



MARIELLE
STOELINGA

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UT SENIOR LECTURER CALCULATES ODDS TO LIMIT RISKS

Mariëlle Stoelinga: mathematical detective

Mathematics rules everything around us; from the car we get into every morning to the films we stream on Netflix in the evening. This complex world of countless variables is brimming with risks. How can you calculate and, more importantly, deal with these risks? Mariëlle Stoelinga (45) knows that is no simple task. She works in the field of risk management. 'Shit happens, but you can do your best to limit the risks.'

What gives her energy? Computer scientist Stoelinga, a professor at the Radboud University and a senior lecturer at the UT, immediately puts on the modern-day classical music of Michael Nyman. Her finger deftly moves along as she says: 'It is a lot more energetic than Mozart or Bach and more original than pop music. Pop is much less surprising and refreshing to me. It never strays off the beaten path.'

Stoelinga herself loves to travel the roads less taken. She tries to find her own limits and exceed them one step at a time. 'I tend to do things that are difficult for me. Things that are just outside my comfort zone,' she says. 'When I climb a mountain, it is always one that is just a bit too high, too steep, and too long.' The researcher knows that it usually comes down to simply doing something. 'I prefer to meet a task head on. Just do it. No risk, no fun!'

That conviction would appear to be directly opposed to her field of research: risk management. When Stoelinga first started out as a researcher at the UT thirteen years ago, she had no idea that this field would take off like it has. She is currently involved in five major research projects. 'The great thing about this field is that it is so broad. It often concerns the interplay of technical aspects and human factors. These two can certainly clash, but it is also possible to use clever designs to solve human problems. Risk management is the perfect embodiment of "high tech, human touch."

Fewer problems on the railways

One of the projects that Stoelinga and her colleagues from the Formal Methods and Tools department are working on is about gaining more insight into the causes of problems with the Dutch rail network. 'Train drivers who pass a red signal are a major risk factor. In many cases, they are distracted and fail to notice the red signal. The question is what causes their distraction. Is it the inattentiveness of the driver or are they distracted by the bells and whistles on their dashboard? If the latter is true, a train driver would be unjustly blamed for mistakes that are the result of a poor technical design.'

Another way to reduce problems on the railways is through predictive maintenance, Stoelinga says. 'This is a very interesting optimisation challenge. If your maintenance is poor or if your efforts come too late, you increase the risk of accidents. If you carry out too much maintenance, the costs can rapidly spiral out of control. We are striving towards just-in-time maintenance: reacting to worn and ageing materiel at just the right moment. By placing smart sensors along the tracks and analysing a wealth of big data, you can gain clear insight into where and when to act. This allows us to reduce the number of operational malfunctions that occur.'

Mathematical detective work

The associate professor says that risk management is about improving safety and security. That requires mathematical



detective work: calculating odds, finding risks, putting these in perspective, determining the connections between factors, analysing all this information, and then taking appropriate measures. 'Almost without exception, there is a huge number of factors in play. What are the major causes? Which are the most common? Risk management is about properly handling uncertainties.'

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'People fear things that they do not have to be afraid of'

The researcher takes things one step further. Once you have identified risks and implemented measures, said measures can lead to new risks. 'We then have to re-evaluate the measure itself,' Stoelinga says. 'Compare it to emergency exits in a building. These are definitely useful when the building is on fire, but they are also a way for burglars to get in.' In short, Stoelinga is caught in a complex web of causality. Cause and

effect and cause. 'Shit happens, there is no way around that. You can do your best to limit the risks, though.'

Preventing incidents

If your research is all about finding risks, does that bleed into your everyday life as well? 'Absolutely,' Stoelinga agrees. 'When I read about incidents in the paper or see a news report, I often catch myself thinking that with proper risk management, the incident could have easily been prevented. One example is what happened in Mali: two Dutch soldiers were killed during a training exercise with unsafe mortars. This ultimately led to the resignation of Defence Minister Jeanine Hennis-Plasschaert. If you do not follow the safety procedures, you are asking for accidents. An incident such as this has a major impact on society, even though it could have been prevented entirely. Everything starts with a proper safety culture. That also goes for hurricanes like Irma and Harvey. We know that hurricanes are more common now because of climate change, so it is crucial to ensure your communication systems are in order in the event of a disaster.'

Stoelinga sees a world in which we are constantly faced with incidents. As a result, people feel afraid. 'Fear is overrated,' she says. 'People fear things that they do not have to be

Mariëlle Stoelinga in a nutshell:

2017:	appointed as full professor Quantitative Risk Assessment of Software Systems at the Radboud University Nijmegen (part-time)
2011:	Associate Professor in IT Risk Management
2004:	Assistant Professor in Computer Science
2001-2004:	Postdoctoral researcher at the University of California
1997-2001:	PhD in Computer Science at the Radboud University Nijmegen
1997:	MSc in Mathematics and Computer Science at the Radboud University Nijmegen

situation has improved, but I think it is still an issue to this day,' says the former board member of the Female Faculty Network Twente. 'Back then, I was motivated to show that there was another way. Having my children also helped me develop my leadership skills, I believe. It is about seeing and then taking responsibility.'

No room for distraction

Stoelinga definitely assumes responsibility in her work, because science is serious business to her. There is no room for distraction. She is rigidly organised and structured and maintains a clear focus, all in an effort to perform. 'I do not schedule any appointments before eleven in the morning. That distracts me. I also work out a lot, because that is the only way for me to maintain my position at the scientific top. Exercising gives me far more time and energy than it costs. It stimulates the circulation in my brain and I sleep better because of it. That is not to say that I never do anything to relax. I love going to concerts – with or without my kids – and I enjoy going for walks and visiting the sauna. It is important that we scientists also take the time to enjoy all our wonderful achievements.'

When it comes to her research, the senior lecturer has no time to stand still. Her field is becoming ever more complex – and therefore more interesting. More complex systems, more data, and new technological developments create more uncertainty and therefore more risks. Stoelinga certainly has her work cut out for her, but she would not want it any other way. Her motto is 'go with the flow.' Stoelinga now devotes all her focus to the world of risk management. She moves forward with purpose, while keeping every possible risk clearly in the back of her mind. ●

afraid of. Risks are exceptions. Sure, if you are being chased by a lion, it is a good idea to run – but you have your survival instinct to take care of that. However, we should try to maintain some perspective and not jump at every shadow. If you want to avoid all risks, you would never get anything done at all.'

Revelation

That attitude characterises the researcher. She is concise in her speech, quick-witted, and sometimes even a bit impatient. Stoelinga focuses on the heart of the matter and knows what she wants. Perhaps she has always been like this: always wanting to move forward and understand the world better. 'Whenever I failed to understand something, lacked the insight or the big picture, I would do whatever it took to gain that insight. I still remember a revelation I felt as a small girl: when you are on an upper storey, you are standing on the ceiling of the floor below you.'

Now, decades later, she has three children of her own: two boys and a girl. Being a parent has made her more confident, she says. 'When I started my work at the UT in 2004, there were no other female senior lecturers in this faculty. Add the two female part-time professors and the only conclusion is that it was an extreme example of the 'old boys network.' That