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SHORT PROJECT REPORT

GENDERING OF BOUNDARY WORK IN ENGINEERING

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INTRODUCTION

The project *Gendering of Boundary Work in Engineering* aimed at studying the ways in which the engineering professional knowledge in the German-speaking area is gendered in its *historical developments* as well as in its *current variations*. More theoretically informed, the central research interest can be formulated as follows: how are historical as well as current processes of "boundary work" within engineering, e.g. demarcations of scientific territories, professional practices and images, linked to social understandings of gender. Thus, the project acted on the theoretical assumption that processes of social differentiation like gender differentiation also happen on the level of technological concepts with regard to the epistemic distinctions (boundaries). In accordance with research on the history of German engineering the analysis of gendered boundary work has focused on the historically highly relevant theory/practice distinction.

The project proposed an innovative research concept with respect to at least three aspects: firstly, by focusing on the only rarely studied *'classical' engineering disciplines* such as mechanical engineering or electrical engineering the project investigated an underresearched subject of science and technology studies. Secondly, by focusing on the *epistemic level of engineering knowledge* the project addresses seldomly studied aspects and ways of gendering engineering. Thirdly, the three-folded qualitative research design that combined two longitudinal studies with one cross-sectional study, allowed to capture *longitudinal developments as well as current variations* of the ways the engineering profession is gendered on the level of knowledge.

The project was conducted with the goal of advancing feminist understanding of gendering engineering by focusing on the connection between engineering and masculinity as it is discursively constructed in the field itself. Furthermore, the project's historical and reconstructive approach is employed in order to enhance a more diversified cultural understanding of technology and to de-construct simplified images of 'the' male engineer.

DISCURSIVE CONSTRUCTIONS OF THE MALE ENGINEER IN THE LONG RUN

The *first* longitudinal analysis of "boundary work" in professional debates of German engineering since its 'scientification' in the mid-19th century shows how historically variable understandings of professional engineering that oscillated between an orientation towards theory respectively practice, were created and linked to specific

understandings of masculinity, so as to allow German engineers to compete for a dominant position within the social field of science. For example, engineering scholars composed the ‘scientist of machinery’ as the symbolically neutralized position of objectivity by following a narrative of progress within their writings in the late 19th century. This image of the engineer was followed by the ‘man of action’, whose competences were presented as a gift of the nature of his sex and, thus, proposed a narrative of prehistorical origin of the technological man. The empirical investigation of engineering professional debates upto date shows that the theory/practice distinction not only has been relevant for the constitution of modern engineering at the time of its establishment, but has been of – also gender – relevance throughout the last century and still is today.

Within the context of the ‘scientification’ of German engineering Tanja Paulitz developed an innovative theoretical approach by connecting discourse analysis to practice theory; e.g. in order to study engineers’ professional knowledge from a sociology of knowledge perspective, Foucault’ian discourse analysis has been combined with Bourdieu’s concept of the scientific field and the habitus. Thus, it is suggested to analyze scientific narratives as 'discursive habitus' which can be understood as routinized ‘strategic fictions’ in the context of gendered boundary work (cf. publications of Paulitz in 2012).

Historical Developments of Understanding the Engineering Profession within General Knowledge

The *second* longitudinal analysis of boundary work in society’s general knowledge shows how the establishment of modern technology is the result of a narrowing-process, including multiple shifts, of what is understood as ‘the professional’. In this process practices of craftsmanship and the design of the machine are presented as scientific and become central; alongside, the engineering profession is formed as a masculine associated and civil profession.

Current Constructions of the Implicitly Coded Male Engineering

In a *third*, cross-sectional, analysis diverse areas of engineering at Austrian technical universities were investigated that differed according to their theory- respectively practice-orientation as well as with respect to their disciplinary development being either more traditional or new – more recently established – and innovative. Results show that there are two diverse concepts of the engineering profession that dominate in theory-

respectively practice-oriented areas – the *engineering theorist* and the *engineering generalist*. Both concepts are implicitly coded masculine, e.g. within the context of current gender equality politics these codings remain largely latent and need to be reconstructed analytically. While the engineering theorist reclines to the ideal of the *natural scientist* and is defined by a specific cognitive *interest* that women are said not to have, the engineering generalist draws upon the image of the research *manager* and is defined by the ability of *balancing diverse interests and duties* – an ability which is denied to women when it comes to balancing work and life issues. Thus, the two concepts of the engineering profession can be interpreted as displaying two current engineering masculinities. It is important to note that not only the images of the engineer and the concepts of engineering diverged with respect to theory- respectively practice orientation of the respective areas of engineering, but that also the *ways* in which these images are gendered varied. Our results hint at the fact that these variations in modes of gendering are not arbitrarily, but contingent with respect to epistemic factors of the respective areas of engineering (cf. Paulitz/Prietl 2013). Thus, future research not only will have to further investigate the *different engineering masculinities* within the field of engineering, but also the *diverse modes* of constructing these masculinities.

Engineering and the Construction of Masculinities – Historical Developments and Current Variations

The project provides a detailed reconstruction of the ways the German-speaking engineering profession has been and is gendered at the symbolic level of its professional knowledge. Drawing on empirical results, considering both the historical development of as well as current variations in the engineering profession, it can be argued for deconstructing the stereotypical gendered image of technology and 'the' male engineer on the basis of the engineering professional knowledge itself. Far from a singular male encoding of technology, the project's results show how incoherent, instable and contested the gendered processes of defining what engineering is, have been and still are today and, thus, clearly call for a more heterogeneous cultural understanding of engineering – also regarding the assumedly 'classical' engineering areas that have been the subject of our research. Following from this, the premise of the 'monolithic' image of the male engineer – especially that of the science-oriented rational German engineer – has to be differentiated and turned into the question about different modes of gendering the engineer.

In sum, the project shows, *firstly*, how concepts of the engineering profession *vary depending on the context* in historical as well as in current perspective. Thereby, the theory/practice distinction that has been confirmed to be highly relevant for the establishment of German professional engineering, appears to still be of relevance for configuring the understanding of the engineering subdisciplines today. *Secondly*, our insights hint at the fact that the *complex constructions of masculinity* need to be integrated when thinking about gender and technology. Thereby, not only different engineering masculinities over time and with respect to current variances could be reconstructed, but also different modes of constructing masculinity within engineering discourses. Both have shown *not* to be distributed arbitrarily but in correlation with epistemic factors – especially the theory/practice orientation – of the respective area of engineering. From these insights follows, *thirdly*, that a monolithic idea of 'the' male engineer appears in several ways foreshortened – this needs especially to be underlined for the often oversimplified images of the 'classical' engineer.

SELECTED PUBLICATIONS:

Paulitz, Tanja; Prietl, Bianca, 2013, Spielarten von Männlichkeit in den "Weltbildern" technikwissenschaftlicher Fachgebiete [*title in English: Forms of masculinity in the „world views" of engineering scientific areas*]. In: Informatik-Spektrum. 1-9.

Paulitz, Tanja, 2012a, "Hegemoniale Männlichkeiten" als narrative Distinktionspraxis im Wissenschaftsspiel [*title in English: „Hegemonic masculinities" as narrative practices of distinction in the game of the scientific field*]. In: Österreichische Zeitschrift für Soziologie, Jg. 37, H. 1. 45-64.

Paulitz, Tanja, 2012b, Mann und Maschine. Eine genealogische Wissenssoziologie des Ingenieurs und der modernen Technikwissenschaften, 1850-1930 [*title in English: Man and Machine. A genealogical sociology of knowledge of the engineer and modern engineering from 1850 to 1930*]. Bielefeld: transcript.

Paulitz, Tanja; Prietl, Bianca, 2011, Variable and flexible constructions of gender within German engineering. First outcomes of a long-term discourse analysis. In: Hofstätter & Getzinger (Hrsg.). Proceedings of the 10th Annual IAS-STS Conference on Critical Issues in Science and Technology Studies, 2nd -3rd May 2011. Graz: IFZ Eigenverlag.

SELECTED PRESENTATIONS ON INTERNATIONAL CONFERENCES:

Paulitz, Tanja; Prietl, Bianca: Images of the Engineer and Gender Norms. A Comparative Empirical Study within Austrian Academic Engineering Cultures. Gender and technology workshop, 22.-23. November 2012, Trondheim.

Paulitz, Tanja; Prietl, Bianca: Images of the engineer and gender norms. A comparative empirical study within Austrian academic engineering cultures. INES workshop: Challenges and Responses in Engineering, 15.-16. October 2012, Copenhagen.

Paulitz, Tanja; Kink, Susanne; Prietl, Bianca: Into the wild? Effects of gender equality politics on gender studies ethnographic field work in engineering and scientific educational cultures.

Annual Meeting of the Society for Social Studies of Science (4S), 17.-20. October 2012, Copenhagen.

Paulitz, Tanja; Kink, Susanne; Prietl, Bianca: 'Dealing with ‘neutrality’: a methodological approach to the analysis of implicit gender norms. International Workshop on “Gender & Technology: New Theoretical Perspectives”; 20.-21. June 2011, Graz.

Paulitz, Tanja; Fürst, Saskia; Prietl, Bianca: The Gendering of Knowledge in Engineering: Conceptions of the 'Ideal Engineer' in the Course of a Professional Project. Conference: “Gendered Ways of Knowing? Gender, Natural Sciences and Humanities”, 1.-4. December 2010, Trento.

Paulitz, Tanja; Fürst, Saskia: The Gender of the Theory/Practice Boundary: "Boundary Work" in Historical and Current Concepts of German Engineering. Annual Meeting, Society for Social Studies of Science (4S), 25.-29. August 2010, Tokyo.