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The Sole Engineering Genius: A Professional Identity Not Fit for the Purpose of Gender Equality Projects

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ABSTRACT
Despite decades of directed efforts gender equality is still a challenge in many university level STEM institutions. Key reasons for this are found in disciplinary and institutional cultures. A crucial cultural element is professional identity. In this article, an ethnographic study of a gender equality program in a technical university in Sweden underpins the identification of a professional identity that we name: the 'sole engineering genius'. This cultural figure displays features that run counter to measures promoting gender equality. As a component of engineering faculty's self-perception as well as views of others, this figure provides rationales for rejecting the changes required to end gender inequality. Against the backdrop of research literature, we argue that this professional identity is not a local or national phenomenon, but likely a key factor in academic engineering culture transnationally that may continue to undermine gender equality strategies in STEM institutions.

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Introduction

European and US universities have carried out numerous gender equality projects to address the underrepresentation and marginalization of women in STEM (Science, Technology, Engineering, Mathematics) subjects in recent decades. Educational institutions are important for gender equality in science in technology more widely because they have a normative role in relation to students Faculty in technical universities and STEM departments reproduce the professional culture into which students are assimilated. Their explicit role as educator and role model also sets engineers working in academia apart from engineers active in other fields, such as industry or the public sector.

However, gender equality projects in STEM education appear to have limited impacts and rarely achieve long-term change. Studies aiming to explain the obduracy of gender inequality in the face of concerted efforts predominantly focus on cultural aspects in the institution to be changed. These cultural factors are primarily understood to be inherent in the organizations in which projects are undertaken For example, Bettina Casad et al., point to '(a) numeric underrepresentation and stereotypes, (b) lack of supportive social networks, and (c) chilly academic climates'.[1] Consequently, efforts to accomplish change focus

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on identifying actions that could overcome the cultural barriers raised by the institution that the projects intend to change. In our view, this approach does not address in sufficient depth the reasons for the widespread failure of gender equality projects to achieve desired impacts. It is necessary to also look at how cultural factors permeate gender equality projects. Critical analysis of the projects in themselves, as insider-driven activities aiming to create institutional change, is necessary. In this article, we offer one approach based on an ethnographic study of a current gender equality project in a Swedish technical university. As common with such projects, this was an effort to create change from the inside, that is, by involving established high-ranking faculty members with excellent academic credentials. Project leadership presented it to the rest of the university as an insider-led, 'bottom-up' effort to address a persistent problem with gender inequality in the organization.

The idea that change should come from within, implemented by people who are familiar with the institution and have demonstrated their commitment to it, directs our interest to aspects of culture that promote belonging and loyalty, professional identity in particular. Hence, this analysis focuses on STEM professional identity in relation to gender equality work. The question we address is how the professional identity of academic engineers could undermine gender equality projects.

Recent research on STEM professional identity mostly focuses on the US.[2] In contrast this article contributes a perspective from Sweden and Northwestern Europe. The gender inequality of Swedish STEM culture is particularly interesting since Sweden has been heralded as the most gender equal country in the world.[3] Gender equality efforts have been implemented by political decrees for several decades across all educational institutions but with limited impact in technical universities and engineering education.

In the following, we first review relevant literature on gender equality projects and professional identity in STEM educational institutions at the tertiary level. Then the methods generating the materials underpinning the analysis are outlined. After this follows a section with empirical findings from the case study and a conceptualization of the professional identity that we discern in the case study. In the discussion, we argue that the assimilation to a professional identity dominated by a figuration that we call the 'sole engineering genius' (SEG) undercuts the ability of insider initiatives to change unequal cultures. The ways in which meritocracy and politics are rendered through SEG prevent interventions that could effectively lead to more gender equal cultures in STEM institutions.

Gender equality projects and STEM culture

Male dominance persists in STEM at the university level despite gender equality projects taking place for decades. Three cultural explanations for this persistence that acknowledge the complex entanglements of projects and surrounding institutions are especially relevant for the present study. First, Wendy Faulkner argues that the limited impact of gender equality projects results from their failure to address more 'subtle inclusion and exclusion dynamics' instead of accepting masculinity as the norm.[4] This is expressed, for example, in beliefs that women bring something special like 'people skills' and 'different leadership styles'.[5] Marieke Van den Brink and Yvonne Benschop explain that although such 'feminine skills' can be emphasized as important and useful for the academic environment in recruitment efforts, they are often less appreciated in the assessment of qualifications and support the image of a scientist, in general, being a man.[6]

The second explanation highlights meritocracy, a firmly established cultural value in academia. Erin Cech discusses how the investment in meritocracy in engineering cultures hinders social justice efforts which are perceived as political and thus a threat.[7] Faculty in STEM academia thus view insider-led projects for social justice, cultural change, or gender equality as less threatening to the status quo than initiatives that can be cast as interference from the outside. Cech and Mary Blair-Loy further argue that valuing meritocracy also provides moral justification for one's own success, regardless of gender. They suggest that successful women within the system could be very invested in meritocracy as their personal experience proves that merit is rewarded. Other women's exclusion can be attributed to an individual lack of qualifications if, for example, none of the women candidates to a position are recruited, or to a lack of qualified individuals if few women apply.[8] This suggests that women in STEM who are invested in meritocracy would also resist changes that appear political and threatening to the meritocratic system.

A third explanation for the lack of impact of gender equality projects is offered by Hannelore Roos et al., who found a tendency to downplay both the responsibility for and the possibility of change in their analysis of Gender Action Plans at Flemish universities.[9] While the plans recognized gender inequality, there was a 'diminution of academic managers' responsibility for them. Roos et al., argue that regardless of intentions to effect change, gender equality programs have limited impacts because people with formal decision-making authority in the organizations involved in the projects do not believe themselves to be able to exercise the power needed to accomplish change.[10] Formal authority is not seen to hold sway in meritocratic academia and management roles do not confer the power to change the organizational culture.

These three explanations for the failure of gender equality projects to bring about change in STEM institutions recognize the cultural embeddedness of such projects. The complementary explanations capture different aspects of STEM culture that prevent the success of gender equality efforts, and they provide a frame to conduct in-depth analysis of self-defeating cultural elements in gender equality projects construed as insider undertakings. This approach to cultural factors that impede gender equality in STEM academia directs attention to professional identity as an aspect of culture that makes it possible to distinguish between insiders and outsiders.

Professional identity is acquired over time. Herminia Ibarra details how young professionals (including students) in investment banking and management consultancy in the United States find role models and experiment with acceptable behaviors to develop a sense of professional self.[11] Ibarra argues that individuals adapt to the surrounding culture when creating identities congruent with professional ideals.[12] Transposed to STEM education, this approach positions faculty and older students as role models, especially if one's goal is to continue as a researcher. Social practices such as the immersive campus experience – classes during the day, partying, shared housing, and studying together at night – would contribute to the sense of belonging to a collective.

There are also negative aspects of the acquisition of professional identity. Lotte Baylin's studies at Massachusetts Institute of Technology in the late 1990s and early 2000s illuminate the pressure of trying to become the ideal academic – an expert who is always 'on', and for whom mentorship or asking for help is considered impossible.[13] Baylin questions the accepted ideal of natural scientists and engineers as being assertive, competitive, and single-minded experts – all unfavorable – qualities when demonstrated by women and

other marginalized groups.[14] More recently Rachel Friedensen et al.'s analysis of an engineering department in the USA finds that the ideal engineer is constructed there as being open to working with people from other cultures and being 'diversity oriented' but not as representing those 'diverse' groups themselves.[15] In this cultural context those ascribed the status of 'other' are not imagined to be engineering faculty. Stephen Secules conceptualizes this as being an 'identity-blind' narrative that considers the underrepresentation of women and people of color to be a new problem in need of solving.[16] The identities incompatible with STEM appear as aberrations in a context where the assimilated insiders consider identity irrelevant, since it was not previously raised as an issue. This view becomes more problematic when coupled with the belief that the underrepresented groups lack skill and interest in engineering.

Studies of young engineering professionals and students highlight the cultural journey toward what Cech terms 'depoliticized' engineers committed to meritocracy.[17] Kristen Myers, Courtney Gallaher, and Shannon McCarragher studied engineering undergraduates of all genders and discussed what they call 'STEMinism' – a way of imagining gender equality or feminism without a structural understanding of power.[18] STEMinism emphasizes individualism and meritocracy as modes of empowerment, usurping structural power changes. This 'flavor' of feminism contributes to the perpetuation of sexism and bias by framing occurrences as isolated incidents and embrace the exceptionalism perspective with women in engineering explaining their own role within the meritocratic value system. Doerr et al., also show how young women in engineering workplaces invest in meritocracy and draw on it to explain the 'different treatment' they received.[19] The interviewees cited junior status or quality of work as the main determinant for being treated differently from the men in the organizational hierarchy. One informant suggested that engineering 'transcends cultural boundaries' thus aligning with an 'engineer first' identity model where other aspects of identity are irrelevant because only the quality of one's work matters for status in the community.[20]

Kacey Beddoes illuminates how an investment in meritocracy among academic staff in engineering underpins a dismissal of cultural perspectives on gender. Her interviewees avoided talking about women as a group, focusing instead on 'personality' and 'individuals' among their students. Interviewees only used their students or 'a statistically significant sample size' as points of reference and disregarded other methods of finding out about the experiences of women in engineering, such as the interpretative approaches of qualitative social science.[21] Social science was thought to 'politicize' the issue of gender equality. Investigating how women in engineering de-politicized engineering culture and separated between purported objective engineering and alleged subjective social studies Carroll Seron et al., found that a 'diversity-quality trade-off' was accepted as an explanation for women's underrepresentation.[22] The interviewees believed that more diversity meant admitting lower quality students. This way of reasoning utilizes both exceptionalism and gender essentialism, that is, the women who are there have skills that other women lack, or they work harder. The interviewees in Seron et al.'s study viewed affirmative action, quotas, or attempts to change engineering cultures as risking the quality of engineers, uprooting meritocratic values, and questioning the legitimacy of existing members of the profession.[23]

The commitment to meritocracy as the key factor legitimizing inclusion in the professional culture can combine with an 'anti-bureaucratic' stance. Wendy Roth and Gerhard

Sonnert found that STEM academics understood themselves as set apart from other university staff.[24] They studied an organization in which informal structures, word of mouth, and being in touch with the right people were both keys to success and detrimental to women and minoritized groups: 'The emphasis on deal-making, rather than on strictly adhering to formal policies, allows the organization and its high-level employees to act freely in their best interests.'[25]

In Sweden, the traits of the professional identity of engineers discussed so far combine with high social status. Swedish civil engineers have historically been part of the intellectual and industrial elite. A historical study of the role of civil engineers' role in creating prosperous industries in a previously agricultural society during the late 1890s into the 1910s notes the high status of the profession: 'To many contemporaries, and indeed many subsequent generations, engineers were the heroes of industrial expansion and the modernization of society'.[26] In the late 1920s engineers engaged in branding with a claim to be 'free' professionals, despite being wageworkers, the strategy worked and gained them higher status compared to their peers in the US, Germany, and the UK.[27] The civil engineer as a heroic figure lived on in Sweden into the 1990s and Boel Berner suggests that this professions' high status will survive into the future if the image is made to embrace entrepreneurial skills. The idea of engineering as an elevated profession to which entry is regulated by meritocracy makes change very challenging. Still, some members of this culture continue to embark on gender equality projects aiming to change institutions from within which is what this study focuses on.

The extensive research literature clarifies the challenges of achieving gender equality in STEM academia through projects run by STEM academics. The cultural belonging, which appears advantageous by circumventing the potential of conflict over outside intervention, entails elements that reproduce values and assumptions about gender and engineering that contravenes change. While there is a well-developed general understanding of the cultural perpetuation of gender inequality the knowledge about how it operates in gender equality projects pursued by insiders is limited. Hence the question addressed in the present article: How does the professional identity of engineering academics undermine insider gender equality projects?

Understanding professional identity as a cultural figure that individuals relate to in complex ways, we address this question through an ethnographic study of a gender equality project at a technical university in Sweden.

Methods

The materials underpinning this article were generated by the lead author who followed the Scandi Tech gender equality project in a manner common in organizational ethnography, doing ethnography, interviews, and collecting documents during its first year 2019–2020.[28] Throughout this period the lead author was a participant observer at weekly and fortnightly meetings with the project management team.[29] They also attended several meetings with the project Advisory Board and the Steering Group over the year. In addition, they conducted participant observation during some of the open meetings that the project arranged for university staff. On all occasions, they took extensive field notes.[30]

From September 2019 until March 2020 meetings were held on the Scandi Tech campus and attended in person. From March 2020 all gatherings at the university were conducted

remotely, on video conferencing platforms, due to the restrictions implemented to counter the COVID-19 pandemic and participant observation was conducted digitally. The digital meetings were organized in the same way as the in-person meetings, with the same individuals present and identical agenda formats, 'small talk' and informal discussions also continued in virtual meetings. The shift to videoconferencing did not significantly impact the meeting organization and format, which means that the data collected in the two contexts are comparable.

The lead author conducted semi-structured interviews with two of the five people in the project management team in early 2020.[31] The interviews focused on reflection on the first year of the project, its motivation and their own role. The lead author transcribed the recorded interviews and discussions between the authors initiated preliminary interpretations. All research participants have been assigned pseudonyms to protect confidentiality.[32]

Throughout the research, the lead author had access to meeting minutes and working documents. They also got permission to access relevant data from the university's annual employee survey (conducted by the Human Resources department). This survey includes questions about gender equality efforts at the university and allows for free text answers that were analyzed as documents.[33] The free text question asked employees to give feedback on the university's gender equality efforts.

The different materials (field notes, actor-generated documents, and interview transcripts) were organized and analyzed with support of the NVivo software for qualitative data analysis.[34] The lead author created nodes of 'insider' concepts used by informants and their own metanarratives related to theory, certain people, or themes. This generated a searchable archive with themed nodes of different levels of abstraction and concretization. This resulting timeline of what was discussed and in which context, noted which actor introduced a concept and when. The lead author's introduction of concepts to participants and in the analytical process was also noted, which enhances reflexivity regarding the ethnographer's interactions and interventions. Collaborative analysis by both authors generated the insights communicated in this article.

The case study: a university with a long-lived problem with gender equality

Gender equality is an issue that has been addressed at Scandi Tech since the 1980s in numerous projects, most of which have focused on increasing the number of women students in the undergraduate programs.[35] One well-documented effort was a computer science project in the early 1990s aiming to increase the number of women students by changing the curriculum toward a more 'human' and 'society' focus and by emphasizing technology applications.[36] This project was instigated in response to a government proposal to recruit more women to STEM and it was funded by the national Higher Education Board. Minna Salminen-Karlsson's study of the project identifies the same issues as discussed in the social science literature on gender equality projects in STEM education internationally: challenges included subtle exclusion dynamics later discussed by Faulkner and a lack of critical analysis of the established culture and challenges.[37]

Subsequent gender equality efforts at Scandi Tech continued to focus on the recruitment of women to the engineering undergraduate programs. A 2008 investigation of recruitment initiatives in several undergraduate programs at the university discussed the

drivers and assumptions of these efforts. The social scientist who produced an internal report found that all projects assumed that girls and young women chose to not study engineering and technology because they 'had the wrong idea' about the subject. This belief was fortified by the conviction that the existing educational programs and the campus culture were 'all good'. In 2018, a new recruitment effort was launched with the aim of attracting high school girls (and later non-binary people) to the university. Workshops with computer coding activities and face-to-face interaction with enrolled students and alumni were arranged, exclusively for these categories of people, to show that the university was an inclusive environment. Since 2016 there has also been a gender mainstreaming program for faculty, with the explicit objective to create a gender equal work environment. It was introduced in response to national Swedish policy for a gender equal academia and implemented by the HR department. It started as a four-year project and has continued since then.

That attempts to improve the gender equality at the university have had limited effects was highlighted in 2017 when a collection of #Metoo stories among students and faculty, and a student survey, revealed that many students had experienced abuse and harassment on campus. This prompted a three-year project against sexism. A 2019 report on gender equality and representation at Swedish universities documented the lack of success of the projects aiming to increase the number of women at Scandi Tech was established. Scandi Tech was found to have the lowest representation of women in higher faculty positions in Sweden. As it became clear to the university leadership that scattered efforts focused on student recruitment had not resulted in an equal number of women and men at all levels across the organization, they initiated a longer term project centered on faculty.

The 40 Percent Project

Scandi Tech launched a new gender equality project in 2019 with two main goals: to 'identify and eliminate structural and cultural barriers that impede women's careers', and to recruit women scientists.[38] A quantitative objective was set: to raise the number of women professors to 40% over the 10-year project period.

The 40 Percent Project was perceived as a 'bottom up' initiative, created through an internal competition that the university president described as follows [39]:

> The project was launched as a result of an internal process at the university aiming at identifying and launching a small number of long-term projects with the goal of strengthening the academic activities at the university. Ideas for projects were identified bottom-up in an open process where staff and students proposed ideas. Internal committees, including the faculty senate and the student union brought a selection of the ideas to the president and the president made a further selection resulting in a proposal to the university board to decide on a very limited number of projects.[40]

The project's origin in faculty proposals has been highlighted as a strength, providing it with the potential to act on different organizational levels, with a direct connection to the university president and department heads.

The project management team comprises two leaders, both professors in different departments; two representatives of the Heads of Departments (one from an engineering department and one in basic science); a project coordinator and representatives of human resources, communications, and finance.[41] The leaders, the project coordinator, and two of

the representatives are women, while the two Heads of Departments and one representative are men. In this article, the interviewed members of the project management team are given the pseudonyms Lisa and Sara. The management team reports to the project steering group, headed by the university president. An external advisory board assembles annually for a meeting with the management team. The advisory board includes two representatives from industry (engineering) and three from academia (one gender scholar, the others from medicine and basic science). One advisory board member is quoted in this article under the pseudonym, Magnus, who is a representative from industry and alumnus of Scandi tech. A social scientist, Ida, is given a pseudonym to clarify the exchange between her and the project management group.

The current project differs from previous gender equality projects at Scandi Tech by being led by academic faculty rather than administrative staff. However, the legally mandated gender equality and gender mainstreaming work remains the responsibility of the employer and is carried out by the Human Resources division. Also, in contrast with previous projects, the 40 Percent Project has the dual aim of increasing the number of women faculty and initiating cultural change. Previous projects did not address cultural change explicitly although cultural factors were viewed as barriers to change. The 40 Percent Project management team presents it as a novel approach to Scandi Tech's persistent gender equality problem to faculty and the public. When the project started the university leadership and the project management team announced a new dawn for the university culture and described it as a driver for change.

'A catalyst for change'

> Lisa: Society is moving slowly towards something better, but we have to kickstart it![42]

Conceiving of the 40 Percent Project as a kickstart for change is a recurring view, and it is described in project plans and other texts as a 'catalyst for change'. The project agenda is ambitious with the goals including: to catalyze change, to offer feedback, to influence the whole university, and to involve the majority of faculty. The project is expected to bring together a heterogeneous university in a shared mission to change an established culture that, historically, has withstood such change. The project management team expresses a desire to bring people together through the gender equality agenda of the project, but they are not clear on who to involve.

The management team insists that the project's gender equality vision must be adopted by all departments and divisions at the university. They view the representatives of the project and the Heads of Departments as the primary agents for this cultural change. However, the project management group also emphasize that that a strength of the 40 Percent Project is that it is not a part of the university line management. In this context line managers and Heads of Departments are described as 'being involved' and 'providing feedback', but the project is 'owned' by the faculty as a collective.

The constitution of the project in the faculty has implications for the experts invited by the management team. In a presentation of the project in one of the first open meetings with faculty Lisa said, almost apologetically: 'We are all from the natural sciences … Gender studies is more 'soft' and social sciences.'[43]

This quote invokes the opposition of soft and hard sciences in a way that relates to the audience and their assumed experiences. It is not an outright denigration of the field of

gender studies but rather a legitimization of the project to an audience presumed to be engineers (it was a mixed group of researchers and support staff). The project management team explained that they considered commissioning a social scientist on a consultancy basis in response to an audience suggestion to hire a social scientist to work in the project. Defensively departments were recommended to hire their own social scientists if they saw a need.

An important demarcation made by the project management team is against that which academic engineers perceive as political. As Magnus, the advisory board member representing industry stated, 'Metrics are science, otherwise you're activists. (…) Make it less activist.'[44] Here, the assumption of engineering culture being apolitical is brought to light.[45] The work that the project is doing is interpreted by Magnus as risking to become activism. Here Magnus voices criticism from faculty members and the popular press for politicizing academia and violating meritocracy.[46] The project management team eschewed this criticism by avoiding that which is perceived as political in STEM culture. Instead, they used metrics to legitimize gender equality action in the university, distinguishing the project's efforts from that of 'political activists', that is, actions perceived to be foreign to academic meritocracy, overtly political, or detached from accepted measures.[47] To rely on metrics to justify action is seen as apolitical, the antithesis to political gender activism. In this narrative numbers do not lie, and the plan of action is clear, change those metrics for the desired result, however, this disregards the ambition to bring about cultural change.

In project management meetings, actions targeting cultural aspects were called 'cheap' in comparison with recruiting top women scientists. Yet culture was also seen as a challenge, and some in the management team felt questioned by other engineering colleagues for lacking expertise on gender equality and culture. In a discussion with the project management team, Ida, an invited social scientist from Scandi Tech, emphasized that the everyday work with gender equality cannot be replaced by 'happenings' or recruitment drives. Later in the conversation, when Ida asked what kind of change the team wanted, two members answered that they wanted long-term cultural change. Ida then asked if they had the tools for analyzing long-term cultural change and one member answered that they would bring in expertise when needed. Ida suggested bringing such expertise into everyday decision-making, which the project team met with: '[we] make sure that there is initial action,' referring to hiring female faculty and talking about cultural change.[48] Earlier in the discussion Ida had named a social scientist with appropriate experience as a consultant for the project, the project management group rejected this because one of them said they had read one of her books without much to take away. One member of the project management group stated: 'Who listens to a social scientist at Scandi Tech?'[49] The project management group does not believe that the faculty will listen to social scientists, hence, social science and gender studies only play a marginal role in the strategy and activities of the project.

A recurring message in published materials and formal presentations of the project is that cultural change cannot be ordered, and no one can be forced to enact change. Hence, to encourage the desired change project actions have focused on positive encouragement through financial rewards such as issuing a call for internal bids for projects related to gender equality and awarding every department two million SEK to support gender equality activities; collecting statistical data; and supporting recruitment of women faculty.

While the need for change is clear to the university leadership, the project advisory board, and the project management team they assume that the rest of the university does

not understand this need. Hence, the justification for the gender equality activities proposed by the project was extensively discussed in the beginning of the project. An example from a meeting with the advisory board:

> Magnus: Why is a big thing, I guess you've read the books on change management. If you don't have the burning platform you have nothing, you need a threat. Why do you need the change?
>
> Sara: Sustainability. You need facts.
>
> Magnus: No, that's not making me interested.
>
> Sara: What do you think, what do you want us to say?[50]

In the quoted conversation, alumnus and advisory board member Magnus asked project management member Sara about the 'why' of the project. The question concerned how they were going to pitch or sell it to faculty members across the university. Magnus voiced the idea that university faculty need a threat to change. The assumption that a sense of threat is necessary to make faculty members interested in change contrasts with the notion of change as an inevitable historical process, also voiced by project team members. The latter argument, that the university will not survive in the long-term if it does not move toward gender equality and that it will fail to attract available talent, was used by the project management team in presentations.

The idea that coming generations will not accept the current culture and that industry needs more women (and 'gender aware' men) underpins the project. One expression of this conception is the reference made to the #Metoo movement and the ensuing public debate, as preceding the project in a direct lineage.[51] #Metoo has also been brought up when the ethnographer has suggested that some project initiatives mimic failed efforts of the 1990s as 'the time is right now', after #Metoo.[52] While the notion of inevitable historical progress would imply that change would occur without any effort, the idea is that the project is needed to prompt the university into action. However, as this section has shown, the project management team and the university leadership did not have a clear understanding of how to bring about cultural change when the project commenced. They were also committed to a valuation system that prevented them from taking on board advice from social scientists and gender scholars.

Obstacles anticipated by the project team

The 40 Percent Project management team identified some key obstacles to change. The two most important to them were: the lack of authoritative leadership in the university organization and the perception of gender equality measures as undermining meritocracy.

Regarding ineffective leaders, the project team believes that Scandi Tech and other universities underperform in comparison with private business. They think that companies and industry are able to implement change efficiently whereas academia is slow moving. When discussing the differences casually one project member described it as: '… Trying to change a university is like trying to move a graveyard.'[53] The university system and culture are viewed as static and resistant to change. Project team members believe that the profit-making objective in industry allows leaders more power over employee education and to enforce a defined company culture.

The team does not articulate this problem as a lack of formal authority but as individual shortcomings. They explain it with a lack of mandatory courses in leadership and gender equality for professors and senior staff in line management roles:

> We run into it all the time, we can't. We can give ideas on how we think things should change but no one is enforcing it. And I don't know if we have the mandate to do it either, we can't demand that department heads should attend more leadership courses. And that all heads of units should do something else, it would have been so much easier.[54]

The project team thinks that the lack of effective leadership is exacerbated by low cultural cohesion among faculty. They view the funding system as a cause, in the university sector, faculty members bring in their own funding to use in research projects that they have created as individuals (often in collaboration with colleagues outside of their own workplace). The issues of leaders lacking authority and low cultural cohesion are seen by the team as issues specific to academia.

The second major obstacle identified by the project team is that the project has been reviled for undermining meritocracy, in negative media coverage and negative attitudes among faculty. When the 40 Percent Project launched heated media debate ensued, claims were made that it was an example of 'gender ideology', a quota project, and a politicization of Swedish universities. Alumnae and faculty echoed such views alleging that the project threatened meritocracy and that the desired number of 40 percent women faculty was arbitrary. This was again repeated in the free text answers of the employee survey during the first year of the project when some respondents claimed it was biased against men and there were warnings against future maltreatment of women hired through to the project.[55] Countering this barrage the management team stressed that the project contributed positively to meritocratic culture by creating a gender equal intellectual environment at the university where everyone can excel.[56] A counter argument that is both strategic and founded on a belief in a better academic environment with the recruitment of more women.

Obstacles invisible to insiders: the professional identity of the sole engineering genius

In the previous section, we examined the 40 Percent Project's diagnosis of the problem of gender equality at Scandi Tech. Next, we turn the inquisitive gaze to the project itself to examine the complexity of insider-driven organizational change. The university leadership and the project team stressed the benefits of having Scandi Tech insiders in the lead for bringing about change, anchoring its ambitions among faculty members. However, the literature review indicated that it could be challenging for insiders to discern cultural barriers to change in their organization.[57] Professional identity has been recognized as a particularly important aspect of becoming and remaining an insider in organizations for decades.[58] We focus on it as a cultural aspect that the 40 Percent Project management team shares with their colleagues in the rest of Scandi Tech that can render barriers to gender equality in the organization's culture invisible to them.

As we saw in the literature review, developing a professional identity is a process that often begins at the time of undergraduate education and continues into the stabilization of a professional career. Interviews with the core members driving the 40 Percent Project at

Scandi Tech shed light on how they appropriated relevant aspects of a shared professional identity over time and felt at home in the technical university.

For the project team members we interviewed becoming part of engineering culture was a positive experience. Sara told the lead author about the shift from being a 'nerdy' natural sciences teen to being included in the student body as a great experience. Starting as a 'zero' in the weeks before the first term the partying and the humorous initiation rituals brought her into a community where she was appreciated for those previously denigrated (nerdy) traits. Decades later she sounded happy when discussing it and acknowledged that this bonding and was something to hold on to in life.[59] Sherry Turkle's account of the emergent hacker culture at MIT hints at something analogous, being appreciated for what you were once ridiculed for.[60] At Scandi Tech a culturally sanctioned competitiveness among engineering students strengthens the narrative of revenge, ironically turning your perceived shortcomings into being powerful and a winner in life.

The experience of Sara, a woman STEM faculty member in the project management team resonates with the literature showing that cultural assimilation into the male-dominated, masculine-coded culture is an imperative for all students, women and men.[61] The literature suggests that when successfully assimilated (or socialized), minoritized groups contribute to the conservation of the dominant culture rather than challenge it. Considering that the successful recruitment of more women in historical gender equality projects have not resulted in a more gender equal faculty at Scandi Tech, the assimilation process should be investigated as barrier to change. The assimilation could, as Doerr et al. suggest, maintain gender divisions.[62] With this in mind we turn to examine three aspects of the professional identity which run counter to the explicit goal of changing the institution in ways that make it gender equal and inclusive.

The three aspects we could discern can also be thought of as three traits comprising a cultural figure assembling as 'the Sole Engineering Genius (SEG)'. These traits are (i) a fierce individualism that we label 'the sole individual'; (ii) a belief that engineering holds the top position in a hierarchy of academic subjects, which we name 'Engineering as necessary and sufficient expertise'; and (iii) an ability to create novel solutions, which we tag 'superior intellectual ability'. Each aspect can have positive and negative expressions when considered from the perspective of the gender equality project, but in our view, even the traits perceived as positive by the project management team simultaneously tend to undermine the project aims. In the following, we illuminate each trait in the context of the 40 Percent Project.

The sole individual

Discussing her experiences as a STEM doctoral student at a different university, Lisa emphasized that teamwork was frowned upon, and competition encouraged:

> Lisa: The part of academia where I grew up is terribly individualistic and competitive. And that's fun if everything goes well, but when it's bad to what use? [63]

Lisa's experience as a cultural outsider to Scandi Tech means that she can compare the different local STEM cultures with the strong engineering identity at Scandi Tech, identifying traits and similarities that become visible with distance. The focus on individual performance surfaced as a negative in the project team's discussions about how difficult it is to

change the culture. In this context, it was seen as a problem that faculty members did not consider themselves as belonging to a group. This was echoed in public appearances at which team members argued that collaboration is the antithesis to an unequal culture and highlighted a more positive group identity as a faculty 'we' in the project.

The individualism permeates the organization as illustrated by an exchange that took place in a conversation between the lead author and one project team member:

> Lead author: Imagine being a man high up in the hierarchy and you're not used to anyone making decisions for you or telling you what to do.
>
> Team member: Yeah exactly … There are those who see themselves as not having a superior. I mean a professor like me, or a man like me. A manager, head of department or the university President have nothing to do with my work. I can do what I want with my students or research.

Before this exchange, individualism had been discussed as connected to the academic financial procedures and the team member explained that: 'It's I who writes the articles and brings in the funding, I have to be good, but I can do what I want'. They viewed this as both a positive freedom and a risk of bad behavior.

The competitive individualism was also expressed in relation to the project team as a collective, in a discussion of the possibility for the 40 Percent Project to collaborate with other Swedish universities on gender equality efforts, a team member negative to this said: 'We want to dominate'.[64]

Individualism underpins ideas about weak leadership and lack of leadership education that were understood as obstacles to change. At the same time, a belief in individuals' ability to change the situation reinforces the project's ambition to recruit top women scientists. There is a tension between the individualist focus of the culture, the ambitions of cultural change, and of seeing women as a disadvantaged group.

Engineering as necessary and sufficient expertise

A core feature of the Sole Engineering Genius cultural figure is a belief that engineering tops academic and organizational hierarchies This was visible in the way the academic faculty members in the 40 Percent Project related to the administrative, Human Resources (HR) department. Interviewed faculty in the project explained that working overtly with HR could jeopardize the credibility of the project among faculty because HR is not an actor that faculty listens to and therefore their involvement could muddy the waters for the project.[65] A clear line is drawn between the politically mandated gender mainstreaming in the organization that is led by HR and the activities of the faculty initiated and led project. Interviewees see their role as showing that 'We' the faculty are doing this and it is therefore legitimate in contrast to other efforts. The interviewee referred to above indicated, and external project communication suggests, that the disconnection is done strategically for legibility to other engineering faculty. The separation can also be viewed as gatekeeping for a meritocratic culture, the 'non-engineers' are not a part of the trusted network of academics. This separation from the regular HR-led gender equality work was a point of criticism of the project articulated in the university's employee survey. The funding disparities were seen as particularly jarring, as the 40 Percent Project multimillion budget vastly surpasses that of the HR led mainstreaming.[66]

An anti-bureaucracy attitude underlies the distancing of the project from HR by the engineering faculty in the project team. In a project team meeting a legal concern raised by HR

about an idea being on the edge of the law was answered with: 'We want to be on the edge, but the right side of the edge'.[67] The engineering faculty think that HR and line management restrain inventiveness with rules and regulations, the law is a dampener on fast action.

The commitment to an organizational hierarchy with academic engineers closest to the top is visible in the way the project was created in a process mirroring competitive bidding for research funding, as if the operational support and administrative staff are not relevant for the ambition to achieve gender equality in the university. Starting a long-term gender equality effort without embedding it in the organization and explicating what commitment is required by line managers, such as heads of department, also expresses an anti-bureaucratic stance.

Another expression of the assumed superiority of engineering is the selection of experts called upon by the project for support. From the beginning, a fellow STEM scientist was the main advisor on how to structure the project, in 2020 the project team consulted with a gender studies scholar already involved as a member of the advisory board. When the project team discussed commissioning a cultural consultant, the applicant's engineering background and knowledge of the university were viewed as favorable, despite a lack of formal education in organizational studies or social science. One project member described the consultant as working in a 'systematic' way with culture which appeals to their engineering identities.[68] The favoring of STEM backgrounds of the experts supporting the work of addressing gender inequality through cultural change demonstrates what the project management team considered legitimate expertise.

Superior intellectual ability

The third key aspect of this professional identity is a presumed superior ability to think rationally and deal with solvable problems. The intellectual ability of the engineer is on the one side bounded by the figure of the mad genius, and on the other by the soft, emotional, non-rational character, historically construed as feminine. The 'mad genius' aspect of the professional identity is reproduced in academic engineering culture in a way that indulges individuals behaving in ways that would otherwise be deemed unacceptable. Such behaviors draw on both the cult of the rational individual and on the mad genius who is allowed to say and do things that are highly offensive. Not knowing or caring about social cues is viewed as an indicator of a brilliant mind.

The concept of 'mad genius' was introduced by an interviewee reflecting on the project's role in relation to the popular stereotype of the 'mad scientist' which she viewed as a problem.

> Lisa: Very often you allow too much because you trust the 'mad scientist', you come up with something great and there can be a lot of negligence along the way. (…) Can we come in there and sort it out? And in a way that's what we're supposed to do.[69]

Lisa sees the tolerance for negligence (social, scientific, and cultural) in the name of 'genius' in combination with the archetype of the 'mad scientist' as a cause of gender inequality. In the latter part of the quote, Lisa expresses apprehension about 'sorting it out', indicating that a disproportional responsibility is placed upon the project to accomplish change. To her the idea of 'superior' intellect is negative.

The rational engineer identification is also cast as positive for gender equality, allowing women engineering faculty to set themselves apart from other women by having taken a step into a different realm. The two interviewees from the project management group described the journey through their STEM education as proving themselves to other students and senior faculty either by succeeding scientifically or by downing the most beers at parties. Sara explained that some women who stay in academia adapt to be tough and support power structures to survive: 'You kind of have to play the same game'.[70] Women notice the laddish culture among students and the old boys' clubs among faculty because they have not been assimilated into those spaces. That they can play the game makes them cultural insiders while they still recognize that the hierarchy favors men. This awareness does not prevent them from seeing themselves, or from being seen as, insiders in academic engineering culture.

Discussion

In this ethnographic study of an ongoing gender equality initiative in a technical university, we identified some of the more subtle aspects of academic engineering cultures that Faulkner indicates as obstructing change of the gender imbalance in engineering.[71] Focusing on institutional culture in academic engineering we discern a shared professional identity (a cultural figure) among faculty members across Scandi Tech that undermines the objectives of the 40 Percent Project. This cultural figure, that we call the Sole Engineering Genius, naturalizes the current order, making it inconceivable to do things differently to promote gender equality. This subtle aspect of academic engineering culture in Sweden underpins the belief that the cultural change needed to achieve gender equality must be devoid of political or ideological connotations.

As such the 40 Percent Project challenges the image of the institutional culture being apolitical and meritocratic thus creating reactions from employees, media, and alumnae. This resonates with Cech's suggestion that engineering identities connecting the ideals of apolitical-ness and meritocracy with the actual institution make any change associated with increased social justice impossible.[72] The study also illuminates how strong leadership can be understood as the key to change even in a 'bottom up' initiative.

Widening the scope from the Scandi Tech project to consider the Sole Engineering Genius as a phenomenon affecting academic engineering cultures in Sweden and beyond we note that the figure of the engineer and scientist in academia as anti-bureaucratic and achieving greatness through being unmoored by regulations, has been found to legitimize informal structures and procedures, which work against the organization housing them.[73] The use of projects as agents of change, be they long-term or not, can be seen as anti-bureaucratic. Rather than working within already existing structures, it creates a new organization and assumes that they will work toward common goals.[74] When the transformation of an organization is led by insiders who understand themselves as partly operating outside of the formal rules of the institution the ability to effect enduring change is severely curtailed. Additionally, the benefit of being an insider when advocating change is nullified if insider status comes with the rejection of the injustice that is to be addressed.

Our findings indicate that achieving cultural change (i.e. gender equality) within the framework of the currently dominant professional identity is rendered impossible due to the nature of that identity. SEG is a cultural figure that supports the belief that everybody

currently within the institution is there due to merit and that change would mean that less qualified individuals would be unfairly promoted.[75] The dynamic can be made clear by extending Secules concept of identity-blindness to cultural-blindness.[76]

The valorization of certain forms of knowledge troubles the relationship of STEM to gender equality and cultural change in academia. A reluctance to embrace knowledge from social sciences or of past efforts can be traced back to the very root of schooling in engineering and science.[77] Sharon Traweek's description of the undergraduate physics student relationship to knowledge is salient here: 'They learn to devalue past science because it is thought to provide no significant information about the current canon of physics'.[78] The faith in scientific progress removed from previous knowledge exacerbates institutional amnesia about difficult issues, such as gender equality.

The presence of SEG in the culture at technical universities does not mean that efforts aiming toward gender equality are futile but rather suggests starting points for self-reflection and change. Cech points to movements within engineering cultures that embrace some social justice perspectives as examples of what can be included in those cultures and identities, through interests or changes in engineering education.[79] Understanding the challenges posed more subtly by specific aspects of culture, such as the Sole Engineering Genius, could be used by insider projects to anticipate resistance and point to ways of accruing different types of knowledge to change the organization.

Conclusion

This article set out to address the topic of recurrent failure of gender equality projects in STEM institutions to achieve the goal by focusing on professional identity. This was prompted by previous research identifying subtle cultural factors such as assumptions about gender in the shared institutional culture as barriers to project success. Ethnographic material from an insider-led gender equality project in a technical university in Sweden provided opportunity for in-depth cultural analysis addressing the question: How does the professional identity of engineering academics undermine insider gender equality projects?

The detailed qualitative analysis pointed to characteristics of a shared professional identity that we named as the Sole Engineering Genius (SEG). Key traits of SEG are individualism, viewing engineering expertise as sufficient to solve all problems (including gender inequality) and a belief in the intellectual superiority of academic engineers. Critical analysis showed how SEG legitimized a view of the technical university that prevented collaboration with gender equality scholars or social science experts, privileging STEM knowledge and seeking to bring about change without challenging established values.

It is important to note that we do not claim that SEG is a professional identity that academic engineers embrace as individuals. We understand it as a cultural figure that individuals and groups can enact or critique depending on the situation. However, in the studied project SEG was not effectively identified and challenged, thereby it was implicitly accepted and allowed to undermine the explicit objective of changing the culture.

Our analysis finds support in the literature, but further research is needed to establish whether similar cultural obstacles are present in other types of universities (e.g. including social science, and humanities faculties) and universities in other geographical and political contexts (other Nordic, Scandinavian, and European countries, for example). Further study

of the 40 Percent Project is also warranted to trace its evolution over time, of particular interest as it is planned to be one of the longest running projects of its kind. The experiences made so far, including our identification of SEG, are likely to impact the forward trajectory of the project and research is needed to understand in which ways.

Notes

1. Casad et al., "Gender Inequality in Academia."
2. See, Secules, "Making the Familiar Strange." Beddoes, "Agnotology, Gender, and Engineering." Cech, "The (Mis) Framing of Social Justice." and Doerr et al., "Making Merit Work."
3. Martinsson and Griffin, *Challenging the Myth of*.
4. Faulkner, "Doing Gender in Engineering," 187.
5. Van den Brink and Benschop, "Slaying the Seven-headed Dragon," 86
6. Ibid.
7. Cech, "The (Mis) Framing of Social Justice."
8. Cech and Blair-Loy, "Perceiving Glass Ceilings?" See Also Blair-Loy and Cech, *Misconceiving Merit*.
9. Roos et al., "The Failure of Gender Equality."
10. Ibid.
11. Ibarra, "Provisional Selves."
12. Ibid. 782–3.
13. Baylin, "Academic Careers."
14. Ibid.
15. Friedensen et al., "The Making of 'Ideal' Electrical," 116.
16. Secules, "Making the Familiar Strange."
17. Cech, "The (Mis) Framing of Social Justice."
18. Myers, Gallaher, and McCarragher, "STEMinism."
19. Doerr et al., "Making Merit Work."
20. Ibid., 9.
21. Beddoes "Agnotology, Gender, and Engineering."
22. Seron et al., "I Am Not a Feminist."
23. Ibid., 144.
24. Roth and Sonnert, "The Costs and Benefits."
25. Ibid., 396.
26. Berner, "Educating Men," 78.
27. Berner, "Professional or Wage."
28. Neyland, *Organizational Ethnography*.
29. Morrison and Lumby, "Is Leadership Observable?"
30. Emerson, Fretz, and Shaw, *Writing Ethnographic Fieldnotes*.
31. Galletta, *Mastering the Semi-structured*.
32. The research followed the guidelines for ethics in social science and humanities by the European Commission, "Ethics in Social Science". Informed consent has been granted by all participants presented in this article and interview quotes have been approved by interviewees. The project team and the university president reviewed draft versions of this article.
33. Bowen, "Document Analysis."
34. Maher et al., "Ensuring Rigor."
35. Nordvall, *Making Politics*.
36. Salminen-Karlsson, *Bringing Women into Computer*.
37. Salminen-Karlsson, *Bringing Women into Computer* and Faulkner, "Doing gender in engineering."
38. Internal Scandi Tech article, July 6th, 2018
39. A pseudonym used for the project used in this article.
40. Personal communication, November 14th, 2021.
41. Here after project management team or project team.
42. Public appearance, early fall 2019.

43. Ibid.
44. Advisory board meeting, Fall, 2019.
45. Cech, "The (Mis) Framing of Social Justice," and Seron et al., "I Am Not a Feminist."
46. Employee survey, 2019.
47. Roos et al., "The Failure of Gender Equality."
48. Field notes, early spring 2020.
49. Field notes, early spring 2020.
50. Advisory board meeting, fall 2019.
51. Interview, March 9th, 2020.
52. Steering group meeting, 12th of December 2019.
53. Advisory board meeting, fall 2019.The project member was referencing a quote by Geoffrey Boulton, full quote: 'The difficulty is, that changing a university is like moving a graveyard, you get no help from the people inside!'
54. Interview, 25th of February 2020.
55. Employee survey, 2019.
56. Public appearance, fall 2019.
57. Cech, "The (Mis) Framing of Social Justice." Myers, Gallaher, and McCarragher, "STEMinism," and Roth and Sonnert, "The Costs and Benefits."
58. Ibarra "Provisional Selves."
59. Interview, 9th of March 2020.
60. Turkle, *The Second Self*.
61. Doerr et al. "Making Merit Work," Seron et al., "I Am Not a Feminist," and Myers, Gallaher, and McCarragher, "STEMinism."
62. Doerr et al. "Making Merit Work."
63. Interview, 25th of February 2020.
64. Field notes, early fall 2019.
65. Interview, 25th of February 2020.
66. Employee survey, 2019.
67. Field notes, fall 2019.
68. Field notes, February 2020.
69. Interview, 25th of February 2020.
70. Interview, March 9th, 2020.
71. Faulkner, "Doing Gender in Engineering."
72. Cech, "The (Mis) Framing of Social Justice."
73. Roth and Sonnert, "The Costs and Benefits," and Traweek, *Beamtimes and lifetimes*.
74. Roth and Sonnert, "The Costs and Benefits," and Roos et al., "The failure of gender equality."
75. Seron et al., "I Am Not a Feminist."
76. Secules, "Making the Familiar Strange."
77. Beddoes, "Agnotology, Gender, and Engineering."
78. Traweek, *Beamtimes and Lifetimes*, 75.
79. Cech, "The (Mis) Framing of Social Justice."

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