GENDERING OF EXCELLENCE IN TECHNOLOGICAL AND ENGINEERING RESEARCH IN POST TOTOLITARIAN REALITY

Virginija Šidlauskienė

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1.INTRODUCTION

This paper aims at exploring, from a gender perspective, the dynamics and patterns by which scientific excellence is constructed in engineering and technology research in Lithuania national settings and internationally. Different arenas of scientific excellence will be explored and compared in order to gain a deeper theoretical understanding of gendering of excellence in engineering and technology research. Furthermore, the aim is also to develop recommendations to the science policy makers on more gender sensitive and gender aware procedures in the contexts of globalize concurrence, from one side, and post totalitarian (postcolonial) country social and cultural reality, from another.

In attempts to strengthen the European research effort, promoting scientific excellence is currently seen as a pivotal issue. Excellence and innovation are seen as "the key to European industrial competitiveness", as stated in the Commission Communication 353 (2004) drafting the future of European research policy. This includes creation of "centres of excellence" for research and higher education at European level, and the same development can also be observed at regional – for example, recently in the Nordic region – and at national level. The Communication characterizes European centres of excellence by high visibility and openness at international level in terms of attractiveness for the best researchers from all countries. Of the six major objectives drafted for the Seventh Framework Programme in the Com 353 (2004), the first is creating European centres of excellence through collaboration between laboratories, in addition of the opportunities offered by the Sixth Framework Programme for building "networks of excellence". Further objectives, such as "stimulating the creativity of basic research through competition between teams at European level" and "making Europe more attractive to the best researchers", include as their aims the boosting of excellence.

A key concern for successful gender-sensitive science and research policy is how to combine the promotion of scientific excellence with the promotion of gender equality. One of the major European policy reports on women in science, the ETAN report (2000) addressed the issue by its very title: "Promoting excellence through mainstreaming gender equality". The Commission-initiated international workshop and publication "Gender and Excellence in the Making" (2004) explored the issue of gender bias in measuring scientific excellence, based on recent research conducted in Europe and USA. One main conclusion was that scientific excellence is not a "universal fact" but rather a social construction, and as such, opens to many kinds of biases, including gender bias. The report recommended that further research should be conducted in several areas related to scientific excellence, such as differences between scientific disciplines, epistemic cultures, national and regional contexts.

Technology and engineering offer an especially fruitful field for this kind of a study, as traditionally and currently the most male-dominated disciplinary field. Engineering and Technology is the discipline with lowest rate of women professors in Europe (She Figures 2006). Furthermore, a large proportion of technological and engineering research is conducted in the business enterprise sector, which currently employs lowest proportions of women researchers of all sectors. Only 18 %

of researchers in the business enterprise sector in the EU-25 were women in 2003, whereas the proportion of women was a third in both higher education and governmental section research. Of the 13 PROMETEA[11] countries, in Austria and Germany, the proportion of women researchers in the business enterprise sector was even smaller than the EU-25 average – only one out of ten business enterprise researchers in these countries were women. On the other hand, in some other participating countries such as Sweden, Spain, Slovakia, Greece and Lithuania there were proportionally more women researchers in the BES sector compared to the EU-average (She Figures 2006).

The research landscape and context varies in the thirteen participating countries in many ways which should be kept in mind when interpreting the results. There is a large variation across the PROMETEA countries in the overall research intensity. Finland and Sweden represent countries with the highest research intensity in the EU, measured by the share of the R&D of the GDP, Germany, Austria and France being also above the EU average, and UK slightly below the EU average, whereas research intensity in Spain, Lithuania, Slovakia and Greece is clearly below the EU average. Sweden and Finland again top the EU statistics when it comes to the share of business sector expenditure on the R&D of the total GDP, when Germany, Austria, France and UK are also above the EU-25 average in 2003, whereas Spain, Slovakia, Greece and Lithuania are clearly below the EU average. When measured by the number of researchers (FTE) per 1000 labour force, Finland and Sweden were at the top of the EU-25 in 2003, whereas France, Germany, UK and Austria all had figures higher than the EU-25 average, and Spain, Lithuania, Slovakia and Greece had fewer researchers in the labour force than the EU-25 average (Key Figures 2005).

The gender context of the participating countries shows also a large variation. In the global gender gap comparison, compiled by the World Economic Forum, Sweden topped the world statistics as the most gender equal country of all. Finland was on the third place, Germany and UK also in the top ten, Spain and Lithuania in the top 20, whereas the rest of the PROMETEA countries were placed lower, Chile as the lowest (78) (Serbia was not included). The Global Gender Gap index measures gender equality in 115 countries in the world by a broad range of indicators obtained from mainly public "hard data" indicators describing fertility, labour force participation, political empowerment and proportion of women among professional and technical workers (World Economic Forum 2006).

In 2005 the World Economic Forum (WEF) launched a new framework for measuring Equality — the Gender Gap Index (GGI) — an attempt to assess the size of the gender gap using economic, educational, health and political based criteria. According to WEF's The Global Gender Gap Report 2006, GGI - 2006 is 0.7077 in Lithuania (21st place), 0.7091 in Latvia (19th place), and 0.6944 in Estonia (29th place) among the 118 investigated world economies. Undoubtedly, the situation of women from the Baltic States is not as bad as of women from the Russian Federation (49th place); however it is not as good as of women from Nordic countries that are amongst the top ten countries with the smallest 'gender gap'[12]. In 2007 the World Economic Forum mentioned Sweden (1), Norway (2), Finland (3) and Iceland (4) once again top the rankings in the latest Global Gender Gap Report**.** All countries in the top 20 made progress relative to their scores last year – some more so than others. Latvia (13) and Lithuania (14) made the biggest advances among the top 20, gaining six and seven places respectively, driven by smaller gender gaps in labour force participation and wages. The Report covers a total of 128 countries, representing over 90% of the world's population.

The aim is to explore comparison, from a gender perspective: 1) **several arenas** where scientific excellence is constructed in technological and engineering research : national technology and engineering research councils and other similar bodies at national level allocating research

[11] http://www.prometea.info/

[12] World Economic Forum (2006): Global Gender Gap Report 2007. http://www.weforum.org/en/initiatives/gcp/Gender%20Gap/index.htm (referred on 09/11/2007).

funding; national and European journals; major national and European conferences, major national and European prizes and awards; patents; 2) **the gate-keepers in these arenas**, referring to those who decide the criteria of granting excellence and those who apply these criteria in decision-making in research councils, selection and programme committees and in editorial boards; 3) **the "applicants" and those receiving funding, publicity and awards.**

2. RESEARCH METHODOLOGY FOR EXPLORING EXCELLENCE IN TECHNOLOGICAL AND ENGINEERING RESEARCH FROM GENDER PERSPECTIVE

Five key arenas where scientific excellence is constructed and identified in technological and engineering research:

- Research funding
- Publishing – scientific journals in technology and engeneering
- Scientific conferences
- prizes and awards
- patents.

(2) the gate-keepers in these arenas, referring to those who decide the criteria of granting excellence and those who apply these criteria in decision-making in research councils, selection and program committees and in editorial boards;

(3) The "applicants" and those receiving funding, publicity and awards;

(4) The experiences of "excellent women in technological and engineering research" who have advanced to the top.

It was expected that a variety of quantitative data by gender might have been gathered on forms of recognition of technological excellence by gender from different stakeholder organizations (research councils, journals, scientific societies and academies) in the participating countries. Increasing amount of relevant information was also expected to be available in the internet. However, availability of and access to the data by gender among the stakeholder organizations was not known for most participating countries and was also of interest here. Responses of the stakeholder organizations approached by the PROMETEA project to obtain this kind of data by gender can be seen as an indicator of gender awareness and gender policy or lack of it of these stakeholder organizations. The intention was also to identify data gaps concerning gender data on the five arenas in different national settings to inform future research.

Quantitative data (complemented with some qualitative data) was planned to be gathered on gate-keepers in funding committees; on application pressure and success rate by gender in technological research funding; on major national and European technology conferences (organizing committees, chairpersons, key note speakers, participants if possible); on major national and European technology and engineering journals (in terms of editorial boards, peer reviewers, authors); on major national and European/international technological prizes and awards, their criteria, selection committees and awards; and patents. Some data on these has been made available for some European countries in the She Figures –publication and in the ETAN-report.

Both quantitative and qualitative data has been collected in all 13 PROMETEA countries on the gendering of excellence. Five arenas of excellence have been investigated in all participating countries: major funding organisations, conferences, journals, prizes and awards, and patents.

The national PROMETEA teams were responsible for collecting national quantitative data on the major research funding organisations, scientific conferences, main technology journals, technology prizes and awards, and patents by gender. The quantitative data collected by the national teams has been entered into PROMETEA wiki[13].

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[13] *We would like to thank our project partners in the participating countries for the great input they provided. This article is based on their results and analysis. In Austria: Birgit Hofstätter, Anita Thaler and Christine Waechter, in Chile: Dámaris Fernández Donoso, Claudia Paz and Sonia Yáñez, in Finland: Liisa Husu and Paula Koskinen, in*

2.1. Data gathering

Five arenas of excellence in technological research were explored in all thirteen participating countries. A large and interesting data set was obtained, highlighting important aspects of gendering of excellence in technological research in Europe. All partners were not able to provide data on all arenas due to access, data availability, research resources, and related reasons. This means that the level of detail in the national data also varies to some extent and that the data obtained is not comprehensive or fully comparable across countries and sectors and should thus be interpreted with caution. Guidelines for data gathering were entered into the PROMETEA wiki and explained and discussed further in project meetings.
The following instructions in PROMETEA wiki guided the data gathering:

2.1.1. Funding organisations

Obtain data on major funding organizations.

Identify major national research funding organisations for technological/engineering research in your country (such as Technological Research Councils, major private foundations) - see examples on She Figures 2006, p. 103-104.

Obtain data on the gender composition of

a) Decision makers in these organisations (members of Research Councils, board of foundations)

b) Referees/evaluators - if available

c) Applicants (those who apply for funding) and those awarded funding (success rate by gender) - if available.

d) Does the organisation have a formal gender equality policy (gender equality plan etc.)? If yes, please submit the policy document or summarize it in English if no English version available.

Please note: no data by gender available (data gap) is data for PROMETEA purposes!

2.1.2. Scientific conferences

Obtain data on major technology conferences.

a) Identify 1-2 major international conferences in each of PROMETEA technology fields (responsibility: Finnish team, suggestions welcome)

b) Identify 1-2 national conferences in those fields (responsibility: national teams).

c) Obtain data on the gate-keepers = organising committee composition, and on the key-note speakers, presenters and participants by gender in 2005.

2.1.3. Publishing: scientific journals in technology and engineering

Obtain data on major technology journals in the five PROMETEA technology fields

5 leading international journals from each field (responsibility: Finnish team, suggestions welcome)

3 national from each field (responsibility: national teams).

Obtain data of gender composition of the editorial boards, referees, authors of these journals in 2005.

France: André Béraud, Anne-Sophie Godfroy-Genin, Cloé Pinault, Yvonne Pourrat and Jean Soubrier, in Germany: Jennifer Dahmen, Gaby Hoeborn and Felizitas Sagebiel, in Greece: Nikitas Nikitakos and Maria Lambrou, in Lithuania: Ala Kovieriene, Diana Saparniene and Virginija Sidlauskiene, in Russia: Vera Uvarova, in Serbia: Jovan Dudukovic, Jelena Jovanovic and Sanja Vranes , in Slovakia: Oto Hudec and Natasha Urbancikova, in Spain: Carme Alemany, in Sweden: Helen Peterson and Minna Salminen-Karlson, in UK: Wendy Faulkner, Lisa Lee and James Stewart, at Schlumberger : Pierre Bismuth.

Note that in many cases, only initials of the persons first names may be used thus making it impossible to identify gender of the person. In that case, please contact the journal and ask if they keep any gender statistics.

2.1.4. Prizes and awards

Obtain data on major technology prizes and awards nationally and internationally.

Identify 5 major international technology prizes (responsibility; Finnish team, suggestions welcome) and awards and any national level ones (responsibility: national teams).

Obtain data on gender composition of prize/award committees and award winners during 2000-2005.

2.1.5. Patents

Obtain data on patents.

Obtain information on whether the national patent authorities collect data on patent applications and patents by gender. If they do, collect all gendered data available. Note again: no data by gender available is data for PROMETEA purposes!

Please note: In many cases it can be impossible to identify whether a person is male or female because of the practice that only initials of first names are used: Dr. M. M. Smith. How widespread these kinds of practices of making gender invisible are is also of interest to PROMETEA so it is important to record and report the use of this practice.

3. FINDINGS – GENDERED ARENAS OF EXCELLENCE

Research funding is one of the key resources advancing a career in research. Ability of and success in generating external research funding is often used as an indicator of excellence in career advancement and recruitment especially in academia in the context of changes in Lithuania sciences politics and reforms.

1. Major research funding organisations in Lithuania is the Lithuanian State Science and Studies Foundation (Valstybinis mokslo ir studijų fondas) is a budget dependent institution, established by the Government of the Republic of Lithuania. It's mission is the implementation of the state policy in the field of science and studies through the administration of monetary resources ascribed to the Foundations, while ensuring their efficient usage, seeking to promote the development of science and studies, speeding up the implementation of modern technologies, increasing the competitiveness of the science and administrating state loans for Lithuanian students.

The main values of the Foundation are: Integration of Science and Studies and Competitive Ability. It means that the Foundation supports national science and studies institutions, scientists, post-graduates (doctoral candidates), researchers, seeking to become a part of international scientific community. The Foundation supports science and studies by organizing competitions, through public administration of the state budget funds.

The most important divisions are: Division of Science and Division of Loans. Overall 19 Expert Committees are working in the Foundation. There are 5 Expert Committees in following areas: 1) Humanities; 2) Social Sciences; 3) Physical Sciences; 4) Bio-medical Sciences; 5) Technological Sciences. There is one special Expert Committee for the Research performed together with economy entities.

There are 5 special Expert Committees under the High-tech Development programs in following trends: 1) Biotechnology; 2) Mechatronics; 3) Laser Technology; 4) Information Technologies; 5) Other High – Techs (Nanotechnologies and Electronics).

There are also 8 special Expert Committees under the Lithuanian Prioritised Research and Experimental Development programs in following trends:

1) Genomic and Biotechnology for the Health and Agriculture; 2) Good Quality, Safety and Eco-friendly Food Technologies; 3) Ecosystems and Global Changes; 4) Information Society Technologies; 5) Citizens and Governance in Knowledge – based Society; 6) Preservation of the National Identity in Global Circumstances; 7) Researches for the Creation of Nanotechnologies; 8) Researches and Experimental Development of Nuclear Safety and Solution of Tasks, related with the Regulation of Radioactive Wastes.

Decision makers:

Director (Manager) of the Foundation: male

Staff: 25 persons, gender distribution not available

Chairman of the Board: male

Board (Council): 11 persons, gender distribution not available

The Ministry of Science and Education of the Republic of Lithuania/Lietuvos Respublikos Švietimo ir mokslo ministerija.

Data gaps were observed when collecting the data on funding organizations. The Ministry of Science and Education do not publish success rates of applicants, but the Lithuanian State Science and Studies Foundation publishes their every call. Success rate by gender of leader of the project team are published as well. The names of experts and evaluators of the project proposals are confidential; therefore it was impossible to perform any gender.

2. Scientific conferences. One international conference was chosen for closer analysis from each PROMETEA technology field. On the basis of websites of Lithuanian technological universities the Lithuanian team identified several national and international conferences which are organised in Lithuania. Kaunas Technological University, the largest technology university in the Baltic States, lists on its website several technology and engineering conferences organised in Lithuania, http://internet.ktu.lt/en/ [14]> Science > Conferences. The members of scientific committees of the conferences are often published on the conference website, in some cases only initials of first names used, in others, full names.

As an example of a national conference, the Lithuanian PROMETEA team analysed the conference ENERGY AND TECHNOLOGY 2006, organised by the two more advanced universities Kaunas University of Technology and Vilnius Gediminas Technical University. All information was announced on the website. In plenary session all 6 keynote speakers were male, among sessions, reports were presented by 58 men and 9 women.

3. Publishing: scientific journals in technology and engineering. Scientific publishing activity of a researcher is one key criterion in recruitment decisions and advancement in a research career especially in academia. International peer reviewed journals are commonly considered as the most highly esteemed publishing arena. PROMETEA WP5 explored publishing by collecting gender data from the most prestigious international journals in engineering and technology, and exploring also the national publishing scene in the participating countries.

The reports of the PROMETEA national teams suggests that scientific publishing in the field of Technology and Engineering is shifting to focus more and more on international arenas and publishing in English.

In the journal chosen by the Lithuanian team, Journal of Environmental Engineering and Landscape Management, the editor-in chief and all of the editorial board are men. In international editorial board there are women, in local editorial board there are only men. The journal doesn't practice gender monitoring. The journal uses full names of authors. The main national technological/engineering research institutions started journal publishing in English with International Editorial Board. Lithuanian researchers mainly try to publish in international journals, mainly in English. The Lithuanian team identified one of the leading research journals by Vilnius Gediminas Technical University

[14] (referred on 16/07/2007).

JOURNAL OF ENVIRONMENTAL ENGINEERING AND LANDSCAPE MANAGEMENT, ISSN 1648-6897 Volume 14, Number 4, 2006.

The Editor-in-Chief is Prof Dr Habil Pranas Baltrėnas (male) and all 4 members of the Editorial Board are male. In the International Editorial Board - 18 males, 2 females; in the Local Editorial Board all 18 members are male. Journal name policy for articles is to mention both names of scientists. 4 issues a year, 7-10 articles in an issue. The journal doesn't have any gender monitoring on submissions and acceptations articles.

In Lithuania, a lot of journals are published at GOV and HE institutions:

Chemical Technology http://ktu.lt/mokslas/zurnalai/meniu.asp

Mechanics http://ktu.lt/mokslas/zurnalai/meniu.asp

Environmental Energy http://ktu.lt/mokslas/zurnalai/meniu.asp

Electronics and Electronical Engineering Economics http://ktu.lt/mokslas/zurnalai/meniu.asp

Information Technology and Control http://ktu.lt/mokslas/zurnalai/meniu.asp

Engineering Economics http://ktu.lt/mokslas/zurnalai/meniu.asp

Material Science http://ktu.lt/mokslas/zurnalai/meniu.asp

Editorial Board members are given on the websites of the journals.

In both national and international journals the situation is very much the same: editorial boards are highly male-dominated even if the situation varies somewhat by field and in different journals. No international top journal in Engineering has a female Editor-in-Chief but two top journals in Computer Science do. Any gender monitoring practices in the journals of Lithuania are not fixed.

Gender analysis of the compositions of editorial staff and gender divisions of authors is complicated or hindered by the varying name policy of the journals. In some journals full names are used, in some others, only surname and initials, and sometimes both systems in the same journal. However, in Russian and Lithuanian language, one can deduct the gender of a person also from the form of the surname.

4. Prizes and awards. Scientific awards and prizes is a traditional way to indicate excellence. Nobel Prize is not awarded in Technology and Engineering field but there are some other, relatively newly established significant international awards in the area. The number of women among awardees of Technology and Engineering prizes and awards is, as expected, very small. 12 PROMETEA country teams provided data on the subject. The data varies a great deal both in quality and quantity but, as was expected, men dominate this field both as gate-keepers and awardees. Transparency of the nomination procedures also varies. In best cases, the nomination criteria and past and present nomination committees are listed member by member with full names in the website of the awarding organisation, together with lists of awardees.

The main prize for lifetime achievements and special achievements for Lithuanian science and research is **Lithuanian Science Award**, established by the Government 1993. The prize is about 13.000 € annually. In 2006 the Committee for distribution of Lithuanian Science Award (in physics, biomedicine and technology) consisted of 36 members of whom 3 were women; the chairperson of the Committee was a male Academician. In 2006 nominees of the Lithuanian Science Awards were nominated in the following areas:

Physics and applied sciences: 7 men, no women

Biomedicine sciences: 12 men, 2 women

Experimental developmental research: 4 men, 2 women

Technology research and technological developmental research: 6 men, no women

National Advance Award (so called ("Lithuanian Nobel Prize") was established by the business sector and Vilnius University in 2006. This award amounts nearly 20,000 €. In 2007 the National Advance Awards were awarded to 6 male researchers in the three areas of advancement: science, partnership and culture. The committee for distribution of National Advance Award consisted of 14 members, all are male.

Lithuanian Academy of Sciences has established Awards for the achievements in science and technology development http://lma.lt.

5. Patents. None of the countries studied by PROMETEA had gender-specific data on patents readily available. From most countries it was not possible to get any statistics on the matter.

The system of industrial property in Lithuania functioned well until 1940 (Trademark Act of January 27, 1925, Inventions and Improvements Protection Act of May 14, 1928, Industrial Models and Design Act).

After the declaration of independence on March 11, 1990, Lithuania started re-establishing an independent national industrial property system. The State Patent Bureau (SPB) was established on April 12, 1991. At present the structure of institutions responsible for the protection of the industrial property in Lithuania has been created (http://www.vpb.lt/en/).

The main functions of the State Patent Bureau include protection of industrial property (inventions, designs, trademarks and service marks, semiconductor product topographies), drafting legal acts in the field of industrial property protection, representation of the Republic of Lithuania in international organizations and international events related to industrial property protection. The State Patent Bureau employs 58 specialists.

From 1998 the State Patent Bureau is charged with the functions of the founder of the Lithuanian Technical Library www.tb.lt. The Lithuanian Technical Library employs 152 specialists.

The Lithuanian team made twice personal calls into the State Patent Bureau in order to find out information on gender of inventors, and concluded that this information was not available.

4. CONCLIUSON

Some information was easily obtainable, such as information on gate-keepers and selection process for and recipients of national technology prizes. This information was readily available on the websites of the prize-giving organisations. Many stakeholder organisations also have informative websites, and many of them responded swiftly to the requests for data from PROMETEA. In general, research of this kind has been greatly facilitated during the recent years due to the fact that the stakeholder organisations have started to publish more and more information on their organisation, activities and policies online.

Technological and engineering research is heavily male-dominated and, as expected, the arenas of excellence in technological research even more so, including when it comes to gate-keepers of these arenas, those who define and decide on excellence. Data gathering within PROMETEA on the gendering of arenas of excellence should be seen as an exploratory mapping exercise which hopefully will inspire further, more detailed research. The picture created on the gendering of excellence in technological research by PROMETEA is not comprehensive but rather patchy, for several reasons. Further studies would be needed to perform systematic analysis of the dynamics of gendering of excellence in the five arenas under scrutiny, and on different subfields of technology which might have slightly varied gender dynamics.

Lithuania made the biggest advances among the top 20, gaining six and seven places respectively, driven by smaller gender gaps in labour force participation (Gender Gap Index – 14 rank in 2007), but the historical context –conflicting heritages in post totalitarian reality - affect women situation in E & T research. On one hand, relatively high women positions in E&T, declared by national gender equality policy, adoption of European gender equality legislation apparently confront the gender stereotypes entrenched in the academic consciousness, as well as in the consciousness of women themselves at post totalitarian reality.

Really implications of postcolonialism for understanding gender identity in diverse research E&T organizational settings are immense. These discourses are produced both within and by organizations. Gendered cultures have persisted despite a great deal of legislation and

consciousness-raising regarding equal opportunity, suggesting the presence of deeply held assumptions and values which more tacitly guide individual behavior in ways that inhibit change.

Near twenty years Eastern Europe countries were moving from a developed socialism and "planned economy" to a postmodern world and a postmodernist conception of the world and industry. **Public gender equality system became more modern, but private system (family, personel life, work family reconciliation) outstanding is very traditional**. The high figures of women employment in E & T research sphere is the heritage of mentality, attitudes and needs of post socialist (postcolonial, post totalitarian) countries. To achieve unified emancipation, legal equality between men and women was introduced, women were encouraged to work outside the home, to take equality of opportunity in education and private life. The gender equality model through sameness (equal opportunities or equal treatment) in sense, male norms remanded as the standards was used. Traditional equal opportunities policies were limited because they mean that women can only gain equality with men if they are able to perform to the standards set by men. Different arenas of scientific excellence (funding, conferences, publising, prizes, patents) practices that do not ensure compliance, and even allowing for the elements of discrimination against women in engineering research

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