

Chapter 3

Interventionist Research



FemTech.dk is fundamentally about combining research and interventions with a focus on making long-term change. Inspired by sociotechnical design (Mumford 2006) and action research (Bjørn and Boulus 2011; Bjørn and Boulus-Rødje 2015), FemTech.dk follows two main interlinked paths: (1) unpacking and understanding the challenges related to unbalanced gender representation in computer science, and (2) intervening and extending the field of computer science to allow for multiple, diverse agendas. In this way, the overall methodological approach is characterized as action research.

Scandinavian Participatory Design & Action Research

Action research was developed as a research method to account for the lack of research methods and insights into a social phenomenon which made it impossible for practitioners to take appropriate action and to consider the results of that action (Lewin 1946). Action research is thus characterized by an immediate problem situation, which requires attention but lacks methods and descriptive insights to solve. The urgency of the problem required immediate action – despite missing methods and theory. Thus, an important part of the research is to plan and conduct interventions – *while* collecting data about the interventions to develop theoretical insights (Rapoport 1970). Moving from social sciences and into computer science, action research has been used as a method for reflective system development (Mathiassen 1998, 2002) or as an approach to information system research (Avison et al. 1999). Action research in computer science in particular shaped the Scandinavian approach to system development (also referred to as participatory design) in the ‘70s and ‘80s – where unions and computer science researchers collaborated closely to ensure that new digital technologies entering the workplace would empower employees and not just support management (Kensing and Blomberg 1998; Bødker et al. 2000). In these research endeavors, there was awareness of the politics that

arrive with digital systems (Markus 1983; Suchman 1994; Bjørn and Balka 2007), and thus a clear political agenda for taking the perspective of workers (Bødker et al. 2004; Bødker 2015) – blue-collar workers (Kristiansen et al. 2018), workers in traditional women’s professions (Wagner 1993; Møller and Vikkelsø 2012) – or in general taking seriously work and workers, which are often neglected when new technology is introduced (Bishop 1999; Star and Strauss 1999; Oudshoorn 2008).

The methodological approach in FemTech.dk takes from the traditions of action research and participatory design in the way that we join the interests and perspectives of the gender-minority in computer science with a clear interest in making a change. The emphasis on gender is a methodological decision to be able to operationalize our interventions within the university context; and we consider intersectional aspects as part of our analysis and activities. Thus, we *do* have a political agenda for change, and we are taking a side in working towards an inclusive computer science field and profession. Simultaneously, we are studying the phenomenon of ‘gender in computer science’ as an entity – as a black box – and that we want to unpack as many facets as possible of this complexity to discover the core foundations that have made computer science gendered as male in Denmark.

Computer Science Is Not Male – It Was Made Male

Historical research has documented how computer science was made male and White in the USA (Ensmenger 2010) and in the United Kingdom (Hicks 2017) – despite the fact that computer programming and software development were done by women and people of color in the early days of computing, and that historically computer science was a women’s occupation (Menendez-Blanco et al. 2018; Rosner et al. 2018a, b; Shorey and Rosner 2019). Interestingly, computing began during WWII, while Denmark was occupied – and thus computing as a profession was introduced later in Denmark (in Regnecentralen (Thorhauge 2006)) than in the USA and the UK. As mentioned earlier, the first department of computer science was not established until 1970. These historic accounts are important to understanding the current situations where Denmark, like the USA and the UK, has produced unbalanced gender representation in computing.

Developing initiatives to improve gender diversity in computing has been a continual topic of interest internationally since the ’80s (Albusays et al. 2021). Surprisingly, the gender-minority in computer science detected in the USA, UK, and Denmark is not mirrored in countries such as Malaysia (Mellström 2009) or Israel (Frieze and Quesenberry 2015). Clearly, the gendered characterization of computing is culturally determined; thus, a change must include considerations of societies’ assumptions and prejudgments of the field and profession. Several initiatives have been taken to transform gender representation in computer science departments; among the most impressive is the transformation of the computer science department at Carnegie Mellon University in Pittsburgh, Pennsylvania, USA. Here, long-term initiatives and efforts transformed the gender representation

toward 50/50 men and women in the computer science student population from 1995 to 2020 (Margolis and Fisher 2003). FemTech.dk is inspired by the work at CMU; however, the culturally different structures of university education between the USA and Europe in general and Denmark in particular means that we cannot simply transfer what others have done in the USA to Denmark.

We do not assume to know a priori why computer science in Denmark lacks diversity; instead, part of our research is to inquire into and unpack the sociotechnical structures that form the foundation of computing in Denmark today. We want to both empirically investigate the research inquiry and make interventions that change the field of study while providing additional important insights.

Our Interventionist Agenda

Interventions can be many things and have many different manifestations (Karasti 2001; Vikkelsø 2007; Zuiderent-Jerak and Jensen 2007; Boulus-Rødje 2012). In FemTech.dk our interventionist approach focuses on design artefacts and draws on a long tradition of interaction design research and research through design (Zimmerman et al. 2007, 2010; Goodman et al. 2011; Wakkary et al. 2013; Disalvo et al. 2014, 2016; Blythe et al. 2016; Menendez-Blanco and Angeli 2016; Menéndez et al. 2017; Bjørn and Rosner 2021).

Examples of interventions in FemTech.dk are hands-on workshops and public events. These interventions focus on inviting participants to implement design artefacts that we had carefully designed to engage and produce certain characteristics about computer science. Our intention was that, when used in interventionist activities, the artefacts would manifest the assumptions and narratives that challenge existing pre-determined understandings of computer science. One important feature of the FemTech.dk design artefacts is that interventions are not only manifested in implementing a final ‘artefact’ – they are being produced *in and through* the design activities that lead to the final artefact. Thus, the *intervention* is about both developing a *product* and engaging in a *process* – and includes considerations for who are included in our design process as well as the participants invited for events and how participants shaped the narrative of the artefacts. Thinking about design artefacts as a process forces us to consider and to not only collect data about our interventions when the final artefacts are displayed but, more importantly, to *collect data about the process* by which an artefact becomes *made and enacted during events* by participants joining in the events.

When we intervene, we use design artefacts not to solve a need or problem; instead, we used them as a contextual feature shaping our interventions by challenging basic assumptions about computer science. For example, the design artefacts challenged the assumptions that digital technology centers around screen or keyboard interaction or that computer science is an individual activity rather than a cooperative one. FemTech.dk for design thus comprises a conceptual framework that manifests our embedded agenda about change in computer science. We do this

by depicting and displaying the interventionist agenda when inviting participants to engage with our proposed agenda, which often means challenging their own basic assumptions about computer science. We used the FemTech.dk events and workshops as a vehicle for interventions, as they provided us a way to engage with different audiences. While we attempt to challenge different kinds of assumptions in different types of ways with different audiences, all the design artefacts fundamentally served the same purpose: to challenge basic assumptions about technology design, the design materials, and the people who make technologies.

Our interventionist agenda includes thinking about the issue as an analytical problem to be explored through design activities. By creating design artefacts that question existing narratives and assumptions about computer science, we can create new boundaries for what digital artefacts might entail (Bjørn 2012, 2014). The boundaries for what make the design artefacts are more than ‘physical’ and ‘digital’ boundaries and reach into activities and engagements with people (Bjørn and Østerlund 2014). This approach produces new potential for who can execute interventions and learn about a problem through change. We conceptually designed the artefacts as a multiplicity of strings (Haraway 1987, 1994) for the participant to follow, such as exploring gender concepts within the computer science education and industry or following relevant strings leading into and through the empirical field (stats, documents, stories, narratives etc.), which leads participants to join our production of an in-depth analysis of the problem from multiple sociomaterial-design perspectives (Bjørn and Østerlund 2014). Sociomateriality challenges the ontological assumption that technology and humans are different and separate entities, instead arguing for a relational ontology where humans and technology only can be understood as mutually entangled (Haraway 1990; Barad 2003; Suchman 2007; Orlikowski and Scott 2008; Bjørn and Markussen 2013; Law and Singelton 2014). Sociomaterial-design brings this relational ontology into the design of artefacts by explicitly designing digital technologies with open-ended boundaries (Bjørn 2012; Bjørn and Østerlund 2014). In FemTech we embrace our work as sociomaterial-design.

Our Role as Researchers

We are women and computer science researchers studying gender in computer science, and thus we are part of the phenomenon we study. Studying our own organization as insiders raises specific challenges (Blomberg et al. 1993; Kensing and Blomberg 1998; Blomberg and Karasti 2013), increasing the demand for reflexivity by us as researchers. Being situated as insiders risks blinding us to invisible structures and taking for granted assumptions that we as insiders encounter in the organization. To account for these challenges, we have explicitly addressed our own assumptions and tacit knowledge about the field as part of the research process. A crucial part of this reflection has been done when reading about gender, feminism, and equity in computing and challenging our experiences with insights from

existing literature. Also, working on the project meant that we were exposed to, and engaged with, discussions, events, and people we would not have engaged with otherwise. Our discussions about designing the activities, writing papers, publishing in news media, and understanding the feedback on our work have also contributed to our reflections on feminism and computing. At the same time, coming from *within* the phenomenon of study also gives us unique access to and engagement with the field, making the long-term effects of our work more sustainable.

In this way, our methodological approach, combining action research and design research into interventions driven by the design process and final design artefacts, is our way of combining activism and research – of learning about gender and equity in computing while creating interventions – of pushing the research forward by reflecting on results and challenging our own assumptions and lived experiences.

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