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(UASP)**

**Research Management at Rutgers,
The State University of New Jersey (RU) –
Hands-on Experience for Tbilisi State University (TSU)
Case Study**

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Introduction and Methodology

Many studies have proposed that the twenty-first century will be the age of the knowledge-based economy (Gardner P.L. 2007). The knowledge-based economy has become an engine of progress in every country. The basis of economic advancement in developed nations is predicated on an advanced knowledge-based economy that drives technology based innovations.

For developing countries, like Georgia, it is very important to enhance the human capital by strengthening the educational system and forming an effective innovation system. A primary focal point of such a system is a research intensive, market-oriented higher education system.

Research management introduces a decision-making process that brings together resources, scientists, personnel, knowledge, and collaborators to realize research projects. These decisions are made with reference to scientific knowledge and the wider society. The overall function of research management cannot be attributed to a single role. Research is managed by scientists, research managers, university administrations, and on a higher level, by science policy.

Professional management is increasingly important for successful research at universities as well as other organizations (Falk Schützenmeister 2010). Research management can be described as work at organizational boundaries as well as at the boundaries of science and society which are increasingly complex and blurry (Whitchurch 2006). The term “boundary work” was originally introduced to replace the logical criterion of demarcation of scientific and non-scientific propositions (Popper 1994). An important part of boundary work ensures the societal support and resources necessary for the continuation of the increasingly costly scientific endeavor. Boundary work does not mean segregation; it is rather a constant attempt to maintain control over the complex relationships of research with its societal environment. Because of the enormous need for resources and the growing complexity of the institutional environment, the orchestration of research projects is very labor-intensive. One effect is the emergence of specialized boundary organizations that

bridge science and the application of scientific knowledge (Jasanoff 1990; Guston 2001; Hellström and Jacob 2003). Notable examples are technology transfer or industry relationship offices at universities (Fisher and Atkinson-Grosjean 2002), user boards, or organizations that transform scientific knowledge and expertise for policy-makers (e.g. the Intergovernmental Panel for Climate Change, Miller 2001).

University technology transfer activities are increasingly important as a source of regional economic development and revenue for the university (Friedman and Silberman 2003).

As a chief specialist of the Department of Scientific Research and Development, I dedicated my Case Study to Research Management with significant emphasis on Technology Transfer based on personal experience and quantitative research conducted at Rutgers, The State University of New Jersey. Case Study involves the comparing and contrasting research administration organizational structure and activities between host and home universities and includes ideas and recommendations on how to enhance the reforms carried out at Tbilisi State University.

The Proposed Case Study is constructed using online and published materials, as well as knowledge and experience gained during meetings and interviews with representatives of different Rutgers administrative units and faculties, especially:

- Dr. Richard Mammone, Executive Director of Office of Technology Commercialization (OTC);
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- Dr. Leon Segal, Director of Agriculture Licensing, Licensing & Technology, OTC;
- Rick Smith, Director of Licensing, Physical Sciences and Engineering, OTC;
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It was my pleasure to join the Ethics in Research Panel at the Center of European Studies and attend an EU-funded Business Forum on Professional Services at Princeton University. These meetings allowed me to participate in open discussions with the faculties and industry authorities from the professional services sector who shared their expertise on doing business transatlantically from the perspectives of IPR (Intellectual Property Rights), banking, the general legal environment and accounting/financing.

RU and TSU – Brief Overview

Rutgers, The State University of New Jersey (RU), is a leading national public research university and the state's preeminent, comprehensive public institution of higher education. Rutgers is the only public university in New Jersey in the Association of American Universities (AAU), a group comprising North America's 62 leading research universities. Rutgers and Princeton are New Jersey's only AAU members. Rutgers is dedicated to teaching that meets the highest standards of excellence; to conducting

research that breaks new ground; and to turning knowledge into solutions for local, national, and global communities.

Since its foundation in 1766, the heart of Rutgers mission is preparing students to become productive members of society and good citizens of the world. Rutgers teaches across the full educational spectrum: preschool to precollege; undergraduate to graduate and postdoctoral; and continuing education for professional and personal advancement.

More than 58,000 students from all 50 states and 125 countries - including 43,380 undergraduates and 14,800 graduate students - choose Rutgers for their education. More than 13,000 faculty and staff are at the heart of everything RU does. About 400,000 alumni - including more than 200,000 in New Jersey - live and work in all 50 states and on six continents. Twenty eight schools and colleges bring rigor and creativity to academic study, with the arts and sciences at the core of academic excellence. Rutgers is New Jersey's land-grant institution, and with impact around the corner and around the globe, Rutgers' service mission reaches throughout New Jersey and beyond, as exemplified by the activities of RU New Jersey Agricultural Experiment Station.

Rutgers creates new knowledge, fueling economic progress, improving lives, and enriching our humanity. Autism, The ocean floor, Walt Whitman, Islamic art, DNA, Airport security, Supply chain management, Transportation safety - RU explores it all, bound only by the reach of human imagination.

Great minds are the engines behind more than 200 Rutgers research centers and institutes, places that make important and lasting contributions to the world's body of knowledge.

Tbilisi State University (TSU) was founded in 1918 by a famous western educated Georgian historian Ivane Javakhishvili and the group of his followers. It was the first institution of higher educational in Caucasus at that time. Originally, the university had only one faculty – the faculty of philosophy. At the beginning of 1918, the board of professors and lecturers totaled only 18, the student body of the university included 369 students and 89 class auditors.

Today TSU is a driving force behind Georgian higher education. As a forward-looking university, TSU realizes that it faces new demands and strives to meet the challenges of 21st century by offering a top tier education, developing research opportunities, and enhancing its material-technical base and resources. The university's main directions, principles, values and reforms are carried out dynamically in a systematic, coordinated manner and have placed TSU on a development path leading towards joining the European Higher Education Area.

In May of 2005, Georgia joined the Bologna process and the transformation of the Georgian educational system started. The university began to implement several new reforms. In 2006, the university successfully passed the institutional accreditation. New specialties have established at the university and new rules for administrative and academic registration were enforced.

Currently, TSU is the largest university in Georgia with 6 enlarged academic units (departments) and over 22,000 students. There are 873 fulltime and 899 part-time academic staff (faculties) at TSU. TSU combines 16 scientific-research institutes (among them 14 are recently integrated). More than 200 scientific-research laboratories and centers, study laboratories and rooms, clinical hospitals, diagnostic centers and libraries are operated under the umbrella of Departments.

TSU closely collaborates with world leading universities and scientific centers. Today, more than 200 national and international research projects are being carried out. It is noteworthy to mention the participation of physicists and engineers from the TSU High Energy Institute of Physics in ATLAS project that is carried out at the European Organization for Nuclear Research (CERN, Geneva).

The results of implemented and ongoing research are represented in both national and high-rating international scientific journals (more than 300 articles were published during 2011 according to the Thomson Reuters Web of Science Platform). Approximately 50-60 doctoral theses are defended annually.

Office of the Vice President for Research and Economic Development, RU

The Office of the Vice President for Research and Economic Development (OVPR&ED) promotes excellence in research at Rutgers and provides oversight for the education of the next generation of researchers. Research is fundamental to the mission of Rutgers and enhances its education and service missions. In fiscal year 2011, \$473,159 million of research at Rutgers was sponsored by the federal government, state government, corporations, and foundations, providing research experiences for undergraduates, support for graduate assistants and postdoctoral researchers, and bringing state-of-the-art equipment and facilities to RU campuses.

OVPR&ED Reporting Units are:

Office of Research and Sponsored Programs (ORSP)

The Office of Research and Sponsored Programs (ORSP) assists faculty with grant submission and pre-award matters, including budget development, electronic proposals, and the negotiation of awards. Support for the Institutional Research Board (IRB) for human subjects research and the Animal Care and Facilities Committee (ACFC) is also provided by ORSP staff who are experienced in federal regulatory affairs.

Office of Technology Commercialization (OTC)

The Office of Technology Commercialization helps turn academic discoveries into commercial successes. To do so, the office provides support with research, intellectual property; marketing; contracts/licensing; start-up company formation and other commercialization assistance to members of the Rutgers community on all three of the university's campuses. The department views the inventors as clients and partners with them throughout the entire commercialization process, ensuring that they receive the services they need when they need them.

More than 80 start-up companies have been created based on Rutgers technologies; two thirds of these are New Jersey-based. Examples of successful companies include Scientific Learning Corporation, Ask.com, TYRX, REVA Medical, Axion International, and Connotate.

Commercial products on the market (via start-ups or licensing) include (but are not limited to) the Fast Forward® language programs, many cranberry, dogwood and holly varieties, stents, plastic bridges/railroad ties and optical fibers. The department is continually looking for new ways to encourage innovation among faculty, staff and students.

Laboratory Animal Services (LAS)

Laboratory Animal Services is a service department that oversees the AAALAC-accredited program of animal care and use at Rutgers. The laboratory animal care technician staff provides daily care for university-owned animals used for research and teaching. LAS managers and supervisors manage animal facilities on the various campuses. LAS veterinarians provide clinical veterinary care for animals and provide consultation and training in support of faculty research. LAS veterinarians work with the Rutgers Animal Care and Facilities Committee, ORSP, the Occupational Health Department, and REHS and its safety committees to monitor animal use activities to provide a safe workplace and assure compliance with federal regulations.

Office of Research Alliances

Rutgers' Office of Research Alliances (ORA) focuses on corporate partnerships. ORA's specialty is getting the right people in the room for high-impact, highyield interactions among faculty and industry. The ORA team works university-wide to help executives, scientists and others in business find the right people at Rutgers. ORA does that by listening and working with colleagues across the university to make the optimal connections.

ORA's main goal is to increase industry engagement with the university. As New Jersey's comprehensive public research university, Rutgers provides broad and integrated resources to external partners and ORA helps make those resources more readily available. Formed just two years ago, ORA also promotes intra-university collaborations. Rutgers is a large, dynamic and diverse university, and ORA is proud to creating new synergies within the research enterprise and with our industrial partners.

Office of Proposal Development (OPD)

The Office of Proposal Development (OPD), part of the Office of the Vice President for Research and Economic Development at Rutgers, The State University of New Jersey, helps achieve the university's research and educational priorities by developing and providing grantsmanship and grant writing support services and resources to the Rutgers community to assist junior and senior faculty and staff, interdisciplinary research teams, and the university's schools, centers, and institutes to increase the quantity and improve the quality of research and educational proposals to external funding sources, including state and federal agencies and private foundations. The OPD works closely with grant facilitators located within the university's various schools to provide information resources and to develop and conduct training programs to assist faculty and staff to become effective and successful grant writers.

Center for Math, Science and Computer Education (CMSCE)

As a university wide center, the Center for Mathematics, Science, and Computer Education (CMSCE) fosters collaboration amongst educators and business leaders, practitioners and researchers to enhance the learning and teaching of mathematics and science, and to demonstrate how technology can contribute to these goals. Center institutes and programs use strong mathematical and scientific content and offer powerful learning strategies. Mathematics programs present strategies and problem solving approaches to improve student mathematics learning. Science programs stress hands-on activities and the importance of developing processes of scientific reasoning. Technology programs are held at the Center's Digital Teaching and Learning Laboratory. CMSCE acts as a broker-facilitator in the service of furthering its goal of improving mathematics and science education. The center is organized as an umbrella unit that encompasses a group of projects which each share these goals. Each of these projects has its own leadership structure and functions independently.

Corporate Contracts

Corporate Contracts, an integral part of the Office of the Vice President for Research and Economic Development, is responsible for reviewing, drafting, and negotiating all commercial contracts with companies who do business with Rutgers' research community. This includes sponsored research agreements, fee for service, subcontracts with industry, center member agreements and all confidentiality and material transfer agreements. Corporate contracts reviews Rutgers' proposals for industrial sponsorship prior to submission to the company.

Department of Scientific Research and Development, TSU

The Research Management in TSU is carried out by the Department of Scientific Research and Development (DSRD). DSRD helps Departments/Institutes staff secure external funding to support their research, and promotes supports and administers quality research activity at TSU.

Key responsibilities of DSRD are: promote high-quality and internationally competitive research; develop conditions for sustainable growth of R&D system; focus on human potential and infrastructure; integrate scientific research and education; administer/monitor research grants - review proposals for compliance with application guidelines and University policies and authorizes submission, review, negotiation and acceptance of grants and contracts on behalf of TSU; collect and report research performance data; develop research related policy and advise Senior Management; conduct seminars/workshops/conferences; advise on all aspects of proposal development and award administration.

Nowadays, TSU combines and provides basic financing for 16 scientific-research Institutes, which operate under the aegis of DSRD. Also, DSRD controls and coordinates the research activity of its sub-units at the Departments.

Key Observations, Management Challenges and Solutions

Taking into consideration the above-mentioned findings, it should be noted that TSU DSRD combines most of the activities/services provided by ORSP, OPD and Corporate Contracts of RU OVPR&ED. The main differences are that DSRD is not divided into offices and does not provide any services, which the rest of the listed above offices (OVPR&ED Reporting Units) provide.

In both Universities the main source of research funding is external grants, with the indirect costs equal to 8-12% (for TSU) and approximately 10-47% (for RU) – with the percentage depending on the funding agency. The maximum of the indicated percentage usually comes from the Federal Agencies). At RU 10.5%-50% of overhead money received goes to the corresponding school/department, whereupon the school/department distributes money received by its needs. The rest of the overhead money goes to RU budgeting and is spent upon RU needs (administrative costs, utilities, different internal funds etc.). It should also be mentioned that the main difference between RU and TSU is that the system of education at TSU is more centralized than at RU. (On the one hand centralization causes difficulties from a financial and administrative point of view, but it is more flexible from a viewpoint of crucial fast reforms and reporting). Consequently, in contrast to TSU, schools and departments at RU have autonomy and are able better control finance and related activities. Nowadays TSU is in process of negotiations with the Ministry of Education and Science of Georgia regarding the flexibility of expenditure of overhead money. If this is decided positively, the RU practice will be adopted to TSU's overhead distribution model.

The big gap between academia and industry exists in Georgia. After interviewing the Director of the Office of Research Alliances, the idea of making the first steps toward closing this gap arose. For this reason initially it is very important to explore what kind of companies exists in the Georgian market and which of them are industry-based. The next step would be to set up meetings with the companies' representatives in order to figure out demands and understand what requests does the industry have and how TSU faculties can

meet and satisfy these requests. Ideally, we can work directly with companies to generate sponsored research upon their demands and connect the right people (from business and academia) with each other.

In order to enhance services and to help internal and external researchers find common and unique tools and resources at TSU, we need to compile TSU infrastructure data and available research tools into one electronic environment – then we can integrate this data into the TSU Research Portal (the successful project implemented under the leadership of the Head of DSRD Prof. Giorgi Ghvedashvili and funded by IREX).

Also, to increase the research productivity of faculties, the creation of a system for faculty performance appraisals is suggested.

No less important are the questions “how do we protect the TSU employees, who generate ideas, create knowledge and come up with an inventions and technologies?” and, “How to we secure their rights and bring revenue to the inventor and the University?”

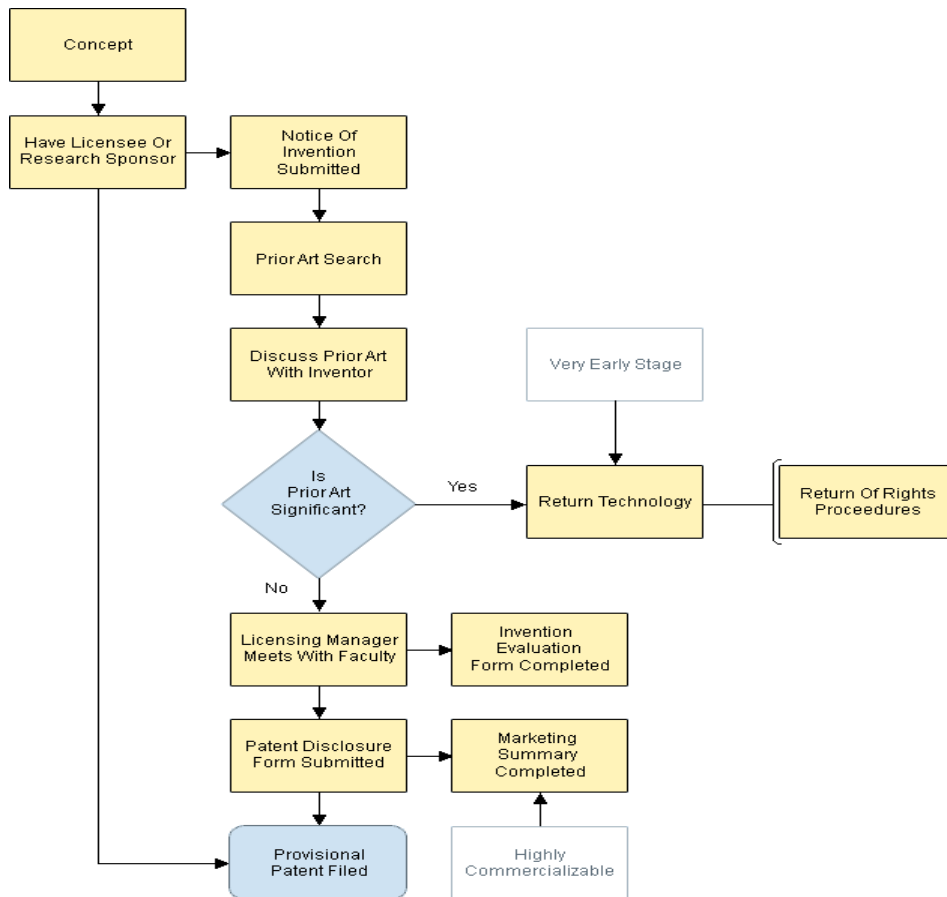
The technology transfer offices (TTO), which are familiar with all mechanisms to cover the mentioned-above issues, are usually operated on the basis of Universities in Europe and USA. None of the Universities of Georgia has a TTO. So knowledge and experience gained at OTC will contribute to the creation of recommendations for further TTO establishment at TSU.

How the Commercialization Process works at Rutgers:

Inventions begin when faculty, staff, and/or students conceive of an idea. All new inventions developed at RU should be disclosed to the Office of Technology Commercialization (OTC) by filling out the Notice of Invention form, which is available online. Within a short period of time the licensing manager who is handling the inventor’s case contacts the inventor. The Inventor is provided with a Rutgers Disclosure Number (the internal number OTC uses to reference technology) and, if applicable, the licensing manager requests to complete a more detailed form - Rutgers Patent Disclosure Form. Rutgers Patent Disclosure Form requests the information needed to file a patent (novelty, utility, and non-obvious) and also provides information to understand the invention, its

applications and the market. The licensing manager assists the faculty member in filling out the form and understanding the technology commercialization process. Once it is completed, the Patent Disclosure Form should be emailed to OTC.

Disclosure Process



<http://otc.rutgers.edu/faculty/disclosure-process.php>

Afterwards OTC evaluates the invention’s economic prospects and decides whether to protect the IP by securing a patent, copyright or trademark or by keeping the invention a trade secret.

Patenting is often done concurrently with the publication of the research results. Any Public Disclosure can lead to the Loss of Patent Rights. For most countries outside of the U.S., inventions cannot be publicly disclosed prior to submission of the patent application.

This means that most publications or presentations of the invention prior to submission of a provisional patent application eliminate the ability to seek patent protection in foreign countries. Within the U.S., public disclosure of an invention initiates a one-year period in which one may seek patent protection through the submission of a provisional or non-provisional patent application. This simplified filing was specifically enacted by Congress to benefit small inventors and research universities. As long as an enabling manuscript is available, a provisional patent can be filed almost immediately. The provisional application allows more time to decide whether to pursue a non-provisional patent application, which requires more work and is typically more expensive. Basically, a provisional patent application is a simple description of an idea along with any applicable drawings. Provisional applications currently cost \$1500 to file in the U.S., while a non-provisional application costs at least \$10000 depending on the type – US/ International or both. Mentioned fees are usually paid by the University. The provisional patent application will automatically become abandoned at the one year anniversary of the provisional patent filing if not converted to a full patent application or refiled. After a patent application has been filed, the inventor may present and/or publish the invention without the loss of patent rights.

Since inventions made using university resources are owned by the university, the inventors in effect assign the rights to their intellectual property and the university is free to license the technology to interested parties. The next step occurs when an individual or organization, usually a commercial company, secures a license to commercialize the technology. A license does not technically grant a company the right to make, use or sell the invention, but it is an agreement for the university not to sue the company for patent infringement. The license source can be in the form of a patent, copyright, trade secret or trademark.

A non-confidential document summarizing an invention is sent by the OTC to interested companies for a review process, with the OTC requesting a signed confidentiality agreement prior to a full disclosure. Upon further interest, the university and the company may proceed to negotiating licensing terms. At this stage, the university typically requires

the prospective licensee to submit a development plan and a corresponding letter of intent. After a due diligence process and the execution of a licensing agreement, the technology is transferred and both parties may start earning income.

The process is complicated in practice and requires corresponding knowledge and skilled personnel as well as set of rules, policies and agreements. OTC has a successful track record of technology licensing and start-up company creation, accomplished with a growing office staff (more than 20 people) of highly trained Ph.D.s, M.B.A.s, patent agents, and others with years of experience in science, business, technology commercialization and entrepreneurship.

Moving toward the establishment of a similar office at TSU at the very initial stage it is extremely important to create rules and policies including a TSU Copyright Policy, a TSU Patent Policy, a Conflict of Interests Policy, a Code of Ethics as well as needed forms such as a Notice of Invention and Patent Disclosure Form.

Afterwards, a presentation describing the benefits and process of technology transfer and forms of intellectual property should be created and presented to TSU faculties emphasizing the main rule – not to publish/not to publicly disclose before applying for IP. The main goal during presentation will be the introduction of a new culture which brings ideas to the market with the manual explaining all necessary procedures. The first target group will be faculties who are going to submit grant proposals to Shota Rustaveli, National Science Foundation under the annual Call for Applied Research (for projects with the potential for commercialization).

All mentioned activities will be performed in close cooperation with the Georgian Patent Agency and recently established on its basis Technology Transfer Office.

An additional idea generated during the fellowship is the creation of a Robotics Center at TSU, similar to CMSCE. This Center will introduce the new approach as an effective way for students to learn STEM subjects (Science, Technology, Engineering and Math) in a more interesting and innovative manner. At the same time, the Robotics Center will be the basis for innovative investigations that involves young researchers. Proposed hand-on programs

will enable students to conduct experiments with robots and be exposed additionally to the basics of ICT, engineering and mechatronics.

Results and Takeaways

The Performed study results in gaining the needed knowledge and experience to advance many reforms to be carried out at my home university. During the meetings and interviews the following ideas have arisen:

- to make the first steps toward the creation of a Technology Transfer Service at TSU (taking into consideration the experience gained in developing policies, forms, presentations);
- to move forward in bridging the gap between academia and industry (market analysis, faculties possibilities, integration of TSU infrastructure data and available research tools into TSU Research Portal);
- to advise how to improve the TSU overhead distribution model;
- to create a faculty performance appraisal system;
- to create a Robotics Center at TSU.