INTERVIEW

TInnGO

Nicole Kringos, Sweden

Female Talent and Innovations will pave the road for Smart Infrastructure

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Nicole Kringos is the first female professor in Highway Engineering in Sweden, teaching at the KTH Royal Institute of Technology. She is also the Director of the KTH Road2Science Competence Centre. Her research focuses on asphalt roads, the development of computational and multi-scale models for long-term performance predictions, and innovation speed in the transportation infrastructure sector.

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Can you tell me about your background?

I am a structural engineer by training and my interest in asphalt was sparked during my master's studies. I moved to Sweden from the Netherlands 10 years ago, and I am now the Director of the KTH Road2Science Competence Centre and the first female professor in highway engineering in Sweden. I am a mechanics specialist, but in my role at the Road2Science Center, I work closely with industry to raise innovation capabilities. In 2020, I organized a webinar with Caroline Criado Perez, author of *'Invisible women, exposing data bias in a world designed for men'* and in spring 2021, I chaired an international conference on the combined subject of digitization and gender data bias in the infrastructure and mobility sector.

How does gender equality relate to infrastructure?

We embark on digitization to enhance efficiency and to raise systemic sustainability. There is even a belief that if a computer does the job, there is much less bias. Yet, digitization means an inherent dependency on data. However, as data was predominantly collected in the past and given that mobility in the past was mostly represented by male travel, this turns into a problem when designing the future. We know today that women travel in a different way compared to men. We also know that women use digital tools differently to men. So, when design considerations are made by teams of mostly male designers and policy is shaped by mostly male decision-makers, the female perspective is missing throughout the value chain. The infrastructure environment is still quite conservative, risk-aversive, and very masculine, and a mismatch between old and modern development expectations often makes young engineers leave the field prematurely.

How can we improve gender equality in infrastructure?

I see smart roads and the push from electrified and autonomous transport as an important development towards increased sustainability in which transportation infrastructure itself plays a crucial role. But to get there, we need to change the process. Women need to play an important role in this. We are more used to thinking about the entire value chain, handling many challenges at the same time while having a peripheral vision of the needs of other stakeholders. The female perspective is needed now more than ever, not only to bring together stakeholders to make these new collaborations work, but also in driving the novel cross-disciplinary knowledge developments that are required. Women are generally less stuck in a subject area and are less nervous of stepping outside their comfort zone, which is what cross-disciplinary work requires.

Women in general like more complex and creative fields. Women also like the sense of urgency and the fact that new thinking is required, which means they feel more driven to engage in new subjects. Women that make it to the top of male-dominated fields have learned the hard way not to emphasize the fact that they are women. I think this is a mistake that we need to rectify. I make a conscious effort to talk about being a mother and to discuss other subjects that come with being a woman. It is important to show that we do not have to become male to be successful in a male world.

Road2Science students are consistently exposed to the different careers of a wide variety of individuals in the construction sector, and yes, there are more women than men, because I often feel that women who work in this sector have learned to survive against many bad odds and are actually more interesting people with very interesting stories to tell. Women generally do not hide the mistakes or failures in their careers, they show them as learning points. Our engineering students do not benefit from macho-style career stories, it only makes them more insecure about the choices they have to make and in fact leads them to pursue other careers, which is not what we want.

It is important to enable young children to learn about engineering subjects. They like discovering the world. They like building things, and they like to learn about the laws of nature, as this is part of

understanding their surroundings. Somewhere along the line as they grow up, this approach disappears and they lose interest in STEM subjects, especially girls. Universities need to collaborate with industry and work closer with schools. We need to give teachers a new vocabulary, access to our R&D infrastructures, give them role models and help them teach children about STEM subjects in the contexts of sustainability and to understand why technology is needed. If we could help teachers to use our laboratories and create 'MakerSpace' and project-driven education, I am convinced more women and even other types of men would start to choose engineering subjects.

What is your experience in this male-dominated environment?

I could list many occasions in which I was the only woman in the room and, as such, was confronted with the established old-boy networks. It is of course hard to make a change or transform a perspective within an environment if all the other people there seem to agree with each other. But I never allowed myself to be sidelined. I have always been convinced that good preparation, ensuring you have sufficient knowledge on the subjects you are talking about and the ability to deliver at the end of the day is most important. And there is a certain amount of stubbornness. I prefer to be respected over being liked. It is important to establish a working environment that is grounded in mutual respect and openness, and which welcomes disagreement.

Why hasn't Sweden made further progress despite viewing itself as a leading country in gender equality?

We are still not seeing the numbers of women that we would like to in many engineering disciplines. I think there are many different aspects that contribute to this. The education system in Sweden is very segmented in its approach. I feel too little is being done in primary and secondary education programs to make connections between subjects, to make STEM more relevant to societal challenges and to showcase the career options people have in these fields. Sweden also has something that I call the 'compost syndrome', if we wait long enough the problem will go away. These two factors do not help gender equality or diversity issues.

What have been the greatest breakthroughs in your area?

I do not think we are there yet. I think we first have to establish a common understanding that we are on our way to a more complex transportation infrastructure system that can no longer go about its business as usual. The push for electrified and autonomous traffic and its associated industries combined with the urgent sustainability goals will drive this awareness. My hope is that we can make changes in the framework of the system, change the rules of the game, enable new risk-sharing structures and, as such, enable traditional stakeholders to take the lead in this change process and establish sustainable partnerships with new stakeholders. If we can reach that stage, the changes in this sector will lead to a more equal and diverse workforce at all levels.

What is the way forward?

In my opinion, the way forward needs to come in two stages: firstly, all the individual stakeholders need to reevaluate their own roles in the industry and make the required changes in their own structures. Here, I mean academia, industry, municipalities and governmental agencies. The second stage in this is establishing effective dialogues between these partners to discuss the different options and changes that need to be made together. As infrastructure is a common good, we cannot compare its innovation mechanism to other sectors. The infrastructure industry is known for its low profit margins, high start-up costs, short timelines, and large risk aversion. The benefits of innovation need to come to those investing in its development. Companies need to be able to set long-term goals and evaluate costs and profits on similar timelines. This requires discussions on changes in procurement rules, on co-ownership, on investments, on operating standards, and on the legal framework but, most of all, it requires a cultural change. We need to welcome partnerships with new stakeholders that will enable some of these transformations to take place.

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