as eminent female PIs visiting TUD will serve as "proof of principle" for a career to the very top in academia and function as career-advisors for female junior scientists at TUD.

(v) TUD Young Investigators

The *TUD Young Investigator Program* intends to close an obvious gap in the German academic system by harmonizing the status of excellent young PIs who are not yet professors. Thus, the target group are top junior scientists in fixed-term positions who have earned themselves a position and resources in high-ranking funding programs (e.g., *Emmy-Noether*, *Heisenberg Program*, *Sofja-Kovalevskaja Prize*, *ERC Starting Independent Researchers Grant*). Importantly, the *TUD Young Investigator Program* aims at independent junior research group leaders in *Excellence Clusters* and similar programs in non-university research institutions.

Early in their career, these high-performing young scientists face a dilemma. On the one hand, they often profit from very favorable conditions with regard to resources and/or equipment, and are in a position to establish their own research profile with scientific independence. On the other hand, their status within the university is not clearly defined, and they are not formally integrated into the university. Notably, (i) they cannot

act as examiners of doctoral theses which they *de facto* supervised, (ii) they do not participate in faculty proceedings and (iii) they lack experience in academic teaching.

To overcome such shortcomings, TUD proposes to establish the *TUD Young Investigator* status. This status is temporary and implies the following rights and duties:

- Each *TUD Young Investigator* is assigned to a TUD professor who acts as her/his mentor. This professor typically is an experienced scientist of the respective faculty or a PI from the respective non-university institution who is also a professor at TUD
- *TUD Young Investigators* are offered personalized training to acquire leadership skills and competence in human resource management
- *TUD Young Investigators* are entitled to act as examiners for doctoral theses which they supervised
- In consultation with their mentor, and only to an extent that does not impinge on their research career development, *TUD Young Investigators* offer appropriate teaching modules (e.g., one course per semester), participate as examiners, and engage in administrative duties
- Like Junior Professors, *TUD Young Investigators* may attend Faculty Board meetings

TUD decides about conferring the status of a *TUD Young Investigator*. For independent junior research group leaders at non-university research institutions, the following criteria apply: (i) the respective institution is a member of the *DRESDEN-concept*; and (ii) the independent junior research group leader position has been awarded in a competitive process equivalent in standard to that of the above funding programs. The status of *TUD Young Investigator* ends with the termination of the fixed-term position.

(vi) Raising the potential of emerging research areas and investigators

To promote the development of the entire University and to realize its full potential, TUD proposes supportive measures (1) for researchers **in emerging areas** that are 'on the threshold' to top research, and (2) for **high-potential individuals in research areas with presently suboptimal performance** as judged by qualitative and quantitative criteria:

(1) For emerging areas, comprehensive assistance will be provided in preparing and submitting **substantial research projects** through submission scouting and support. This assistance will be provided by submission scouts (from within the TUD as well as from the *DRESDEN-concept* partners (see 3.3.4) who are experts in the respective scientific field. These scouts will support the networking of identified competences and

the extension of suitable cooperations in such a way that the road is opened for the successful submission of highly competitive research projects, which will be overseen by these scouts.

(2) Support for scientific areas where research performance needs to be enhanced significantly will **concentrate on promising younger academics** to provide them with a chance to catch up with the top performers in their discipline. They will be assisted by experienced TUD colleagues in the submission of their first (and, when indicated, follow-up) third-party funded projects. On substantiated request, internal financial support and concept coaching will be provided.

(vii) The TUD Graduate Academy: Career development for doctoral students and post-docs

The **TUD Graduate Academy** coordinates the qualification of post-graduate students working at TUD and its non-university research partners, and is, therefore, the educational complement to the 4 SACs which purely focus on research aspects. It has three central objectives, (i) to serve as an umbrella organization for already existing and future **PhD programs** at TUD, such as *Graduiertenschulen* (e.g., DIGS-BB) and *Graduiertenkollegs*; (ii) to provide a forum for **"individual" doctoral students**, i.e. those who are not members of PhD programs, offering them the benefits of structured doctoral training; and (iii) to implement and oversee common activities and training opportunities for **post-docs**, who are often neglected in this regard. To achieve this, the TUD Graduate Academy will

- provide a platform for cross-checking, and – if indicated – harmonizing, the quality standards and procedures between the various structured PhD programs at TUD
- develop quality-assuring measures, including monitoring and reporting procedures, to ensure high standards of supervision of "individual" doctoral students
- offer training in disciplinary as well as transdisciplinary topics (such as Intellectual Property/Patent Management, Human Resource Management, Scientific Writing, Project Management) to doctoral students and post-docs
- become the showcase for TUD's junior scientists, who will be given the opportunity to present their research profile on websites accessible to prospective academic and industry employers
- offer an advisory service for doctoral student that deals with issues such as (i) conflicts with supervisors, (ii) delays in completing doctoral work, (iii) equal opportunity, and (iv) compatibility of family and academic career

- offer three forms of financial support to foster the career of excellent young researchers, (i) support for short research stays abroad and the participation at international scientific conferences, (ii) support for scientific retreats organized by PhD students, and (iii) performance-based bridging funds for doctoral students and post-docs to support their transition to the next career level
- develop novel concepts and framework conditions for external doctoral work in industry, where research students are frequently confronted with conflicting expectations concerning practical application and academic rigor. The indispensable conditions for this cooperative model are high scientific quality and standard of supervision, to prepare students for either an industrial or an academic career

Located centrally on the campus, the TUD Graduate Academy will house the PhD programs offices, rooms for seminars and events, and a number of "think cabinets" for doctoral students. An attractive scientific and cultural framework program (guest lectures, readings, exhibitions, beer hours) will make the Graduate Academy a vibrant interdisciplinary and intercultural venue. As a meeting place, where communication and the exchange of ideas are fostered, the Graduate Academy will offer an ideal spot for doctoral students, post-docs and (even) their supervisors.

(viii) Recruiting the best undergraduate and graduate students

While student numbers in TUD have been continuously increasing against the demographic trends, we are well aware that the competition for the best students nationally and internationally will accelerate in the near future. To raise TUD's attractiveness for this target group, we want to take measures according to the following categories:

(1) strategically integrating the strengths already established and improving them
(2) enhancing the attention paid to TUD by unconventional means
(3) offering top programs for top students integrating studies with research

INTEGRATING THE ESTABLISHED STRENGTHS AND IMPROVING THEM

To attract the best students, a central marketing strategy shall considerably improve TUD's public relations work, in particular in the internet. Beyond the relevant information on study programs and future areas of employment, the *Student Marketing Site* will offer interesting and challenging **self-assessment tests**.

TUD's *Central Academic Advisory Service* (*CAAS*) will extend its *Student Information System* further, to provide not only the latest information about the various academic disciplines and their degree programs, but also about the main research areas and

their recent successes. Apart from information for undergraduates, this aims to illustrate TUD's attractiveness for potential master and doctoral students. Within the *CAAS,* TUD will establish a *Contact & Coordination Office* for all joint activities with high-schools, such as lab classes, excursions and project days. TUD is also coordinating a range of local activities for high-school students, such as the *Technical Collections* with its *Math Adventure Land*, the *DLR_TUD_School_Lab* and the *Cool Silicon Adventure Land*. Special emphasis will be placed on contact with "elite" high-schools to make TUD's range of support for outstanding students known to the best future students.

TUD students intending to become teachers will be involved in MINT activities with high-schools and may do internships in engineering/science institutes at TUD or its *DRESDEN-concept* partners, to gain "real-life" experience, which will assist them to confer the excitement of MINT subjects and of research to their future pupils.

TUD "ON THE SCREEN"

To demonstrate to German high-school graduates that TUD is an excellent university to study at and the City of Dresden a wonderful place to live in, an annual ***Study Festival*** will be organized during a long week-end in summer. This dual-event will combine the well-established ***TUD University Day*** with the famous ***Campusparty***. While the former will give prospective students the chance to obtain first-hand information about the various courses of study, the students´ residencies and to explore the campus and its buildings, the latter is the largest student festival in Germany with more than 15,000 participants having a great night out with fun and music. What better way is there to meet ones´ future fellow students, to get hooked to the exciting spirit of the University and the City of Dresden? TUD Dresden will provide sponsorship in form of free entrance tickets to the Campus Party and is negotiating further support for travel and accommodation with TUD's industrial partners. It is TUD's aim to establish the Dresden *Study Festival* as THE event in Germany for high-school graduates who are about to decide what and where to study, and to get them excited about TUD.

To attract international students, TUD and its *DRESDEN-concept* partners will take special measures, profiting from their existing, large international networks. These measures comprise the recruitment of students via the web and personal activities of eminent Dresden scientists acting as ambassadors.

ENHANCING TUD'S ATTRACTIVENESS FOR TOP STUDENTS

The self-assessment tests already mentioned above shall not only provide a possibility for the orientation of the students but also illustrate that the TUD wants to get the best

students. Therefore, the Student Service Offices in the various academic units will run an **annual contest *"We look for the best"***. Interested students may register their test results with the relevant faculty, which selects the best 5% of the submissions and invites these high-school students to a three-day visit to Dresden under the auspices of the Rector. These students will also be offered the opportunity to enroll in the **"Top5 Program"**, which is modeled according to honors study programs. To widen the students' horizons, this program will offer special courses from all academic disciplines and small study groups mentored by either eminent TUD professors or *Senior Dresden-Fellows* (see p. 37). They will also be offered internships at *DRESDEN-concept* partners and enterprises located in Dresden.

3.3.2 Organizing the 14 Faculties into 5 Schools

Currently, the organizational units for education and research at TUD are the 14 Faculties and, additionally, several Central Academic Units which also run study programs. This traditionally wide scope of activities in teaching and research has a number of decisive drawbacks. Thus, this structure does not sufficiently allow for **interdisciplinary education and research** among the disciplinary fields and the Faculties, which in turn impedes the identification and subsequent realization of **future-oriented, innovative topics**.

It also bears the danger that disciplines work in isolation, the competition for resources is Faculty-centered, and courses are doubled. As a result, academic education and research are compartmentalized and the assessment of one's own performance is self-centered. Moreover, as some of the Faculties are relatively small, they work on the verges of the critical mass which is necessary for competitive research, education and strategic development. In addition to the Central Administration, each Faculty has its own administrative and support structures that function to different degrees of perfection. Where such structures exist at all, they mostly depend on the engagement of individuals, and hence are fragile and do not allow for responsible, professional performance.

To overcome these weaknesses, the 14 Faculties of TUD will be reorganized under the roofs of 5 *Schools*. Governed by the principle of subsidiarity, academic plurality shall be ensured and, simultaneously, the synergetic advantages in research, education, administration and infrastructure shall be supported. The Schools planned are (in alphabetical order):

- **School of Civil and Environmental Engineering:** Faculty of Architecture, Faculty of Civil Engineering, Faculty of Forest, Geo and Hydro Sciences, Faculty of Transportation and Traffic Science
- **School of Engineering Sciences:** Faculty of Computer Science, Faculty of Electrical and Computer Engineering, Faculty of Mechanical Engineering
- **School of Humanities and Social Sciences:** Faculty of Business and Economics, Faculty of Education, Faculty of Law, Faculty of Linguistics, Literature and Cultural Studies, Faculty of Arts, Humanities and Social Science
- **School of Mathematics and Natural Sciences:** Faculty of Science, comprising the departments Biology, Chemistry, Mathematics, Physics and Psychology
- **Medical School**: Faculty of Medicine

Since submission of the Draft Proposal in 2010, the structures of the individual Schools have been agreed upon in an intensive process of coordination between the Rectorate and the Faculties concerned. The focus lies on the potential of research synergies and a reasonable distribution of the Faculties' activities in education and research. The Schools will be endowed with a considerably wider range of flexibility and independence with respect to human resources, finances as well as strategic planning than is presently the case for the Faculties. The **advantages of the School Structure** are:

Research: Encouraging joint research projects; Development of a common research infrastructure; Implementation of new joint doctoral programs.

Teaching: Harmonization of guidelines for existing study programs and development of new interdisciplinary study programs; Encouraging the development of joint courses; Where possible, establishing a common First Year Program to postpone the decision for the area of specialization; Improving students' support by establishing substantial *School Student Offices* for all matters related to teaching, examination and general advice.

Management: Motivating strategic planning and cooperation by delegation of responsibilities to the Schools and the allocation of a global budget; Encouraging the strategic appointment of professorial and non-professorial staff beyond the scope of individual Faculties; Extending the management and coordinating capacities of both decentralized units and the University as a whole; Providing TUD with a clearly visible, strategic profile.

Administration: Professionalizing and bundling of support processes in larger units; Uncoupling administrative and academic functions; Avoiding duplication of administra-

tive processes at Faculty and Central Administration levels; Avoiding excessive peak work load, improving flexibility and continuity through clear standing-in regulations; Maximizing the use of the planned comprehensive resource planning **(ERP)** and student life-cycle management **(SLM)** systems.

Technical Support: Synergies with respect to technical competence and workshop machinery; Safety aspects.

A detailed listing of the distribution of individual responsibilities to Rectorate, Schools, Faculties, Institutes and individual professorships is provided in Annex 9.

The restructuring of the 14 Faculties into 5 Schools implies fundamental changes for the University. In order to organize this in an optimal way, a **defined transition process** is envisaged:

In the immediate future (2011-2012), the 5 Schools will be established to bracket the respective Faculties. During the following transition of about one year (Phase 1), the autonomy of the Faculties and Centers will be retained while they adjust their procedures gradually to the future School structure. Such structures already exist for the Faculty of Medicine and the Faculty of Science. The restructuring steps for the remaining 12 Faculties have been set down in agreement with the respective Deans and Faculty Committees.

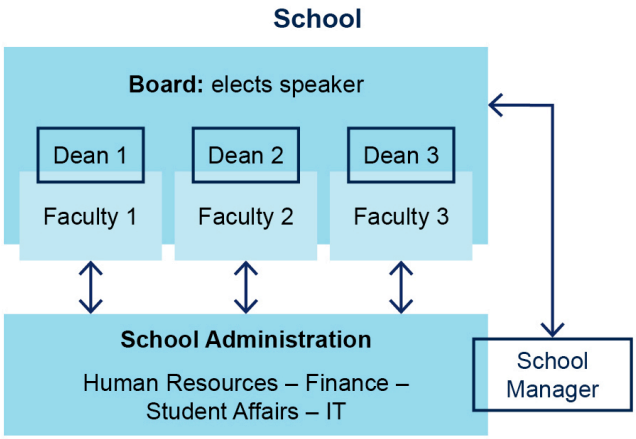


Fig. 7: Schematic representation of School structure

Each School will be led by a *School Committee* composed of the Deans of the constituting Faculties, who elect from their ranks a Chairperson. The Chairperson is assisted by a School Manager who is responsible for all administrative matters of the School. To improve the mutual flow of information and the coordination of activities, monthly meetings of the Chairpersons and the Rectorate will be called.

In the subsequent Phase 2, the newly formed Schools will be given an administrative unit endowed with functions and competences which are at present allocated either in the Faculties or the Central Administration.

The majority of the *School Support Staff* will originate from the support staff of the constituting Faculties or will be transferred from the Central University Administration. For a transitional period, funding will be provided through the *Institutional Strategy*. To endow the Schools with partial financial autonomy, a global budget for non-professorial staff and investments will be assigned to each School. **The Schools' annual goals and the strategies to achieve them will be set down in Agreements on Objectives between the Rectorate and the School Committees, and linked to the resources allocated to the Schools.**

To avoid tensions and potential weaknesses in the new system, the implementation of these measures will be accompanied by continuous reflective monitoring. Funding has also been applied for to support the whole process by professional *change management* to ensure that all members of TUD are prepared for the new challenges and that they are in the position to implement them (see 3.5). The legal bases for the structure and the allocation of functions are set down in the Law for Higher Education Institutions of Saxony, which includes an “experimentation clause” for innovative concepts.

At the end of the *Institutional Strategy* funding period, the Schools will be realized as functional structural units with their own autonomy. While the Faculties keep the operative responsibilities for research and education, the Schools take over main support functions for these activities as well as for administration.

If changes introduced in Phases (1) and (2) are as successful as expected, a subsequent third phase of structural changes shall be considered to transfer the remaining responsibilities of the Faculties to the School level so that, finally, TUD has 5 Schools with rights similar to those of the present Faculties.

3.3.3 Optimizing administration and support processes

The detailed SWOT analysis carried out in preparing the Draft Proposal of TUD's *Institutional Strategy* in 2010 revealed an urgent and extensive need to modernize and restructure TUD´s administrative processes, which do not cope sufficiently well with the vast increase in student numbers (50% in 10 years) and third-party income (100% in 5 years), nor with the requirement for fast, transparent and reliable response on demand.

Numerous fundamental problems have been identified which restrict the further development of TUD. To overcome this detrimental situation, a unique project has been initiated in October 2010 to benefit all members of TUD. Its aims are:

- to maximize the efficiency of central and de-centralized administrative processes at all interfaces, and with optimum IT support
- to restructure the TUD Central Administration, considering the significantly increased management responsibilities of the 3 full-time Vice-Rectors (see 2.5) and the establishment of de-centralized administrative units in the 5 Schools (see 3.3.2)
- to extend and develop a service-oriented organizational culture

In total, 370 existing administrative processes have been analyzed in detail by 160 persons in 41 teams, resulting in the development of 233 revised target processes. In a number of cases, quick-wins have been identified already at this early stage and have immediately been put into practice. With this information, a complex and competitive bidding process for ERP software (see 3.3.2 above) was initiated to award a contract in December 2011. A second tender will be placed in September 2011 aimed at a comprehensive SLM software (see 3.3.2) to be ordered in March 2012.

In this *Institutional Strategy*, the installation of these systems will be synchronized with the restructuring of the administrative and academic units, and will be accompanied by a *change management program* which will comprise targeted competence training (e.g., in the new IT systems) as well as training of service- and quality-oriented performance. This program will also extend the competence in spoken and written English in the administrative units and provide additional qualifications for individual needs and portfolios of responsibilities. Job rotation shall be introduced as a standard option for human resource development. As part of university-wide quality management, an *Efficiency Office* will be established as of October 2011 where all members of TUD may hand in suggestions for the improvement of administrative processes and receive awards if these suggestions are subsequently realized. All these activities will be accompanied by the quality and change management as described in 3.5.

3.3.4 The *DRESDEN-concept*

The ***DRESDEN (Dresden Research and Education Synergies for the Development of Excellence and Novelty) -concept***, in operation since January 2009, places **TUD in the center of a unique, synergetic network** (see 2.3.4). As the mission of each of these institutions is distinct, the partners of TUD within the *DRESDEN-concept* remain

independent in institutional terms. This also ensures that the specific strength of each of the partners is preserved. In this regard, the philosophy of the *DRESDEN-concept* differs from that of certain other endeavors where potential benefits are envisaged from merging research institutions with distinct missions. Rather, it is the conviction of the *DRESDEN-concept* partners that **the true strength of a research campus lies in the pluralism of its institutions, provided that the synergies between them are maximized and a clear framework is established for cooperation**. Regarding the *DRESDEN-concept*, synergies will be realized at five levels.

Synergies in research – Nurturing innovation, clusters, transdisciplinarity

There are several scientific areas where research not only at TUD, but also at *DRESDEN-concept* partner institutes of TUD, is already excellent and has reached international visibility. It is obviously to the advantage of TUD and its *DRESDEN-concept* partners, to maximally exploit the synergies that emerge from this fortunate constellation. Here, the term "synergies" does not merely refer to "standard"-type research cooperation, but to unusually **comprehensive and integrative dimensions of research interaction**. These include:

- Aggregation of PIs affiliated with different institutions but engaged in **related research** into thematic clusters. This then provides the basis for numerous mutually beneficial interactions between these PIs, may constitute the crystallization point for a new focus area of research in Dresden, or may promote the further growth of an existing research cluster through joint grant applications. A recent example for the success of this form of synergy is the newly established *Collaborative Research Center* in the humanities *"Transcendence and Common Sense"* (SFB 804) with its Integrated Research Training Group, which involves cooperation with SKD, SLUB and DHMD
- Bringing together PIs affiliated with different institutions and engaged in – at first glance – **unrelated research** in transdisciplinary assemblies. This may promote the development of completely novel approaches to solving a given research problem, and may boost the establishment of new research fields. The Excellence Cluster application *Center for Advancing Electronics Dresden* is a recent example for this form of synergy.
- Identification, by tapping the knowledge and networks of PIs affiliated with different institutions in Dresden, of PIs elsewhere in the world who should be targeted for **recruitment** to TUD and the Dresden research campus in general. The ongoing recruitment to the newly established *Center for Systems Biology* of a Full Professor at

TUD with joint appointment as Research Group Leader at MPI-CBG is a recent paradigmatic example of this form of synergy.

To nurture the synergies between TUD and its non-university partners within the *DRESDEN-concept*, ***Scientific Area Committees*** (***SACs***) in four areas of research excellence have been established, which are closely related to 4 of the 5 TUD Research Priority Areas (RPAs) described in 2.1.2:

SAC 1 – Biomedicine and Bioengineering

SAC 2 – Information Technology and Microelectronics

SAC 3 – Materials Science for New Technologies and Energy Efficiency

SAC 4 – Culture and Knowledge.

These *SACs* are composed of the major representatives of research in the respective areas at TUD and its non-university partners. *SACs* (i) develop recommendations about emerging fields of research and research activities that should be established at TUD, (ii) make suggestions as to PIs who may be recruited to TUD, and (iii) are essential drivers regarding the development and promotion of transdisciplinary research clusters. Importantly, *SACs* are committees that **develop recommendations** to the DRESDEN-Board and thus eventually to the TUD Rectorate; they are **NOT empowered to make decisions** concerning TUD, a privilege of the relevant TUD bodies.

Institutionen	Einrichtungen	SACs 1	2	3	4
TUD Schools	Civil and Environmental Engineering				●
	Engineering Sciences	●	●	●	●
	Humanities and Social Science				●
	Mathematics and Natural Sciences	●	●	●	●
	Medical School	●			●
Fraunhofer	IWS			●	
	IPMS		●		
	IKTS			●	
	FEP		●	●	
Leibniz	IPFDD	●	●	●	
	IFW		●	●	
	IÖR				●
Max-Planck	MPI-CBG	●	●		●
	MPI-PKS	●	●		
	MPI-CPFS			●	
Helmholtz	HZDR		●	●	
Kultur-einrichtungen	SKD				●
	DHMD				●
	SLUB	●	●	●	●

Fig. 8: TUD Schools, *DRESDEN-concept* partner institutions and SACs

Synergies in teaching – Improving student/teacher ratios, enlarging expertise

One of the most disquieting problems – not only at TUD, but German universities in general – is the highly unfavorable ratio of teaching staff to students in most disciplines. This is demotivating for the students and turns the pleasure of teaching into a constant pressure for the teacher. The *DRESDEN-concept* offers an excellent opportunity to ameliorate this situation in that the non-university partner institutes have agreed to have not only their PIs, but also their staff scientists including senior post-docs participate in the teaching at TUD, both at undergraduate and postgraduate levels. Importantly, the staff from the non-university partner institutes will not just contribute individual lectures in their respective field of specialization; they will be fully integrated into, and contribute to, the basic TUD curriculum of a suitable degree program. Thus, depending on individual qualification and preference, staff from the non-university partner institutes will participate in all forms of teaching at TUD, be it practical courses, tutorials, workshops, seminars, or lectures. A list of staff from the *DRESDEN-concept* non-university partner institutes participating in teaching at TUD as of the winter term 2011/2012 is provided in Annex 8.

There are four key advantages to this, which are mutual in nature as three of them benefit TUD and one the staff at the non-university partner institutes: (i) the participation of highly qualified researchers from the non-university partner institutes of the *DRESDEN-concept* is ***"kapazitätsneutral"*** and hence results in a **much more favorable ratio of teaching staff to students** in the respective field; (ii) a broader spectrum of state-of-the-art expertise will be offered to the students; (iii) many key investigators of the non-university partner institutes are from abroad, and hence provide high-level teaching in English and an international perspective to teaching; and (iv) high-potential investigators working at the non-university partner institutes get the opportunity to participate in TUD's training program in Academic Didactics and to become qualified as academic teachers, an important aspect in their career development. Their participation in the TUD course program will be certified by the Vice-Rector for Academic and International Affairs.

Synergies in career development – The Common Graduate Schools

In the scientific area of *SAC 1*, a Graduate School with a 10-year track record whose faculty comprises PIs of TUD and 4 non-university partner institutes and which offers 3 interactive PhD sub-programs has already been established: the *DIGS-BB* (see 2.1.3). TUD is in the process of establishing two additional *Graduate Schools* in the scientific areas of *SACs* 2, 3 and 4, with a structure similar to that of the successful *DIGS-BB*.

One is *the Dresden International Graduate School "Materials for Energy Efficiency" (DIGS-MEE) in SACs 2* and *3*; the other is the *Dresden International Graduate School for Cultural Research* (*DIGS-CR*) associated with the prospective *Dresden Center for Cultural Research* in *SAC 4*.

The range of Faculties involved in *DIGS-MEE* and *DIGS-CR* will reflect the great potential for synergies emerging from the *DRESDEN-concept* and will comprise PIs of TUD and 7 respectively 4 non-university partner institutes. As described in (3.3.1), these 3 *Graduate Schools*, together with the *DFG "Graduiertenkollegs"* and other structured doctoral programs at TUD will coordinate their activities under the roof of the **TUD Graduate Academy**.

Synergies in human resources – Attraction, appointment, career development

Additional forms of synergy between TUD and its *DRESDEN-concept* partner institutes concern **human resources**, in particular **the ability of TUD to recruit top scientists** at all career levels.

- In the global competition for the very best, attracting top professorial researchers to TUD may require a financial commitment that TUD alone would not be able to realize. Here, the *DRESDEN-concept* enables TUD to become truly competitive by offering **joint appointments** with one or more of its *DRESDEN-concept* partner institutes. Such joint appointments will allow for the provision of additional staff, consumables, equipment, space, etc. at a level exceeding offers made elsewhere. There are several examples where this has already been realized with little bureaucratic effort.
- The recruitment of top researchers to TUD often requires that attractive career opportunities are also offered to their partner or spouse. The *DRESDEN-concept* provides a decisive advantage in that all partner institutes are fully committed to jointly explore such **dual career opportunities**. Furthermore, a data base of potential employers within the *DRESDEN-concept* network is currently being compiled to include the major enterprises in the Dresden area. TUD recently appointed a *Dual Career Officer* who will be involved in relevant recruitment processes from the very beginning; in the long term, we seek to establish a joint DRESDEN-concept Dual Career Center.
- The standard career path of young scientists recruited at an early stage of their professional development to TUD or non-university research institutes would imply that these PIs will have to leave Dresden to further their career or because of limited appointment periods. Now there is the distinct possibility to keep potential high-flyers in Dresden by providing a career opportunity at another DRESDEN-concept partner.

- Such a ***DRESDEN-concept* Career Track** is suited to counteract the danger of losing talent and competence from the Dresden Campus.
- In order to offer foreign doctoral students, post-docs or staff the best support immediately after their arrival in Dresden, TUD will establish and operate an **International Welcome Center** together with the City of Dresden. This Welcome Center will cooperate closely with the *International Offices* of the individual institutions in the *DRESDEN-concept*. Among the duties of the Center are the support in obtaining legal documents, contacting local authorities, finding accommodation, opening of a bank account, translations and the general orientation in Dresden's daily life. In spring 2012, the City of Dresden will open a central administrative branch in the City Center, within walking distance from the Main Station. Here, officers of the relevant authorities and *DRESDEN-concept* personnel will work side-by-side and hand-in-hand, to take care of all needs of scientists arriving from abroad.

Synergies in support processes – Administration and Infrastructure Committee

One of the features of Premier-League Universities are excellent infrastructure and highly professional support for their researchers and students. Here, the *DRESDEN-concept* offers outstanding opportunities for synergy. As in the case of the 5 *Schools*, the cooperation between TUD and its non-university partners will allow the **establishment of cost-intensive common infrastructure** that neither TUD alone nor any single one of its *DRESDEN-concept* partner institutes could afford (e.g. the Genome Center, described in greater detail below). Moreover, such cooperation will be highly beneficial for the **recruitment of top-notch PIs to TUD**, as these may require access to special infrastructure that may not exist at TUD, but may be available and accessible at one of its non-university partner institutes.

These activities are overseen by the *Administration and Infrastructure Committee* (*AIC*) which has been in operation since 2009. It is chaired by the Head of Administration (*"Kanzler"*) of TUD; other members are the administrative heads of the *DRESDEN-concept* partner institutes. Examples for cooperation projects that are about to be implemented are:

The **Genome Center,** where TUD and its *DRESDEN-concept* partners will allocate cost-intensive equipment required for state-of-the-art genomics (e.g., next generation sequencing). The Genome Center will serve as a pilot project to find an exemplary solution for the legal framework conditions of a jointly used technological platform. It is developed in three stages (phase 1 is a virtual center; phase 2 is administratively but

not yet physically integrated; phase 3 is a fully integrated center) until being fully operational as a single entity in mid-2012.

The **Common Technology Platform,** an interactive database that will facilitate the fast and simple retrieval of information as well as provide electronic access to equipment and services available at the DRESEN-concept partner institutions. It is linked with the information data bases of the individual institutions and shall be accessible for all scientists at TUD and its *DRESDEN-concept* partner institutes. The availability of comprehensive information about infrastructures and equipment will encourage additional cooperation and synergies, within TUD itself and with the *DRESDEN-concept* partner institutes. While the structure and layout have already been agreed, conditions for use, prospective forms of accounting and incentive systems are presently being developed.

The **Dresden Science Calendar** aims to support interdisciplinary research in Dresden by collecting, structuring and distributing announcements of upcoming scientific talks at TUD and the *DRESDEN-concept* partner institutes via a unified internet platform.

3.3.5 Transfer from academia to society

TUD intends to attract the best staff by providing the best environment. As a crucial element, TUD will establish a *Knowledge Transfer System* for turning research results into a benefit for society. Here, “Transfer” extends beyond technology transfer, the commercialization of intellectual property, spinning-out startups, and creating public-private-partnerships. Transfer also includes transfer of knowledge, culture, political awareness and measures to improve health and well-being, and providing insight into societal issues. Building on the opportunities provided by the *Institutional Strategy*, TUD will enhance its engagement with the regional economy and society to fuel innovation at the national and international level. Already-existing, though fragmented, transfer activities will be organized into a new coherent network which may also include transfer resources of the partner institutions of *DRESDEN-concept*.

A central **Transfer Office** with an experienced director and several transfer support officers will be established to coordinate internal and external information flow whilst attempting to increase synergetic effects between TUD and external transfer partners. Importantly, the Transfer Office will also scout for projects and opportunities – with the help of liaison officers from the *DRESDEN-concept* partner institutions– and support budding transfer activities by providing advice on financial, legal and strategic aspects.

Affiliated to the Transfer Office is the "**Society and Industry Relay Center (SIRC)**" which accommodates the various transfer entities and projects, and in which the following measures will be established:

- A **Chair for Transfer and Translational Research** to explore relevant and innovative models relating to transfer to the economy and to society, developing methods and tools to close gaps in the transfer chain. After five years of funding through the *Institutional Strategy*, i.e. starting November 2017, TUDAG will cover the costs by endowing the chair.
- A **new interdisciplinary Master Program** will be initiated by the new professor, providing targeted education in transfer skills for science managers and scientists working towards transferring their scientific results to the economy and society.
- **Pre-seed and seed phase incubator space** will be provided to nurture the development as well as provide mentoring during the initial stage of a transfer project. Here, the SIRC will bring together the required expertise as well as coordinate funding from industrial sponsors and grant agencies, scrutinize and evaluate selected projects, and evaluate applications for the special transfer project fund of TUD.
- A **Personalized Career Development Program** will be established within the SIRC through mentorship of senior graduates interested in refining their skill sets for a particular career trajectory.

3.4 Concept for research-oriented teaching

Since Wilhelm von Humboldt, the German university has been conceived of as an institution in which research and education form a unity. Thus it shall be the overarching philosophy that, from the very beginning, the students see their teachers in the dual function as educators and researchers. Moreover, TUD with its wide range of disciplines offers the unique chance to raise the students' interest to look beyond their discipline of studies, to make them familiar with views from outside their discipline and to train them in self-organized, cooperative projects. By intensifying research-oriented education beyond what is already described in Section (2.4), TUD pursues three aims: (1) making the whole range of excellent research in Dresden accessible for education; (2) integrating current research into the study programs; and (3) establishing interdisciplinarity and the awareness of the wide range of disciplinary approaches in all study programs at the undergraduate level. In addition to traditional activities such as research seminars and final-year research projects, TUD will initiate a number of measures to close the gap between teaching and research:

- A **Buddy System** will be established in each School (see 3.3.2) where 1st year students will be teamed up with more advanced students to advise them in all study matters. At a later stage, advanced students act as mentors of student research groups. By providing this peer assistance the gap between the students and their teachers shall be bridged so that the students progressively phase into the world of science and research.
- **Interdisciplinary research-oriented education** has to begin at an early stage of the curriculum and shall be institutionalized university-wide and made a **mandatory curricular component**. To achieve this aim the curricular slots presently allocated in the Bachelor programs as "General Qualification" and in the Diploma programs as "General Studies" shall be restructured as "Interdisciplinary Studies" and credited with 10-15 credit points.
- This curricular component "Interdisciplinary Studies" will be organized by a newly founded "**Center for Interdisciplinary Learning and Teaching**" (ZiLL), which will develop and accompany methods of learning and teaching transdisciplinary and research-oriented topics. To make this curricular innovation externally visible TUD plans to restructure the present annual *dies academicus* into a "Day of Interdisciplinary Studies" where students groups present the results of their projects. TUD will offer a prize for the most original and / or convincing 'product' to subsidize its publication.
- In Master Programs and in higher semesters of Diploma study programs, students naturally will come into closer contact with the research of their professors, but due to the *DRESDEN-concept* also get acquainted with research topics and strategies of non-university institutions. As a measure to give extra support to particularly talented students, the *Schools* will offer a *TOP5-Program Course of Studies* (see 3.3.1).
- To consolidate the link between theory and practice, the institutions of the *DRESDEN-concept* and national as well as international partner businesses within TUD's global network will offer internships for TUD students.

Research-oriented education at all levels will be integrated into TUD's Quality Management System (see 3.5).

3.5 Project management

The *Institutional Strategy* proposed by TUD is a complex undertaking involving a multitude of stakeholders and individual processes. It must, hence, be realized with a modern and professional approach to project management, while taking into account the specifics of an academic environment.

Ensuring participation within the university. To elaborate on the concepts suggested in the draft of the *Institutional Strategy* and to involve representatives from all communities within the University, TUD established 15 teams consisting of 6-10 persons each. Since November 2010, these teams have been looking into the main topics suggested in the *Institutional Strategy* as well as the associated administrative and financial aspects. A second group with 41 teams involving 160 people, has analysed the 370 main administrative processes practiced today at TUD and has made recommendations as to their improvement (see 3.3.3). The process of developing the *Institutional Strategy* from draft level to a full proposal was accompanied by internal consultation, international benchmarking and professional advice.

Systematic approach to project management. The significant changes associated with the *Institutional Strategy* will touch most aspects of TUD. To realize the suggested concepts successfully and in consensus with all communities of the university, three *credos* are followed:

1. **Spirit:** no top down decisions; participation of all communities.
2. **Method:** careful project planning combined with professional change management.
3. **Goal:** sustainability of changes, including systems and institutional culture which favor a continuous development of structures and procedures thereafter.

In order to manage the increasing strategic and operative challenges faced by a modern university in an efficient and innovative manner, TUD is currently developing a **Balanced University Score Card** (BUSC). The Score Card tracks the key elements of the University's strategic and operative goals and gives immediate information on the various and complex aspects of TUD. Thus, BUSC will also be used to control the progress of project "Institutional Strategy". In a second step, BUSC may be implemented at the level of the Schools and used as an advanced basis for Agreements on Objectives, which are practiced at TUD as a strategic development tool, both at the institutional level (e.g. Schools and Faculties) and individual level.

Quality management and project management. TUD integrates its project and process management activities as well as its change and innovation management in its overarching quality management. The Center for Quality Management (QM Center) will be founded as a Central Academic Unit with the Vice-Rector for University Planning at its head. With this center, TUD realizes a unified quality management system for education and research, for the promotion of young scientists and for the transfer of knowledge and technology. From this shall result an improved culture of quality and

support. The project management of the *Institutional Strategy* will be embedded within this framework of QM and will be operated by a team of five persons: Project Manager, Change Manager, Controller, Bookkeeper and Assistant.

Change management and change communication. The significant changes in structures and processes may be challenging for some people working at TUD. The restructuring processes will therefore be accompanied by an experienced change management team made up of internal and external experts and coordinated by a central Change Manager who will be a member of the Project Management Team. The Change Management Team will concentrate on identifying the areas where transformations are necessary and will provide support in realizing these transformations and in securing their sustainability. To ensure the success of this process, TUD will follow the **principle of comprehensive participation**: all groups of the university will be actively provided with the relevant information on the goals, milestones and evolution of the changes and will be part of teams which will support the communication process. This shall realize a **strategy of wide communication**: information and dialogue within the TUD will be extended and improved.

Realizing the Institutional Strategy. The following chart outlines the roadmap for the key measures described in the *Institutional Strategy* in the years 2012 - 2014.

	Road Map		
Measures	**2012**	**2013**	**2014**
Recruiting and supporting outstanding individuals (3.3.1)	Recruitment/ organisation of infrastructure	Recruitment/ start of acitvities and programs	Recruitment/ operation of acitvities and programs
Organizing the 14 Faculties into 5 Schools (3.3.2)	Recruitment / preparation of new structure	Implementation of shared services	Operation and evaluation of new structures
Optimizing administrative and support processes (3.3.3)	Implementation of ERP system/ training	Implementation of SLM system/ training / change management	Training / evaluation / change management
The DRESDEN-concept (3.3.4)	Recruitment/ organisation of infrastructure	Recruitment/ start and expansion of services	Operation, evaluation , expansion of services
Transfer from academia to society (3.3.5)	Recruitment / organisation of infrastructure	Recruitment/ start and expansion of services and research	Operation, evaluation , expansion of services
Research-oriented teaching (3.4)	Recruitment/ organisation of infrastructure	Start of ZILL activities and Buddy System	Operation, evaluation , expansion of acitvities
Project management (3.5)	Recruitment/ organisation of infrastructure/ starting PM/PR.	Operation of PM/PR	Operation of PM/PR
Interdisciplinarity (3.6)	Recruitment/ organisation of infrastructure	Start and expansion of KAU activities and Innovation Sheds	Operation, evaluation , expansion of acitvities
Internationality (3.7)	Recruitment/ organisation of infrastructure	Start of acitvities and services	Operation, evaluation , expansion of acitvities and services
Gender equality (3.8)	Recruitment/ organisation of infrastructure	Start of acitvities, services and sociological project	Operation, evaluation , expansion of acitvities, services and project

3.6 Interdisciplinarity

Interdisciplinarity is an **intrinsic feature of the Synergetic University TUD** and, consequently, a central element of its *Institutional Strategy*, as outlined e.g. in chapters 3.3.1, 3.3.2, 3.3.4 and 3.3.5. The mega-problems of mankind, such as communication, energy, health and mobility, can only be resolved through interdisciplinary approaches; hence, it is essential that TUD has the appropriate structures, resources and spirit. There are already numerous examples for this interdisciplinary approach in research as well as in teaching, see e.g. chapter 2.1.2. However, TUD is not yet content with its present achievements - it intends to set up an environment where interdisciplinarity will not only be sustained but developed to an even higher extent.

A pre-requisite for achieving interdisciplinarity is the timely flow of information about seminars, events and achievements of the different academic units and groupings to all communities of the University. At present, this is not happening sufficiently well, as different academic disciplines are located in different sections of the spread-out campus or even in different areas of the City. In addition to the **Dresden Science Calendar** (see 3.3.4), TUD intends to resolve this deficiency by installing **information screens at all major nodal points** (e.g. entrance to lecture theaters, foyers of major buildings, cafeterias), linked to and continuously updated by the central Communication Department.

In addition, two innovative approaches will be explored towards fostering inter- and transdisciplinarity. Both reduce the impact of directive top-down management by offering a stimulating, neutral and inspirational “closed room and context” for all interdisciplinary groups involved in particular topical areas, without established hierarchies: the *Knowledge Architecture Unit* and the *Innovation Sheds*.

Enabling and empowering interdisciplinarity. To professionalize the process of identification of targets as well as the initiation, development and performance of synergetic interdisciplinary activities, TUD will establish a central **Knowledge Architecture Unit (KAU).** Based on ground-breaking work by Allen and Henn (MIT, TUD), “Knowledge Architecture” is an innovative new field, offering unique tools, measures, models and strategies that already have been successfully applied in many fields to improve and enhance complex functional processes in research and development.

To strengthen the strategic approach of TUD by encouraging and enabling successful interdisciplinary research and exploiting the full potential of synergetic project groups, KAU will 1) identify and monitor possible synergies between disciplines and stakehold-

ers, 2) support and empower the realization of these synergetic projects, 3) optimize the process of synergetic cooperation and its outcome, and 4) initiate third-party funded research activities in the developing field of spatial and organizational conditions of cooperation and knowledge generation.

With the assistance of KAU, transdisciplinary groups may be formed temporarily in order to work on problems or questions which have been raised within the University or from outside, e.g. by society, industry or any other institution. Alternatively, such groups can also gather around exceptional research results or ideas developed by researchers coming from heterogeneous disciplines and fields of study. This constellation allows tapping of the full potential for innovation which lies in the combination of ideas and knowledge from heterogeneous disciplines as well as utilization of the results directly by and for stakeholders. The KAU initiative particularly encourages researchers with different backgrounds to bring their ideas, innovations and research results to have them tested and developed with the help of a synergetic team. The KAU team will consist of an experienced PI and researchers originating from already existing activities in TUD, who are thoroughly trained in methods of visualising and modelling knowledge and information, e.g. in third party funded projects with VW, BMW, Max Planck and FhG Institutes. The KAU team will report directly to the TUD Vice-Rector for University Planning; its assistance will be available to all Schools and administrative departments of TUD and, for joint activities, *DRESDEN-concept* partners as well as interested stakeholders outside the University.

Open spaces – home of ideas. Some of the most stunning inventions in recent history originated in simple spaces such as barns or garages, rather than high-tech laboratories. While there is certainly no causal link, it may still be useful to offer to interdisciplinary teams a change in scenery and an informal working environment, i.e. a “locus creativus” where ideas are free to fly. Hence TUD aims at fostering highly original interdisciplinary cooperation by transferring this thought to the Dresden campus, where several unused wooden huts shall be restored and equipped in a rudimentary fashion. TUD hopes they will be similar to the legendary *garages* in Silicon Valley and work as highly efficient hotbeds of innovation, i.e. ***Innovation Sheds*****.** Transient users will be obliged to cooperate ‘closely’ in a casual and collaborative atmosphere. Promising ideas initiated in the *Innovation Sheds* may subsequently be developed to the required level of maturity in the SIRC described in 3.3.5.

3.7 Internationality

TUD's concept of internationalization pursues three aims: (i) increasing the numbers of international students and scientists at all levels of qualification, (ii) establishing an international environment for academic education and research, and (iii) enhancing TUD's visibility and reputation abroad. To achieve this, TUD proposes the following measures.

- TUD will establish strategic partnerships with selected top-universities internationally, such as the already existing ones with the Universities of Berkeley, Canberra, Boston, Yonsei, University College London, ETH Zurich, University Sydney, Tohoku University and Ohio State University.
- TUD will offer **additional support** to the Schools and their academic staff, and to international scientists at all levels of qualification. The *International Welcome Center* and the *Dual Career Support* have already been outlined in 3.3.4. Additionally, TUD plans an *International Children's Day Care Center* as well as several general measures to create an international, bi-lingual (German and English) environment to lower language barriers. This includes the website in English geared to international interests, signposting the campus bi-lingually and providing relevant forms and other essential documents for internal communication in English. Last but not least, intensive courses will be offered for all members of the university to improve their command of English in their respective area of work. At least one English-speaking person will be available in each administrative unit in contact with foreign students and scientists. To facilitate interaction within international projects, video-conference facilities will be installed in each *School*.
- For scientists and students leaving to a foreign country, TUD will offer **preparatory modules in the language and culture** of their destination, comparable to such modules on Germany which will be available to incoming scientists and students.
- The bundling of Faculties into *Schools* (see 3.3.2) will provide an excellent opportunity for establishing in each School an **International Office** to support international activities such as point of contact, exchange programs, acknowledgement of coursework, joint study programs, summer schools and guest lectures.
- Each Faculty will, if appropriate, have at least one **International Master Program** or a Continuing Education Program with English as teaching language.

3.8 Gender equality

In addition to the significant progress already described in 2.3.8, TUD will further intensify its efforts to correct its gender balance within the framework of its Institutional Strategy. Three additional measures are:

- Ideally half of the Open-Topic professorial positions (see 3.3.1) shall be filled with female scientists. TUD expects these **high-profile appointments** to accelerate the engagement of female professors on a larger scale and thus ameliorate one of the greatest deficits in this area (see 2.3.8).
- By establishing the **Eleonore Trefftz Visiting Scholar Program**, excellent female scientists are attracted to spend time at TUD as 'living proof' that an academic career is feasible irrespective of gender. These eminent women will also act as contact persons to advise young female scientists and students on their careers. The equivalent of three fulltime professorial positions will be available for such temporary appointments, preferably allocated to Faculties or disciplines in which the ratio of female professors is particularly low.
- For a period of five years, a research project will be implemented to **explore the social processes** at TUD, focusing on aspects of gender difference and gender structure. Considering the diversity of disciplinary cultures this sociological project shall identify hidden obstacles, which - in spite of all political sensitizing and counter strategies - continue to produce inequality among women and men in the social world of academia. In addition to fundamental insights this project shall also produce recommendations leading to improvement of organization of university education (especially in the entry phase), the qualification of junior scientists and, last but not least, the abolishment of still remaining structural hurdles in the everyday routine of academic life.

3.9 Partner institutions

While TUD is already cooperating with a large number of academic and non-academic organizations world-wide, its present strategy will emphasize partnerships with longer-term, strategic commitments to ensure continuity and activities which are large enough to become self-sustaining. Central to this effort is, of course, the cooperation with the *DRESDEN-concept* institutes (3.3.4). In addition, TUD will strengthen its national and international cooperation with Government research centers (e.g. DLR, NIH, UFZ, WHO), top universities (e.g. MIT, UC Berkeley, Canberra, UCL) and industrial companies (e.g. Global Foundries, Siemens, ThyssenKrupp, Vodaphone)

3.10. Financial figures are not shown in this public version

3.11 Sustainability

The *Institutional Strategy* proposed here provides the basis for the development of the university as a whole, including those research areas where participation in the present round of applications has not been successful. Importantly, **the *Institutional Strategy* is to a major extent identical with the Strategic Development Plan of the University** and hence extends beyond the funding period of the second program phase of the *Excellence Initiative*. Therefore, and following intensive university-wide discussion and strategic planning, continuation of the *Institutional Strategy* beyond 2017 is seen as the logical consequence for TUD to reach its ambitious goal to become an internationally leading university.

The Rectorate of TUD has hence decided on July 19, 2011 to guarantee continuing basic funding for all positively evaluated projects financed by the *Excellence Initiative* through additional funds assured by the Government of the Free State of Saxony, and internal funds as required. A detailed assessment will be performed towards the end of the fourth year of funding by a panel of internal and external experts, also involving representatives from the TUD Advisory Board and the Saxon State Ministry for Higher Education, Research and the Arts. The resulting report will include recommendations for continuation, strengthening or discontinuation of individual measures according to their potential to support the TUD strategy.

TUD has the resources, the determination and the support from the Government of Saxony to transfer the measures outlined in its *Institutional Strategy* into a continuous development plan for the university, following the initial period of funding.

Several measures described in the *Institutional Strategy* require additional staffing only for the actual funding period until re-training or re-allocation of support staff has been completed. Furthermore, the TUD Rectorate has already completed a detailed round of negotiations with the Deans of the 14 Faculties to identify and agree on their strategy with respect to teaching and research during the next decade, as well as the required resources. The present concept of a Synergetic University will unleash resources which will be invested in furthering TUD´s *Institutional Strategy*. In light of TUD's track record, one can be confident that TUD will continue to increase its third-party income through grants and contracts with funding bodies and private organizations.

4 The Institutional Strategy in the context of the university's long-term planning

4.1 Goals

As described in Section 2, *Status Quo,* TUD has transformed itself over the past 20 years into a comprehensive, dynamic academic institution, which already now is among the leading universities in Germany. Nevertheless, TUD still has some structural and organizational weaknesses that restrict it from realizing its full potential. **The measures outlined in the *Institutional Strategy* will reinforce the strengths of TUD, overcome its remaining weaknesses and foster cooperation with the non-university research institutes in Dresden** to an extent and in an intensity that is unique in Germany.

The *Institutional Strategy* is not limited to individual aspects of the University - it is THE central instrument for realizing its overall long-term development plan and will transform the university in terms of strategic approach, structures and culture of organization. Its huge potential for change is a radical approach to move TUD into a higher league in all its main activities, to eventually become competitive with the best universities world-wide. Measures of the *Institutional Strategy* are focused on supporting the existing research profile, but will also have sustainable positive effects on all other academic activities within TUD. To maximize the benefits from the external funding for the *Institutional Strategy*, TUD will additionally provide 30.4 Mio € from its own resources to fully finance several measures concerning *Research-oriented Teaching* (see 2.4 and 3.4) and the reorganization of its administrative procedures (3.3.3), and to contribute to the other proposed measures as required for success of the overall strategy. A *Flexible Strategy Fund* will be set up to be able to react quickly if stabilizing measures are required within the far-reaching, structural and conceptual changes associated with the realization of the *Institutional Strategy*.

With the *Institutional Strategy* and its associated measures successfully in place, TUD will be in a strong position to realize its strategic goals, namely:

- to transform itself into a **world-class university** in research areas which are selected from the full spectrum of scientific disciplines
- to overcome the traditional dichotomy of sciences and establish a **unique research profile** based on collaboration across the traditional academic disciplines

- to become **the internationally visible academic lighthouse of the Eastern Federal States of Germany**. It will thus become a major contributor to a balanced provision of first-class education, research and technology transfer across Germany, and strengthen the regional development by attracting businesses and qualified staff
- to become **an international university** with respect to both top performance and population. In addition to the typical Western-European and U.S. based clientele of most German universities, TUD is a natural and historical "gate to Eastern Europe", forming close alliances with the dynamic and upcoming States of this region
- to enhance transfer of knowledge, technology and insight for the **benefit of society**
- to establish a **strong network with former staff and students** all over the world to communicate the high quality of TUD and to develop collaborations
- to establish forums for lively **intellectual exchange with the population** of the Dresden region, thus reducing the borders between "town and gown"
- to synergize traditional academic values and modern management tools into a **stimulating and productive environment** where excellence can thrive

4.2 Strategic approach

The impact of the *Institutional Strategy* will be twofold by addressing both the **overall system** TUD and the people who work and study **within its boundaries**. To strengthen excellence within TUD, measures will be established to raise the quality of researchers and students, and their infrastructure and support even further. In combination with the submitted *Excellence Clusters* and *Graduate School,* this will dramatically accelerate the growth dynamics of the entire University. To become fully effective and sustainable, these measures must be complemented by significant changes in the way the university overall is structured and operated. **TUD will pursue this overall strategy, even if it were not successful in the present round of the *Excellence Initiative*.** However, considering the limited internal resources, this would become a high-risk strategy which may stretch over a considerable period of time.

The ***Institutional Strategy* is at the core of the University's strategic development plan**. However, its full impact can only be realized if it is accompanied by complementary developments regarding the culture of the institution and the quality of its environment, as excellence requires a fertile, stimulating ground, both intellectually and in terms of infrastructure. It is indeed a strength of the proposed *Institutional Strategy* that it is not solely focused on existing areas of excellence and thus does not create a two-

class academic society but allows TUD to support emerging research areas and individuals to reach their full potential.

Furthermore, the **development of TUD cannot be seen in isolation** – it must be embedded in multiple ways in the *City of Dresden* and its wider scientific, socio-cultural, economic and political environment. First and foremost, this concerns the *DRESDEN-concept* partnership, which has the potential to become a paradigm of inter- and trans-institutional synergy. But it will also involve **increasing cooperation with other institutions of higher education, research organizations and industry**, to raise maximum synergies by exploiting mutual strengths and structures.

The ultimate success of the *Institutional Strategy* will depend on all actors involved at all levels of the University, as well as on the support from the Government of Saxony. Importantly, it provides the urgently required **initial momentum and direction** to trigger another phase of successful development with the aim to exceed purely regional and national standing.

Overall, this is **a highly interactive and dynamic process, which by itself is challenging and inspiring**. The University, its strategic development and its interactions with the outside will continuously influence and reshape each other under the influence of the various measures and their protagonists. While all measures of the *Institutional Strategy* are important for the future success of TUD, its main benefit is not the achievement of certain clearly defined goals, but the multitude of reflective and transformative processes involved in the realization of these measures. The individual measures of the *Institutional Strategy* will thus **rejuvenate those aspects of TUD which have remained or have become rigid**, while maintaining and indeed **fortifying the inspiration of Technische Universität Dresden**.

4.2.1 Raising the academic potential

TUD is neither financially able to compete on the global market for academic superstars, nor does it consider this a promising strategy in view of the successful and committed performance of its present staff. **Attracting young high-potentials** and supporting their development so that they can extend the ranks of the TUD high-performers is much more in-line with a dynamic and, despite its long history, in many regards “young” university like TUD.

The best international universities are characterized by the fact that their most promising junior professors are working on highly innovative blue-sky research projects that

are not necessarily initiated by the continuation of established research programs or the appointment to traditional chairs. Consistent with the *Institutional Strategy* (3.3.1), this **need for continuous innovation and rejuvenation shall be considered** during the forthcoming phase of retirements and new appointments at TUD, **by filling a certain percentage of vacancies with potential high-flyers independently of their specific area of expertise** (in addition to the *"Open-topic" Professorships*, see 3.3.1). It will also provide those academic quarters of the university that have not been able to participate in the present round of applications to the *Excellence Initiative* with a possibility for further development and re-orientation.

Top professors are always attracted by the presence of top-students, and vice versa. TUD has been very successful in off-setting adverse demographic trends by becoming a highly attractive location for studying, resulting in continuously increasing application numbers. This will be further enhanced through new interdisciplinary courses, innovative measures of student marketing (3.3.1) and the evidence provided by TUD's best ambassadors – its alumni.

4.2.2 Encouraging synergy and transdisciplinarity

Following the scientific waves of "nano" and "bio" and their enormous impact on everybody´s life, the next scientific wave may well be "socio", as society will have to accommodate these new possibilities and transfer them into benefits for present and future generations. This essential knowledge can only be elaborated in the cultural and social sciences but must not happen in isolation from parallel developments driven by natural and engineering sciences. This conclusion clearly supports the concept of a comprehensive, synergetic university, as presented by TUD in its *Institutional Strategy*.

At the core of this strategy is the vision to develop and mature the university's potential due to its complete portfolio of scientific areas, in order to be able to address the grand challenges of the future by transdisciplinary teaching and research. For the specific case of TUD, this may be understood as an **evolutionary process**. **The four principal scientific disciplines** – each of them already very strong at TUD – **will grow together and thereby produce an added value through transdisciplinarity** - an evolution, which in this intensity and speed is only possible in Dresden.

This will be achieved by promoting future professorial appointments in areas interfacing with at least two disciplines (e.g., energy economics, environmental legislation, medical ethics, bio-informatics, etc.) and reducing the specialization in areas which are, despite

their undoubted academic merits, at the outside boundary of the synergetic spectrum of competencies of TUD. TUD will thus develop a profile and portfolio which is unique amongst the leading German universities.

While this process has already been successfully initiated and will be accelerated through new projects, the innovative appointment and networking procedures outlined in the *Institutional Strategy* will provide it with a further boost. Central support will be provided for project proposals with interdisciplinary and transdisciplinary aspects, so that academic staff will become aware of, and excited by, the challenges and intellectual stimuli inherent in such research and teaching activities. With time, a significantly stronger **culture of "togetherness" and cooperation** will thus be established where academic staff voluntarily and continuously are looking forward to establishing interdisciplinary research projects, either within the University, with the *DRESDEN-concept* partners, or with other excellent research institutions. This cultural change will be supported by the catalytic action of the *Knowledge Architecture Unit* and the *Innovation Sheds* established within the framework of the *Institutional Strategy* (3.6).

Parallel to focusing its research profile, TUD is also moving through a **strategic review of its teaching portfolio** to benefit from synergies within the "Science Zones" established by the Saxon State Ministry for Higher Education, Research and the Arts and to avoid unnecessary duplication with course programs offered by other Institutions of Higher Education in Saxony. The aim of this exercise is to free resources for core activities defined in the strategy of the University.

4.2.3 Strengthening research performance and post-graduate education

Present role models (such as the existing Excellence Cluster and Graduate School) will safeguard that **TUD as a whole adopts only concepts with demonstrated success and acceptance**. This will include a second Excellence Cluster *Center for Advancing Electronics Dresden*, which has been selected for full-length submission, as well as a substantial number of other graduate schools and research clusters, which are already established, under review or in preparation.

Particular attention will be given to those research areas which have not been successful in the present applications for *Excellence Clusters* or *Graduate Schools*, despite very positive feedback on several aspects of their proposal. TUD will support the realization of these aspects in modified form and through other funding mechanisms.

4.2.4 Optimizing resources and procedures

Excellence in research and teaching must be supported by **optimum use of all available resources**. In this aspect, traditional German universities perform sub-optimally if compared to international top universities or research institutions, which have introduced management and support processes with a successful track-record from industry. In the context of the international competition for best brains and research funding, German universities frequently appear to be poorly positioned, slow, inefficient and moderately innovative. Within the framework of its *Institutional Strategy*, TUD will initiate a process to overcome these shortcomings. Starting with a professional external evaluation and using state-of-the-art information and communication technology, structures will be established which will **increase the productivity of researchers, professors and support staff and significantly improve their job satisfaction**.

To realize its long-term scientific goals, namely to reach international excellence in all of its four principal scientific disciplines, TUD will require access to world-class research facilities, infrastructure and sources of information to an extent, which significantly exceeds its present financial capabilities. This will, however, be achieved through the intense cooperation within the *DRESDEN-concept* partnership.

4.2.5 Developing the TUD campus

An undoubted strength of TUD is its integrated main campus, which is within walking distance of the Dresden City center. The campus combines the high functionality of new laboratory and teaching buildings with the inspiring academic tradition represented by historical buildings. It is TUD's aim to develop the campus further **to facilitate synergies by short distances, common infrastructures and spaces for communication.** The *State of Saxony* and the *Mayor of Dresden* have indicated their strong commitment to invest **funds in the order of several 100 Mio € on the accelerated development of the TUD campus, including the improved access by public transport and the provision of additional space for future expansion.** This will include, among others, a purpose-designed building for the prospective *Excellence Cluster cfAED* and the refurbishment of a central building for the *Graduate Academy* outlined in the *Institutional Strategy*.

4.2.6 Enhancing regional cooperation

While TUD sees itself as an **important player on the international field**, it nevertheless **needs a strong home base,** from which it can act and develop. Fortunately, the Science Region Dresden is an ideal environment with a multitude of outstanding non-university research institutes, dynamically developing industries and strong institutions of tertiary education. Many strategic alliances already exist, or are in the process of finalization, to raise synergies beyond TUD and its *DRESDEN-concept* partners.

Moreover, TUD is in the process of realizing further measures, which will have a very positive impact on the scientific community of Saxony, and which may also serve as examples for other regions:

- The new **High Performance Computing and Data Storage Complex** which has been awarded to TUD by the *Wissenschaftsrat* (see 2.3) is closely interrelated to *Excellence Clusters CRTD* and c*fAED* and will provide substantially increased computing power for TUD and its *DRESDEN-concept* partners (3.3.4). Furthermore, it will be linked by a high speed data line to the Technical Universities of Chemnitz and Freiberg, providing these institutions with enhanced computing power beyond their own possibilities and at the same time saving costs by exploring synergies.
- TUD will establish **the Lehmann Center for Integrated Engineering,** which will provide a particular focus for computer science R&D by bringing together partners from the *Center for Information Services and High Performance Computing*, the newly founded *Resubic Lab*, the *Center for Virtual Mechanical Engineering*, the *Center for Advanced Modeling and Simulation*, and the *Media Center*. It will physically interlink the strong TUD competencies in the areas of information technology and microelectronics with complementary activities presently undertaken in other universities in Saxony, and work done at several *DRESDEN-concept* partners and industrial activities in and around the City of Dresden.

4.2.7 Widening the international perspective

While TUD may appear big in Dresden and is well-known in Germany, its international visibility pertains to individual scientific activities and does not extend to the University as a whole. Many of the measures outlined in the *Institutional Strategy* aim at correcting this unsatisfactory situation. In addition to these measures, success in the *Excellence Initiative* will by itself increase the attractiveness of TUD as a partner in international cooperations and as a potential employer of promising junior researchers.

In parallel, the University will have to develop a **focused strategy for internationalization,** rather than relying on the present approach which is largely based on coincidence, individual connections and historical developments. This will involve the selection of a limited number of potential and beneficial partner universities with international reputation, targeted contacts with key players and decision makers, personal visits from senior TUD officials and soliciting high-level political assistance from both sides. A task-force will be established at TUD to initiate these measures and to ensure that concrete proposals for teaching and research cooperations are identified before the initial visits. These activities must be accompanied by strengthening marketing and corporate identity, to increase the "memory" effect of international contacts with TUD staff.

4.3 Foreseeable effects

The success of its strategic vision will determine the future of TUD. It will ensure that the university will have access to high-quality academic staff, students, infrastructure and the support services required for leading-edge research and teaching at the highest international standard. To go even further, the **successful development of TUD will have a significant impact on the development of the Dresden area, and the entire State of Saxony**. A successful university attracts a wide spectrum of top performers, who in turn will accelerate scientific and economic growth.

Despite its historical disadvantages and its unusual mix of disciplines, TUD is now in the top-performing group of German universities. The **realization of the *Institutional Strategy* will place TUD in an excellent position to continue its uniquely successful ascent** during the past 20 years. This success will also be essential for the large number of non-university research institutes in the Dresden area, who strongly depend on TUD for cooperative research, supply of young academics and positions for joint appointments of world-class senior staff.

Like most German universities, TUD does not rank highly in international league tables and even well behind many universities of minor quality and productivity. This problem is partly – but certainly not exclusively – due to the German educational and research system, which is not appropriately reflected in league tables based on Anglo-Saxon structures. Irrespective of this, there are relevant performance indicators such as awards, publications, third-party income, completion rates and internationality which will be improved considerably by the *Institutional Strategy* of TUD and the cultural changes it will initiate. Quality assurance procedures established within the *Institutional Strategy* will include regular benchmarking with international universities of similar pro-

file and comparable performance, but significantly higher rankings in international league tables. Together with human resource focused measures, such as innovative recruitment processes, performance-related staff development and corporate identity, **TUD will be in a promising position to ascend to the top 100 universities worldwide over a period of 10-15 years**.

4.4 Legal preconditions

The present *Law for Higher Education Institutions of Saxony* has been approved in 2008. While it has significantly improved the operation of universities, several weaknesses as well as undue limitations to the self-governance of universities have been identified since. A revision of this legal framework is in preparation at the moment and expected to be passed by the governing bodies in autumn 2011. TUD has, on invitation, made numerous suggestions for this revision, which have been positively received by the Saxon State Ministry for Higher Education, Research and the Arts. These revisions would affect many areas of the operation of the University and its drive towards more autonomy, and would facilitate implementation of the *Institutional Strategy*. However, care has been taken that **all aspects of the *Institutional Strategy* may be realized, even without changes to the present legal framework**.

By the end of 2011, the State of Saxony will also finalize its master plan for the future of higher education thru 2020. TUD has been involved in the development of this strategic plan from a very early stage onwards and hence now presents an ***Institutional Strategy* which is consistent with the main points of the master plan.** This in particular includes the *DRESDEN-concept* as a subset of the *Science Region Dresden*, the sharpening of TUD's research and teaching profile along the 5 RPAs, cooperation with other tertiary education institutions, and increasing autonomy with respect to human resources as well as administrative and financial procedures.

Legal boundary conditions for tenure-track positions, promotions within the professorial pay scale, performance-related payments, increased flexibility for recruiting or maintaining top performers, as well as facilitated procedures for joint professorial appointments with *DRESDEN-concept* partners are all considered for inclusion in the present revision of the *Higher Education Law of Saxony*. The integration of the existing 14 Faculties into 5 Schools is possible due to *the Experimentation Clause* in the present law.

Even more important than "legal preconditions" is the approval of the *Institutional Strategy* by the membership of the University. In a substantial survey covering all constitu-

encies, more than 80% of respondents supported TUD´s participation in the *Excellence Initiative*, and the submission of the **present *Institutional Strategy* was unanimously agreed upon the Senate**.

ANNEX

Annexes 1 – 6 are not shown in this public version

Annex 7 – Glossary

English	German
Committees	**Gremien**
University Advisory Board	Hochschulrat
Extended Senate	Erweiterter Senat
Senate	Senat
Rectorate	Rektorat
Faculties and Departments	**Fakultäten und Fachbereiche**
Faculty of Mechanical Engineering	Fakultät Maschinenwesen
Faculty of Electrical and Computer Engineering	Fakultät Elektrotechnik und Informationstechnik
Faculty of Computer Science	Fakultät Informatik
Faculty of Civil Engineering	Fakultät Bauingenieurwesen
Faculty of Architecture	Fakultät Architektur
Faculty of Transportation and Traffic Sciences	Fakultät Verkehrswissenschaften
Faculty of Forest, Geo and Hydro Sciences	Fakultät Fort-, Geo- und Hydrowissen-schaften
Faculty of Science	Fakultät Mathematik und Naturwissenschaften
Department of Mathematics	Fachbereich Mathematik
Department of Physics	Fachbereich Physik
Department of Chemistry and Food Chemistry	Fachbereich Chemie und Lebensmit-telchemie
Department of Psychology	Fachbereich Psychologie
Department of Biology	Fachbereich Biologie
Faculty of Linguistics, Literature and Cultural Studies	Fakultät Sprach-, Literatur- und Kulturwissenschaften
Faculty of Law	Juristische Fakultät
Faculty of Education	Fakultät Erziehungswissenschaften
Faculty of Arts, Humanities and Social Science	Philosophische Fakultät
Faculty of Business and Economics	Fakultät Wirtschaftswissenschaften
Faculty of Medicine	Medizinische Fakultät
Schools	**Schools**
School for Civil and Environmental Engineering	School for Civil and Environmental Engineering
School for Engineering Sciences	School for Engineering Sciences

School for Humanities and Social Sciences	School for Humanities and Social Sciences
English	**German**
Schools	**Schools**
School for Mathematics and Natural Sciences	School for Mathematics and Natural Sciences
Medical School	Medical School
DRESDEN-concept	**DRESDEN-concept**
DRESDEN-concept	DRESDEN-concept
DRESDEN-Board	DRESDEN-Board
Scientific Area Committee (SAC)	Scientific Area Committee (SAC)
DRESDEN-concept Partners	**DRESDEN-concept Partner**
Max Planck Society	Max-Planck-Gesellschaft
Institute of Molecular Cell Biology and Genetics	Institut für molekulare Zellbiologie und Genetik
Institute for the Physics of Complex Systems	Institut für Physik komplexer Systeme
Institute for Chemical Physics of Solids	Institut für Chemische Physik fester Stoffe
Helmholtz Association	Helmholtz Gemeinschaft
Helmholtz-Zentrum Dresden-Rossendorf	Forschungszentrum Dresden-Rossendorf (2011)
Leibniz Association	Leibniz Gemeinschaft
Institute for Solid State and Materials Research Dresden	Institut für Festkörper- und Werkstoffforschung Dresden
Institute of Polymer Research Dresden	Institut für Polymerforschung Dresden
Institute of Ecological and Regional Development	Institut für ökologische Raumordnung
Fraunhofer Society	Fraunhofer Gesellschaft
Institute for Material and Beam Technology	Institut für Werkstoff- und Strahltechnik
Institute for Photonic Microsystems	Institut für Photonische Mikrosysteme
Institute for Ceramic Technologies and Systems	Institut für Keramische Technologien und Systeme
Institute of Electron Beam and Plasma Technology	Institut für Elektronenstrahl- und Plasmatechnik
Museums / Library	Museen / Bibliothek
Staatliche Kunstsammlungen Dresden	Staatliche Kunstsammlungen Dresden
Deutsches Hygiene-Museum	Deutsches Hygiene-Museum
Sächsische Landebibliothek – Staats- und Universitätsbibliothek Dresden (SLUB)	Sächsische Landebibliothek – Staats- und Universitätsbibliothek Dresden (SLUB)

acatech	National Academy of Science and Engineering (Deutsche Akademie der Technikwissenschaften)
ACP	African Caribbean Pacific Science and Technology Program
AIC	Administration/ Infrastructure Committee
AvH	Alexander von Humboldt Foundation
BDI	Federation of German Industries (Bundesverband der Deutschen Industrie e.V.)
BIOTEC	Biotechnological Center of the Technische Universität Dresden
BMBF	Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung)
BMELV	Federal Ministry of Food, Agriculture and Consumer Protection (Bundesministerium für Ernährung, Landwirtschaft und Verbraucher-schutz)
BMFSFJ	Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (Bundesministerium für Familie, Senioren, Frauen und Jugend)
BMG	Federal Ministry of Health (Bundesministerium für Gesundheit)
BMI	The Federal Ministry of the Interior (Bundesministerium des Innern)
BMVBS	Federal Ministry of Transport, Building and Urban Development (Bundesministerium für Verkehr, Bau und Stadtentwicklung)
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicher-heit)
BMVg	Federal Ministry of Defence (Bundesministerium der Verteidigung)
BMW	Bayerische Motorenwerke
BMWi	Federal Ministry of Economics and Technology (Bundesministerium für Wirtschaft und Technologie)
BUSC	Balanced University Score Card
CAAS	Central Academic Advisory Service
cfAED	Center for Advancing Electronics Dresden
CIMMT	CIMMT Zentrum für Produktionstechnik und Organisation
CRTD	Center for Regenerative Therapies Dresden
DAAD	German Academic Exchange Service (Deutscher Akademischer Austauschdienst)
DFG	German Research Foundation (Deutsche Forschungsgemeinschaft)
DHMD	Deutsche Hygiene-Museum Dresden
DIGS-BB	Dresden International Graduate School for Biomedicine and Bioengineering
DIU	Dresden International University
DKTK	German Consortium for Translational Cancer Research (Deutsches Konsortium für translationale Krebsforschung)

DLR	German Aerospace Centre (Deutschen Zentrums für Luft- und Raumfahrt)
DRESDEN-concept	Dresden Research and Education Synergies for the Development of Excellence and Novelty
DZD	German Diabetes Center (Deutsches Zentrum für Diabetesforschung)
DZNE	German Center for Neurodegenerative Diseases (Deutsches Zentrum für Neurodegenerative Erkrankungen)
ECEMP	European Centre for Emerging Materials and Processes Dresden
EMECW	ERASMUS Mundus External Cooperation Window
EPC	European Project Center
ERC	European Research Council
ERC-StG	European Research Council-Starting Grant
ERP	Enterprise Resource Planning
ESF	European Social Fund
ETH Zurich	Swiss Federal Institute of Technology Zurich (Eidgenössische Technische Hochschule Zürich)
EU	European Union
EU-IP	European Union Integrated Projects
EXC	Cluster of Excellence (Exzellenzcluster)
exp.	expenditure
FEP	Fraunhofer Institute for Electron Beam and Plasma (Fraunhofer-Institut für Elektronenstrahl- und Plasmatechnik)
FOR	Research Unit (DFG Forschergruppe)
FRP	Framework Programme of the European Union
FSP	Main research (Forschungsschwerpunkt)
FTE	Research and technological development (Forschung und technologische Entwicklung)
FZT	Research Center (DFG Forschungszentrum)
GSC	Graduate School
GSK	GlaxoSmithKline GmbH&Co KG
GRK	Research Training Group (DFG Graduiertenkolleg)
HPC	Center for High Performance Computing
HR	Human Recources
HRSK-II	High Performance Computing and Storage Complex (Hochleistungsrechner- und Speicherkomplex)
HU	Humboldt-Universität zu Berlin
HZDR	Helmholtz Zentrum Dresden Rossendorf
IBM	International Business Machines Corporation
IEE	Intelligent Energy Europe

IEEE	Institute of Electrical and Electronics Engineers
IF	Impact factor
IFW	Leibniz Institute for Solid State and Materials Research Dresden (Leibniz-Institut für Festkörper- und Werkstoffforschung Dresden)
IGF	Industrielle Gemeinschaftsforschung
IGK	DFG International Research Training Group
IGS	DFG International Graduate School
IKTS	Fraunhofer-Institute for Ceramic Technologies and Systems (Fraunhofer-Institut für Keramische Technologien und Systeme)
IMPRS-MCBB	International Max Planck Research School for Molecular Cell Biology and Bioengineering
IMPRS-CDSB	International Max Planck Research School for Cell, Developmental & Systems Biology
IMPRS-Dynamics	International Max Planck Research School for Dynamical Processes in Atoms, Molecules and Solids
IPF IPFDD	Leibniz Institute of Polymer Research Dresden (Leibniz-Institut für Polymerforschung Dresden e. V.)
IPMS	Fraunhofer Institute for Photonic Microsystems (Fraunhofer-Institut für Photonische Mikrosysteme)
IPP	Max-Planck-Institut für Plasmaphysik
IÖR	Leibniz Institute of Ecological Urban and Regional Development (Leibniz-Institut für ökologische Raumentwicklung)
ISI	Fraunhofer Institute for Systems and Innovation Research
iVTH	International Association for Technical Issues related to Wood (Internationaler Verein für Technische Holzfragen e.V.)
IWS	Fraunhofer Institute for Material and Beam Technology (Fraunhofer-Institutes für Werkstoff- und Strahltechnik)
JEP	Joint European Projects
JTI	Joint Technology Initiative
JU	Joint Undertaking
KFO	Clinical Research Unit (DFG Klinische Forschergruppe)
KKS	Coordinating Centres for Clinical Trials (Koordinierungszentrum für Klinische Studien Dresden)
MBC	Max Bergmann Center of Biomaterials Dresden
MC-IEF	Marie Curie - Intra-European Fellowships
MC-IOF	Marie Curie - International Outgoing Fellowships
MC-IRSES	Marie Curie - International research staff exchange scheme
MINT	Mathematics, Information Technology, Natural Science and Technical Studies (Mathematik, Informatik, Naturwissenschaften und Technik)

MIT	Massachusetts Institute of Technology
MPG	Max Planck Society (Max Planck Gesellschaft)
MPI-CBG	Max Planck Institute of Molecular Cell Biology and Genetics
MPI-CPFS	Max Planck Institute for Chemical Physics of Solids
MPI-PKS	Max Planck Institute for the Physics of Complex Systems
MTZ	Medical Theoretical Center at TU Dresden (Medizinisch Theoretisches Zentrum)
PI	Principal Investigator
PRO INNO	Programm "Förderung der Erhöhung der Innovationskompetenz mittelständischer Unternehmen"
R&D	Research and Development
REKLAM	Development and Testing of an Integrated Regional Climate Change Adaption Program for the Role Model Region of Dresden (Entwicklung und Erprobung eines Integrierten Regionalen Klimaan-passungsprogramms für die Modellregion Dresden)
RPA	Research Priority Areas
SAB	Scientific Advisory Board
SAC	Scientific Area Committee
SAW	Saxonian Academy of Sciences (Sächsische Akademie der Wissenschaften)
SCM	Structural and Complementary Measures
SESAR JU	Single European Sky ATM Research Joint Undertaking
SIRC	Society and Industry Relay Center
SFB	Collaborative Research Center (DFG Sonderforschungsbereich)
SFB/TRR	Transregional Collaborative Research Centre (DFG Sonderforschungsbereich/Transregio)
SKD	Dresden State Art Collections (Staatlichen Kunstsammlungen Dresden)
SLM	Student Lifecycle Management
SLUB	Saxon State and University Library Dresden (Sächsische Landes-bibliothek – Staats- und Universitätsbibliothek Dresden)
SME	Small and Medium Enterprise
SPP	Priority Program (DFG Schwerpunktprogramm)
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TEUR	Thousand Euro
TAC	Thesis Advisory Committee
TU9	TU9 German Institutes of Technology e. V.
TUD	Technische Universität Dresden
TUDAG	Technische Universität Dresden Aktiengesellschaft
TUDIAS	Technische Universität Dresden Institute of Advanced Studies

UCL	University College London
UFZ	Helmholtz Centre for Environmental Research (Helmholtz-Zentrum für Umweltforschung)
UNU	United Nations University
VW	Volkswagen AG
WHK	Research assistant (Wissenschaftliche Hilfskraft)
WHO	World Health Organisation
WING	Materials Innovations for Industry and Society (Werkstoffinnovationen für Industrie und Gesellschaft)
WOS	Web of Science
ZIH	Center for Information Services and High Performance Computing (Zentrum für Informationsdienste und Hochleistungsrechnen)
ZIK B-CUBE	Center of Innovation Competence for Molecular Bioengineering (BMBF Zentrum für Innovationskompetenz)
ZIK OncoRay	Center of Innovation Competence for Radiation Research in Oncology (BMBF Zentrum für Innovationskompetenz)
ZIM-KOOP	Zentrales Innovationsprogramm Mitteldeutschland - Kooperation
ZiLL	Center for Interdisciplinary Learning and Teaching (Zentralinstitut für Lehr-Lernforschung)

Annex 8 – DRESDEN-concept

8.1 Partner institutions of DRESDEN-concept

Max Planck Society

- Institute of Molecular Cell Biology and Genetics
- Institute for the Physics of Complex Systems
- Institute for Chemical Physics of Solids

Helmholtz Association

- Helmholtz-Zentrum Dresden-Rossendorf

Leibniz Association

- Institute for Solid State and Materials Research Dresden
- Institute of Polymer Research Dresden
- Institute of Ecological and Regional Development

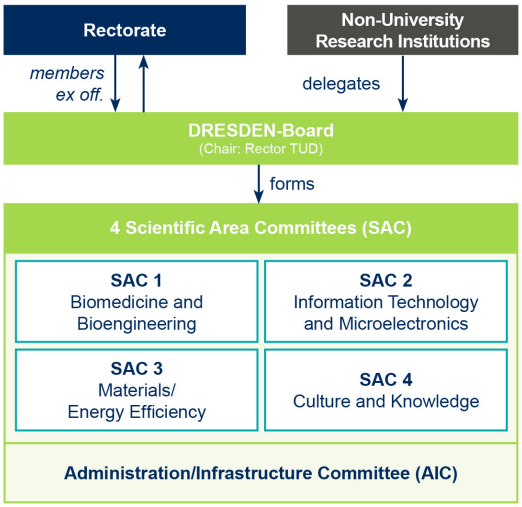
Fraunhofer Society

- Institute for Material and Beam Technology
- Institute for Photonic Microsystems
- Institute for Ceramic Technologies and Systems
- Institute for Electron Beam and Plasma Technology

Museums/Library

- Staatliche Kunstsammlungen Dresden
- Deutsches Hygiene-Museum Dresden
- Sächsische Landesbibliothek – Staats- und Universitätsbibliothek Dresden

8.2 Organization of DRESDEN-concept



Annex 9 – Functions of School Administration

1. Education and Studies

Processes	Description	Personnel / Advantages
ACADEMIC ADVISORY SERVICE		
Academic Advisory Service for students	▪ Parts of the Central Academic Advisory Service (CAAS) and the subject-related advisory service are taken over by a School Student Office. ▪ Here, students get advice on how to organize their studies. ▪ The CAAS continues to counsel prospective students with regards to entry requirements and degree programs as well as taking care of school co-operations (e.g. informative events). ▪ Subject-specific advisory service stays with the individual academic units	▪ By establishing a „Student Office“, competencies for students advising, organizing exams and internships are bundled. ▪ staff „Student Office“: ▪ specific knowledge of the field/disciplines (to maintain links to the Faculties) ▪ skills: T-profile, i.e. advice on all topics can be given to a specific level, and expert knowledge on one or two topics (professionalization instead of personalization) ▪ good command of foreign languages
Academic Advisory Service for students		▪ advantages: ▪ sufficient staff during individual periods of holidays, illnesses or retirement as well as specialization on specific procedures ▪ compensation in times of peak periods ▪ alignment of competencies within the „Student Office“ ▪ services can be offered on a broader scale (e.g. office hours) ▪ establishing an information network of experts on specific topics within the Faculties

Processes	Description	Personnel / Advantages
Advisory Service for international (prospective) students	▪ International Office remains at central level	▪ For each School, coordination of international affairs could be concentrated in one or two people.
SUPPORT OF TEACHING ACTIVITIES		
establishing, modifying and closing study courses	▪ cooperation within the School (main tasks stay with the respective disciplines) ▪ involving competencies from the Student Office ▪ Central University Administration: technical support for coordinators of study courses, provision of documents (models of study regulations, legal principles) and review process ▪ close cooperation with the Central Quality Management Service	▪ advantages: ▪ strengthening corporate identity (both of disciplines and socially) – networks ▪ joint planning of interdisciplinary study courses ▪ exchanging organizational, legal and administrative regulations (e.g. accreditation)
SUPPORT OF TEACHING ACTIVITIES		
coordinating courses (rooms and times)	▪ involving competencies from the Student Office ▪ collaboration with the coordinators of study courses ▪ contact person for infrastructural problems (e.g. defective technical devices)	▪ wider access to rooms ▪ optimizing imports and exports of courses ▪ better room occupancy rates ▪ on the basis of a central room management system (cf. SLM-system)
ORGANISATION OF EXAMS		
▪ admissions and registration ▪ organization (including registration of marks, provision of certificates etc.)	▪ centralization of examination offices for each School as part of the Student Office ▪ single point of contact for examination matters	▪ see „Academic Advisory Service“

Processes	Description	Personnel / Advantages
▪ planning exams ▪ notifications for BaföG		

2. Research

Processes	Description	Personnel / Advantages
ASSISTANCE WITH PROPOSAL DEVELOPMENT		
precise information on regulations for third party funds, model contracts, property rights, calculation of costs	▪ main support still provided by Central Administration ▪ additional staff for Schools with a high numberof third party funding	▪ advantages: ▪ expertise; concentrating on smaller groups of researchers; optimized work flow ▪ particular support for members of the School with low performance in third party funding;
PROJECT MANAGEMENT OF THIRD PARTY FUNDING		
▪ Recruitment ▪ Purchase orders ▪ expenditure ▪ preparing and revising contracts	▪ preparation and applications for personnel recruitment for each School ▪ Central University Administration: additional support for schools with low-performance in third party funding	▪ implementation of the new demands/ tasks of project management, support for: ▪ structuring projects; pre-calculation, concurrent and post calculation; internal cost allocation; controlling; accounting; reporting on expenditure of funds; supporting project managers in project execution

Processes	Description	Personnel / Advantages
TECHNOLOGY TRANSFER		

▪ Advisory Service on inventions and patents
▪ contacts between economy and sciences
	▪ cooperation with central units for technology transfer (PIZ, TUDAG etc.)
	▪ professional advice on inventions and patents
	▪ assistance and advice for scientists concerning the exploitation of inventions and patents
		▪ Advantage:
		  ▪ Close personal cooperation with researchers
		  ▪ professional competence for intense and individual advice
		  ▪ advantages for partners from industry et al.: professional contact person (“one face to the customer”)
		▪ staff skills: academic background, professional and legal competencies in the field of patents and inventions, high communication skills, very good command of foreign languages

3. Personnel, Finances and Material Acquisitions

Processes	Description	Personnel / Advantages
MATTERS OF ACADEMIC AND NON-ACADEMIC STAFF, INCLUDING STUDENT AND ACADEMIC ASSISTANT		
planning of human resource requirement and access	▪ coordination of the human resource requirement	▪ establishing a „Personnel Office“ (cf. „Student Office“)
recruitment	▪ keeping „expert pools“ (overview of temporary staff and former applicants for possible employment) ▪ preparation and applications for recruitment ▪ keeping data for recruitment ▪ severely handicapped employee representation	▪ staff „Personnel Office“: skills: training / experience in human resource management, good command of foreign languages, knowledge of all formalities concerning applications, high social competence, cooperation with Central Personnel Management

Processes	Description	Personnel / Advantages

employee services	▪ first point-of-contact for all staff matters of each School
	▪ contact person for managing crisis situations (warning letters, conflicts, addiction etc.) – first mediation or forwarding to the Central Personnel Management
		▪ advantages:
		  ▪ close personal cooperation with staff
		  ▪ efficient recruitment strategies (e.g. using the “expert pool”)
		  ▪ in the „Personnel Office“: mutual stand-in as well as focus on particular procedures
		  ▪ compensation in times of peak workload
		  ▪ alignment of competencies within the „Personnel Office“
		  ▪ establishing an information network of experts on specific topics together with the Central Administration

FINANCES		
accounts payable department (central invoice receipt)	▪ invoice verification ▪ review of invoice receipt	▪ advantages: ▪ bundling competence, overview of the School’s funds
CONTROLLING		

cost centre controlling	▪ by cost accounting establishing cost centre controlling:
	  ▪ planning/budgeting
	  ▪ activity recording and accounting
	  ▪ reports of cost centers
		▪ recruiting one/some experienced controllers who are contact persons for staff in charge of cost centers within the teaching and research units
		▪ are professionally led by the central controlling unit
		▪ advantages:
		  ▪ control mechanism (budgeting)
		  ▪ providing information from the ERP-system
		  ▪ bundling of professional competence

Processes	Description	Personnel / Advantages
		for each School ▪ appropriate dealing with administrative processes of a sufficiently large „critical mass“ (too marginal on the level of the Faculties)
PROCUREMENT OR PURCHASE		
operational procurement or purchase	▪ Procurement or Purchase within the limits of a specific budget for each School ▪ purchase requisition is still executed by the teaching and research units	▪ skills: commercial apprenticeship or experience, high social competence, customer responsiveness ▪ advantages: ▪ bundling of Procurement activities ▪ avoiding double buying within a School: approval of purchase requisitions in coordination with controllers and clerks for third party funding ▪ overview of assets and available funds ▪ simplified exchange of furniture / transfer of assets ▪ complete listing of assets ▪ facilitating physical inventory ▪ links between purchasing unit and Central Procurement ▪ value limits shift purchase requisition to Schools

4. Other Functions

Processes	Description	Personnel / Advantages
PUBLIC RELATIONS / MARKETING		

	▪ in coordination with the Central Marketing Office some tasks are taken over by the Schools	▪ advantages:
		  ▪ consistent presentation of the School
		  ▪ „critical mass“ for specific activities
		  ▪ close coordination with the Central Marketing Office

INTERNATIONALIZATION		

	▪ contact and coordination of all international activities of each School
	▪ coordination of ERASMUS-activities
	▪ coordination of international relations of the individual courses of studies
	▪ contact person for students (e.g. for organizing stays abroad)
	▪ contact person for staff (e.g. initiating relations with international universities or faculties)
		▪ advantages:
		  ▪ expertise
		  ▪ “one face to the customer”
		  ▪ identifying and supporting units in the Schools with low-performance in internationalization
		  ▪ skills: academic background, high social competence, excellent command of foreign languages

IT-SUPPORT		

	▪ bundling of the current IT-support for each School to obtain the “critical mass”	▪ skills: IT-expert with respective training or experience
		▪ advantages:
		  ▪ both standardized and research-specific requirements
		  ▪ IT solutions for each School can be run and

Processes	Description	Personnel / Advantages
		supported centrally ▪ clear separation between central IT services and user-specific IT services for each School ▪ establishing an IT service team (mutual stand in as well as specialization in some areas)

Annex 10 – Graduate Programs

Research Training Groups

Nano- and Biotechnologies for Packaging of Electronic Systems (GRK 1401)
Speaker: Prof. Dr.-Ing. Gerald Gerlach,
Faculty of Electrical and Computer Engineering

Mass, Spectrum, Symmetry: Particle Physics
in the Era of the Large Hadron Collider (GRK 1504)
Berlin, Dresden, Zeuthen
Speaker for Dresden: Prof. Dr Michael Kobel, Faculty of Science

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Graduate school PoreNet: Nonmetallic porous structures
for physical-chemical functions PoreNet (GRK 1375)
Bremen, Dresden
Speaker for Dresden: Prof. Dr. Stefan Odenbach, Faculty of Mechanical Engineering

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Itinerant magnetism and superconductivity
in intermetallic compounds (GRK 1621)
Speaker: Prof. Dr. Hans-Henning Klauß, Faculty of Science

Integrated Research Training Groups

"Matrixengineering"
Speaker in Dresden: Prof. Dr. Dieter Scharnweber, Faculty of Mechanical Engineering

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Textile-Reinforced Composite Components for Function-Integrating
Multi-Material Design in Complex Lightweight Applications
Speaker: Prof. Dr. Volker Ulbricht, Faculty of Mechanical Engineering

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Institutional Orders, Script and Symbols/ Ordres institutionnels,
écrits et symboles (International Graduate College 625)
Speaker: Prof. Dr. Gerd Schwerhoff,
Faculty of Arts, Humanities and Social Science

Endowed Graduate Colleges

Lifelong Learning

Graduate College of the Hans-Böckler Foundation

Speaker: Prof. Dr. A. Wolter, Faculty of Education

Aspects of future satellite reconnaissance missions

Graduate College of EADS SPACE

Speaker: Prof. Dr. Klaus Janschek,

Faculty of Electrical and Computer Engineering

European Graduate School in Addiction Research

VolkswagenFoundation

Speaker: Prof. Dr. Gerhard Bühringer, Faculty of Science

Dresden Leibniz Graduate School (DLGS) at

Leibniz Institute of Ecological and Regional Development

Speaker: Prof. Dr. Bernhard Müller

Helmholtz Graduate School "HIGRADE"

Helmholtz Association

Speaker: Prof. Dr. Peter Krebs, Faculty of Forest, Geo and Hydro Sciences

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Research School DIKE -True Cost in Transport

Heinrich Böll Stiftung e.V.

Speaker: Prof. Dr.-Ing. Udo Becker and Prof. Dr. Bernhard Schlag,

Faculty of Transportation and Traffic Sciences "Friedrich List"

Graduate School “Public acceptance of large energy-related Infrastructures”

Boysen Foundation

Speaker: Prof. Dr. Antonio Hurtado, Faculty of Mechanical Engineering

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