It is a pleasure for me to offer you a new overview of the research spearheads of the Institute for Innovation and Governance Studies (IGS).

IGS is the home of social science research at the University of Twente. It houses research groups in psychology, communication, public administration, business and management, educational studies, science and technology studies, sustainable development and civil engineering, as well as several crossover subjects. The University of Twente offers teaching programs in these fields— at bachelor, master and PhD levels and for professionals.
All these teaching and research programs have shared an ‘engineering’ approach ever since the start of the first program – in public administration – in 1976, 40 years ago. In addition, collaboration between social sciences and natural sciences and engineering is successfully encouraged. Policy scientists work with engineers and mathematicians on the development of smart energy grids; sociologists work with information specialists on the social effects of Twitter campaigns; experts in technology assessment and in law study the social risks and legal regulation of nanotechnology and climate change, to name just some examples. IGS promotes this distinct profile of social science at the University of Twente, summarized as “academic excellence, unique combinations”.

There are two relatively recent developments that I would like to point out in this respect.

The first development is the increasing attention given to the public relevance of science. The Dutch Ministry of Education in 2015 initiated a National Scientific Agenda (Nationale Wetenschapsagenda) inviting literally everyone in the Netherlands to formulate and propose research questions. Almost 12,000 questions were proposed, and these are currently still being condensed to a limited set of 100-150 broad, interesting and challenging questions that will help to guide the future directions of research in all areas. IGS researchers have been actively involved at most stages in the development of this National Scientific Agenda.

There is more to be gained from the increasing attention given to the public relevance of science. The social sciences in particular have been criticized for their ‘scientism’ – a term used long ago by Friedrich Hayek and others to describe a servile imitation of the methodology of natural sciences. Scientism leads to sterile forms of social science, characterized by pseudo-precision, quasi-objectivity and a general lack of relevance. For this reason a renewed attention to the public relevance of our work (without sacrificing rigorous logic, methodological clarity, transparency, and verifiability) is a welcome development, which fits in well with current international debates about this relevance.

The second important development is the tendency towards building integrated research infrastructures. Stimulated by the rise of ‘big data’ and its associated methods of analysis, researchers from diverse fields increasingly recognize the possibilities that large-scale integration of data offers them in their studies. A research infrastructure provides a relatively stable foundation for innovative, cross-disciplinary research. In 2015, NWO and KNAW have initiated new short-, medium- and long-term initiatives for research infrastructures. IGS researchers are directly involved in these and other initiatives.

Research infrastructures provide a foundation for innovative research. The IGS Datalab has been doing exactly that for several years now. The IGS Datalab offers tools for data collection, data analysis and secure data storage. We support innovations at all stages of research, and pay special attention to enhancing the quality and usability of research data. In my own field, IGS Datalab fits in with developments such as the Data Access and Research Transparency initiative of the American Political Science Association.

Ironically, some commentators fear that a strong emphasis on the accessibility and transparency of data in research procedures comes at a cost … in terms of public relevance*. Thus, these commenters argue, the two broad developments sketched here would be inconsistent with each other. Personally I do not believe this at all. Social scientists can still gain so much by simultaneously enhancing public relevance and improving research practices. This brochure contains many examples of how IGS researchers successfully work towards both goals.

* | See, for example, Jeffrey C. Isaac (2015). For a more public political science. Perspectives on Politics 13:2, 269-283.
WORKING OUT BETTER E-HEALTH
More and more people are using e-health applications, varying from websites to wearable wristbands. The enormous amount of data gathered with these applications has the potential to not only change individual health and behaviour, but also the way health care in general is organized. Postdoc researcher Liseth Tjin-Kam-Jet - Siemons and PhD-student Floor Sieverink run a project that aims to chart this potential.

‘Take one of the wristbands now available’, says Floor Sieverink. ‘It will gather data on your movements, your heartbeat, blood pressure and sleeping pattern. You may have an app that records your eating habits and your weight. That’s a lot of data. You may simply present the results to the user, but it’s also possible to give advice, like: this week you haven’t been exercising as much as usual, shouldn’t you go out for a walk? It may, based on all these factors, even be able to predict that you are at the point of failing ill.’

A slightly raised body temperature and heartbeat, for example, may go unnoticed by the wristband’s wearer, whereas they may herald an emergent flu. The app may issue a warning about these symptoms, but in what way? Just saying ‘in two days you’ll be in bed with a fever’ will not do, but neither will producing a lot of data and letting the user himself figure out what to do. To maximize its benefits to the owner, an app should present its findings in a personalized way. Such applications may help healthy people to stay in shape, whereas people with chronic conditions such as diabetes may find in it a coach that persuades them to move into the right direction. ‘If you see your doctor four times a year, you must monitor yourself most of the time’, Liseth Tjin-Kam-Jet - Siemons explains. ‘E-health applications are there to support you. However, in practice we find that patients often stop using them after some time. We’re interested in finding out why, because this will give clues how to design applications that perform their coaching role more successfully.’

For their research Tjin-Kam-Jet - Siemons and Sieverink have acquired several datasets. Among those is navigation data from a web portal that supports self-management by patients. Sieverink: ‘This dataset tells us how often people log in, how they navigate through the site, which exercises they take and so on. We use this data, along with real life information from the user’s ailment history, to analyse which behaviour of the portal is most relevant. In turn, our analysis may for instance lead to a redesign of the website or a different navigation of the site for different types of users. If you know at what point users tend to quit an application, you may be able to prevent them coming to this point or, if they do, intervene in order to persuade them to carry on anyway.’

EXPERT PANEL
With the benefits come issues as well. That handy wristband, for instance, will send its data to the manufacturer (which users may not realize, as they don’t read the often sketchy terms of service they agree to). This is necessary for the equipment’s future development, because the algorithms will get better if they can be fine-tuned and tested using lots of data. Other issues may even be more complicated. Can insurers be allowed to reward or penalise their customers depending on the healthiness of their behaviour, as recorded by an app? Given that the training algorithms are often opaque, even to their developers, to what extent is it safe to trust an app’s recommendations?

Taking on such legal and ethical considerations at an early stage is important for a successful e-health application, as any objection may be a reason for users to refrain from using it. To address these issues Tjin-Kam-Jet - Siemons and Sieverink cooperate with an expert panel that feeds them with insights from as many disciplines as possible. Tjin-Kam-Jet - Siemons: ‘Our goal is to acquire information on the way people actually use and experience e-health applications, and combine this with technological, medical, ethical and legal knowledge, with the ultimate goal of developing strategies that lead to better applications.’
Finding the right business model is never easy, especially not for young companies. There are so many factors that determine whether a new product or service will succeed. Yet it may be possible to identify success factors, which reduces the uncertainties for companies and their stakeholders, such as governments that want to stimulate innovations.
The actual environments that new companies operate in are often enough quite different from what they imagined. They even may change as the company enters the market. One company that researcher Kasia Zalewska-Kurek recently spoke to started by renting out devices with a touring app for hiking and cycling enthusiasts. Its business model was challenged when smartphones became widely available. People no longer required a dedicated device, just the app. Smartphones usually have GPS on board, which changes the way tours can be offered. The company found their customer base shifted from dedicated enthusiasts to families, and that there was a demand to provide information about hotel services with the app. By adapting the company survived.

‘Another company I recently encountered did not initially know its market’, Zalewska-Kurek says. ‘It provides a wearable electronic tag, which triggers signs in a building to guide the wearers to their destination. This company thought their market was in hotels and conference venues, but by accident they ended up in the health care sector. That’s where they are now expanding.’

**ECOSYSTEMS**

While the hits or misses of individual companies are relevant to their direct stakeholders mostly, on a larger scale the success rate of a company may affect local or regional economies. Consequently, if governments want to be the home of an entrepreneurial ecosystem that fosters valuable, innovative companies, they like to know which policies to implement. In other words, governments need business models as well. ‘I will be looking at several ecosystems where universities, governments and business interact’, says Zalewska-Kurek. ‘We have an ecosystem, of course, close at home in Twente. It will be interesting to compare this to others in The Netherlands, Europe and the United States. There are many factors to consider – this is about much more than just nursing start-up companies. A university, for example, may also create value for local communities by offering all sorts of courses to disseminate its knowledge.’

In an ecosystem there is also the issue that interests may not always be aligned. What is good for the local economy does not automatically benefit the local university and the other way around. Successful start-ups may decide to relocate closer to their markets, taking jobs with them. The question is which factors maximize the advantages for all stakeholders. There is no recipe to build your own Silicon Valley, but at least you can try to savour some of the ingredients.

‘THERE ARE MANY FACTORS TO CONSIDER – THIS IS ABOUT MUCH MORE THAN JUST NURSING START-UP COMPANIES’
In 1993 and 1995 high water in its rivers threatened significant portions of The Netherlands. This served as a wakeup call for policy makers, that flooding risks not only were posed by the sea. Because there were too much objections against raising the dikes along the rivers, another policy was adopted. Land was reserved for future flooding areas, while at the same time the rivers’ capacity to convey water had to be increased. The policy is visibly affecting Dutch landscape. For example, the design of groynes (dams perpendicular to the water flow) has changed, which benefits the shipping industry during periods of low discharge, but also affects the ‘look and feel’ of the river. Side channels have been dug, floodplains redesigned. Such developments have ecological consequences as well. ‘All these things directly influence the daily work at Rijkswaterstaat’, says Ralph Schielen, who is affiliated with both the University of Twente and Rijkswaterstaat, the infrastructure agency of the Dutch government. ‘In principle we do this in order to improve safety by enlarging the discharge capacity of rivers. However, there are many more considerations, such as costs, which have to be taken into account. Therefore, we are looking

ARISING WATER QUESTIONS

After some serious high water events the Dutch government set up a programme to improve the flood safety along its rivers. Now the measures are being implemented, it is time to monitor the effects and see if additional policy adjustments are needed.
for policies that are most of the time self-sustaining. Policies that require constant interventions are less desirable. We are good at finding the right policies, but still there is a lot to learn.’

Take the use of floodplains as providing extra discharge-capacity for superfluous river water. The pace of water flowing in and out of the floodplains is largely determined by the vegetation. The question is to what extent nature may follow its course without endangering the function of the floodplain from the perspective of water management.

**RIVER CARE**

The River Care research programme was designed to investigate the effects of the policy changes, which in many cases are too complex to predict precisely. ‘We gather lots of different data’, says associate professor Denie Augustijn. ‘Satellite images are important, because they reach back many years. We also have flora and fauna databases going back to 1990. Apart from that we do our own observations and measurements in the field, for instance on elevation, moisture and vegetation.’ Schielen adds: ‘In some places we may install webcams to get a close up look at the developing landscape. This not only serves our own purposes, but may be of interest to a general audience as well. Public awareness means a lot to us.’

Apart from government bodies and research institutions, Dutch engineering consultancies also participate in the projects. They are renowned worldwide for their cutting edge knowledge on water engineering – and they are determined to remain at the forefront. One of the programme’s focusses is the ‘virtual river’, a so called serious game which models a river landscape and allows stakeholders to propose policies, the effects of which become immediately visible in the model. Because it can model any lowland river, this game is a potential export product.

**UNCERTAINTIES**

Of course, there are limitations to the models, as experience has shown. For instance, in the past the river bed was modelled as a flat surface, whereas in reality dunes form, slowing down the current and hence rising the water to levels higher than the model predicted. Once the model took this into account, it appeared the predictions were sometimes too high, because stronger currents flatten the dunes. These may be small adaptations in a model, but they matter a lot, because the necessary height of dikes depends on expected water levels. The consequences in terms of safety and costs are considerable.

‘Despite all the knowledge we have and are acquiring, we must never forget that uncertainties remain’, Augustijn warns. ‘Everybody knows how difficult it is to predict the weather even for the next few days. For us the weather prediction is only one of the inputs for our models. And we’re not only expected to predict water levels for the coming days, but for the coming century as well. An extensive and careful review of river policies is essential. Actually, I wouldn’t mind some really high water one of these days, so we can calibrate our models.’
Big data offers exciting new opportunities for social research. Group processes that could only be described sketchily, because so much was happening at the same time, can now be analysed in detail, since a lot of data can be captured simultaneously.

Recently, Wi-Fi tags were introduced in a Dutch health care centre for the elderly with psychiatric problems. Both the 65 patients and staff wore them continuously for three weeks. Receivers in all rooms tracked their movements. The aim was to acquire detailed information about interactions between employees as well as between employees and patients in the health care centre, with the ultimate goal of providing better care.

‘The Wi-Fi tags only say something about proximity’, says assistant professor Maaike Endedijk, whose interest is in complex learning settings. ‘We cannot be sure if people have been interacting, but when they were in the same room together for some time, it is very unlikely they just ignored each other. Also, we don’t know the nature of the interaction.’ Nevertheless, this information is so much richer than traditional methods for social research like observation and questionnaires, according to Endedijk’s colleague Elze Ufkes, whose background is in social psychology. ‘In this field much research takes place in lab settings just because that’s an ideal way to closely observe important, but often subtle, group processes. But how does this knowledge translate to real world situations? That’s why it is so exciting to have new tools at our disposal.’

**POTENTIAL**

Endedijk and Ufkes specifically teamed up to explore the potential of new technologies. The Wi-Fi tags are easy to use, but still fairly limited in what they can achieve. There are more extensive tags that also record speech and the direction people are facing, but these are bulky and hence awkward to use. Smartphones might be an alternative, but these have their own drawbacks, such as mutually incompatible technologies. Even more serious are the privacy issues raised by following “research objects” 24 hours per day.

‘One of the things we encounter is that our traditional methods of analysis, which work fine if you have a couple of hundred questionnaires, simply cannot cope with millions of data points’, says Endedijk. ‘How do you extract information from that? We are lucky to work at a university where lots of expertise on big data is available, which we can call upon when searching for new analytical methods.’
With automated data collection and analysis new ways of doing research also come within reach. For instance, one could automatically send a questionnaire to participants for extra information about an incident as an interesting data pattern turns up, instead of finding out (or not) about it through a questionnaire weeks later, when recollection may already have become hazy. It is easier to follow developments through time, as they emerge – until now, with interviews at regular intervals, researchers are likely to miss the crucial moments.

Currently, Endedijk and Ufkes focus on methodology, which brought them together from research areas that traditionally have very little to do with each other. ‘There is still so much to discover at the basic level, with implications for all social sciences’, Ufkes explains. ‘How do you read data from devices, how do you clean up this data, how do you perform a quick scan to see if the data is any good? We are developing protocols to deal with that, so others won’t any longer have to draw their own rules. This really is pioneering a new field.’

APPLICATION

There is no question that a plethora of social data is about to open up. According to Endedijk and Ufkes it will certainly prove to be useful in numerous settings where people work together. Take, for example, the flexible office plans that are popular nowadays. What do they mean for interaction between employees? Or, the emergence of self-managing teams. What actually happens in these teams, which interactions at which moments appear to be vital for them to function efficiently?

Endedijk: ‘Many organisations strive to be learning organisations. Many want to be innovative. We do know something about what makes them learning or innovative, but not a lot. Closely following the interactions in these type of settings may tell us a lot more about the factors that lead to success. We may be in the pioneering phase right now, but we are convinced that this development will have a large impact.’

The picture shows GER Moodswater by Sensoree / Kristin Neidlinger, visiting designer at University of Twente
In places where large groups of people gather, be it for a music event or a football match, there are always risks that things get out of hand, potentially with lethal consequences. Behavioural sciences and technology meet to devise new methods of crowd control – though technological innovations may also make this task more difficult.
'In the Netherlands there is a lot of expertise on crowd control, for instance with event organisers, the police and local authorities’, says assistant professor Peter de Vries, who studies the behaviour of large groups and methods to influence them. ‘Keeping large crowds in check is important in order to prevent calamities. Professionals use many channels to communicate with crowds, both verbal and non-verbal.’

De Vries investigated five large events, which allowed him to develop a list of do’s and don’ts. For example, as soon as a location is beyond seventy percent of its capacity, organisers start informing potential visitors that it is full. Many people will be dissuaded to go there, while people who still show up can be admitted without compromising safety.

‘Our expertise on this subject is largely anecdotal’, De Vries observes. ‘There is hardly any systematic research. Technology provides new methods for crowd control, as well as new challenges. To make sure a location is evacuated before bad weather strikes, as an organiser you may want to give an early warning. What you don’t want is the audience, relying on social media, to decide that you are exaggerating and stay put. There are new dimensions that justify closer, more systematic research into crowd control.’

HOOLIGANS

Naturally, the type of control depends on the crowd. Group behaviour at music festivals is typically different from the one at football matches. Small groups of hooligans may wilfully try to create chaos, adding a new factor: not only managing the crowd itself, but also trying to isolate troublemakers from the rest. Modern technology works both ways.

On the one hand, smartphones have greatly added to the capacity of hooligans to organise mayhem. On the other hand, advances in pattern recognition make it easier to spot them. De Vries explains: ‘If you have something to hide, this affects your behaviour. In groups of hooligans isolating the group leader can help avoid trouble. It appears that a hierarchy can be traced by tracking the number of handshakes within the group - the person who gets the most handshakes emerges as the group leader. In a railway station someone who joins a queue at the ticket machines, seems to buy one, but then re-joins the queue is probably not there to actually travel, but has other intentions.’

Though laboratory settings can never accurately mimic real life situations, they are useful to study fundamental effects. De Vries supervised an experiment where a group of four students had to perform a task during which one would become the leader of the group. The goal was to see if analysis of video material could help identify who would emerge as the leader. It appeared that high frequency of movement and gestures was an important indicator. In another experiment two groups had to play ‘smugglers and custom agents’. All participants were fitted with GPS-trackers. The GPS data proved to be sufficient to tell who belonged to which group. Though the results are significant, De Vries warns they are still far from fool proof – and even if results would be a hundred percent correct, they would still call for interpretation.

While technology may help in detecting anti-social behaviour or tracking down ringleaders, the question remains: what next? Psychological insights are essential to undertake the right action in crowd control. The availability of technology itself may already change the situation, for better or worse, if people are aware of its potential. De Vries: ‘Cameras in public spaces make people feel more secure, but they also remind them that the situation is potentially insecure. As a consequence people will look differently at groups of youngsters hanging around, depending on the presence of cameras.’

‘TECHNOLOGY PROVIDES NEW METHODS FOR CROWD CONTROL, AS WELL AS NEW CHALLENGES.’

Ultimately, there is intense interaction between crowds, the officials who are to ensure their safety and technology. If engineers and behavioural scientists do not join forces, both may end up designing tools and methods that fail their reality checks.
Disruptive innovations not only change the shape of technology and markets, but often pose legal challenges as well. Building your own electricity grid or flying with a drone in your backyard, for instance, may land you in legal troubles, because lawmakers did not foresee the possibilities created by new technologies. Therefore, to prevent the law from hampering innovation, and indeed to make law facilitate innovation, it is essential to timely investigate legal consequences of technological development.
Almost a century ago a dentist in The Hague used a knitting needle to stop his electricity meter monitoring his power consumption. The public prosecutor then charged him with theft. At the time, theft was defined as ‘taking away a good’ and it was unclear whether electricity was something that could be taken away. The Supreme Court decided that, since electricity had economical value, it should at least be treated as a good.

‘The problem of laws not keeping up pace with technology is hardly new’, says Professor Michiel Heldeweg, who specialises in the legal aspects of innovation. ‘Nowadays, too, there are plenty of developments that escape regulation. Take driverless cars. Their introduction has serious legal consequences, especially when it comes to responsibility in case of an accident. Dutch law only says that the driver of a car must be properly licensed. The issue of a car without a driver is simply not dealt with.’ This doesn’t mean these cars drive around in a legal no man’s land. Many laws allow exceptions to be made, for instance by including a clause that gives authorities the right to bypass, within limits, certain parts of the regulation. But then still it is necessary to think thoroughly about the consequences before applying an exception. Pushing aside the law just because it is inconvenient for technological development is equally undesirable. At the same time, legal regimes can be useful to accommodate technological experimentation.

GRID

Heldeweg has been devoting much attention to the energy grid recently. When the energy market was liberalized, to prevent monopolies, European governments explicitly separated the roles of energy producers/providers and of grid operators. Under the law individuals could become producers, for instance by installing solar panels on their roofs. They are allowed to sell surplus electricity to their energy company, but to collectively set-up and operate a local, smart grid would be against the law. The latter situation was simply not envisaged upon liberalization. Currently, as distributed (or decentralised) energy production is becoming more widespread, for instance a neighbourhood installing its own wind turbine, pressing questions arise – and no easy ones. ‘The technical issues alone are already quite bewildering’, Heldeweg explains. ‘Who owns the neighbourhood grid? Who owns the energy in the grid? Is value added tax owed when you supply your neighbour with electricity? Who is to blame if the system fails? If the majority of people in your neighbourhood joins the system, can you still opt out? Do you want your neighbours to know how much electricity you use and at which moments?’ These issues within a decentralised grid seem complicated enough. However, when you get to regional, national and international levels they are even more complex, because maintaining stability inside the larger, more geographically dispersed grid will become a real challenge. New types of technical and administrative coordination will be necessary, as well as legal rules to determine who decides and on what criteria.

REGULATION

Apart from purely legal and technological questions, there are also political and ethical issues to consider – and not just in the case of the energy grid. ‘Regulation must facilitate socially desirable developments’, Heldeweg remarks. ‘Light touch regulation leaves more freedom to citizens, but does not guarantee a level playing field. Those with more means and expertise already have an advantage, not only when it comes to conflicts of interest between citizens and companies, but between citizens as well. If a neighbourhood grid turns a profit, there’ll be discussions on who is entitled to what. On the other hand, strict regulation may prevent innovation from taking place at all.’ In these situations there are no straightforward answers, which is exactly what raises Heldeweg’s interest. He proposes more room to manoeuvre for local governments, to encourage communities in managing their own energy affairs. ‘As with any technological development the essential thing is that a comprehensive system of checks and balances is put into place, to ensure that the benefits are fairly shared.’
Scientists know the applications they work on will have an impact on society. This is often what drives them. That doesn’t necessarily mean they have a concrete view of this impact, as it is fairly remote from their daily routines. Even so, developing impact scenarios at an early stage could have significant benefits.

Suppose you are a PhD-student, working on a new application of certain nanoparticles. Your first priority will be to get the technology working. This is largely what your thesis will be evaluated on. There is no immediate scientific need to consider the risk your nanoparticles might pose once released into the environment. This will depend on the eventual business model – and that is not your most pressing interest as an up and coming scientist either.

Understandable though this situation is, a scientific project should not be undertaken without a broader understanding of its possible consequences, says assistant professor Kornelia Konrad, who has done extensive research into responsible research and innovation within NanoNextNL, the Dutch national research programme for nanotechnology.

‘The general idea that a broader view is desirable, is easily acknowledged’, she explains. ‘The question is how to implement it. One approach developed within NanoNextNL is giving courses so researchers are stimulated to think about the effects of their own project. Ideally, they should be supported to do this over a longer period of time, which is now done by offering coaching. Currently, a set of tools is under development that may help researchers to assess the consequences of their work.

Nanotechnology has proved to be one sector where uncertainty about effects, as well as about what users precisely need, has resulted in a bottleneck for applications. Scientific breakthroughs are plentiful, but market penetration takes its time in some areas, because companies hesitate as the outlook for commercial performance or social acceptance is vague and uncertain. This in turn may at some point put a break on scientific progress. Hence, the case is clear for nanotechnologists to consider business models and environmental/social scenarios as they are developing their applications.

This is certainly not to say that the issues are less pressing in other fields. Konrad: ‘Although most expertise has been developed in the context of nanotechnology, other fields need to be explored as well, such as ICT and 3D printing.’
DEMANDS ON SCIENTISTS

Konrad and her colleague Bart Walhout, a PhD-student, are now working on the governance of emerging technologies, attempting to take the expertise acquired in Dutch and other national projects to the European level. The aim is to develop a framework for governing research and innovation systems, which builds on existing practices to promote responsible forms of research and innovation. It should facilitate responsible research and innovation for different circumstances and different technology fields.

‘This is not just about the internal workings of science’, Walhout says. ‘There is also a public policy component. For instance, scientists nowadays are almost solely evaluated on their publications and, sometimes, the economic relevance of their research. If other demands are made on scientists, this should be reflected in the way they are funded and evaluated.’

The research programme addresses three levels: the work floor of specific research projects, policy and the intermediate level of technology and application fields. The task is complex, Walhout concedes. ‘Most of the time it simply is not very clear what the impact of some development will be. You may have developed a diagnostic test or a sensor, the function of which is itself evident. Yet it may be difficult to predict how widespread its use will be and in what way it will affect users and their surroundings.’

Complexity and difficulty are no deterrent for ambitious scientists. Actually predicting the future will remain as impossible as ever. However, anticipating possible developments can at least help to carefully steer research and innovation into useful directions. Insights in possible developments can be attained through sophisticated scenario building and developing a toolbox of courses, knowledge bases, protocols for including expertise from various disciplines, public debate, etc.
It is a well-researched phenomenon that consumers will buy more products if they are led through a supermarket counter clockwise. Marketing experts know many more tricks to persuade consumers to buy things. Yet, if a researcher would give consumers a questionnaire about their shopping decisions, few of them would state that they were motivated by the lighting or their route through the shop. Their main motivation is that they need certain products. Nevertheless the influence of unconscious incentives is significant in making them part with their money.

The same might apply to voters, thinks Martin Rosema, who has built a career on researching the psychology of elections. ‘There are plenty of themes to explore’, he explains. ‘How do people decide on which party to vote? How do parties attract voters? Why do people bother to vote at all? What is the impact of assistance tools for online voting?’

Traditionally voter behaviour is studied by asking voters to fill in questionnaires. These certainly tell a lot, as in the case of supermarkets, but much remains untold. Rosema: ‘It is said voters these days vote for party leaders they like rather than policy. That’s only partly true. Policy remains the dominant consideration. It is true that voters are bad at pointing out the motives for their choice. As a result, questionnaires have limitations.’

Unlike shopping sprees elections do not happen on a daily basis, thereby limiting the scope for observation of voter behaviours. Therefore Rosema is opting for another method to lay bare their hidden motives.

**SCANNER**

‘We are planning to combine political science and neuropsychology’, Rosema says. ‘The idea is to put people in an mri-scanner, present them with textual and visual fragments on political themes and see what these do to their brain. We already know quite a lot about where the emotional centres of the brain are located. Therefore, we should be able to see if certain fragments trigger certain emotions. Once we know how to connect emotions and policies we may try to link these to party preferences.’

Jumping to conclusions is certainly a risk, Rosema warns. If, for instance, a picture of an overcrowded boat with migrants triggers the amygdala, the brain centre associated with fear, it could still mean totally different things. One person could fear the boat will sink, while another might fear the migrants taking away his job.
The two ostensibly similar cerebral effects of the same picture would probably be linked to quite different voting behaviour. Rosema thinks that, when treated carefully, physiological reactions to political statements can be a measure of voting intent. ‘In the forties pollsters would visit people at their homes to ask them about their voting intentions’, he says. ‘Quickly they learned to predict which way people would vote on the basis of their living style, even if their research subjects themselves told the pollsters they were undecided. There is really nothing new about trying to predict voting on basis of indirect information. Right now it is far-fetched to think of predicting someone’s vote on basis of a brain scan, but it is not unthinkable.’

‘WE ARE PLANNING TO COMBINE POLITICAL SCIENCE AND NEUROPSYCHOLOGY’

To give an example: winning a football championship can bring a whole country in a very positive mood’, Rosema says. ‘If elections are held shortly afterwards, the outcome will be affected. Ideally, our research could predict which parties were to profit most.’

POSITIVE MOOD

Naturally, political parties, who are already using demographic and other data extensively in their election campaigns, will be interested in getting into the voter’s brain. To a certain extent they already have. Researchers have shown, for example, that using active phrases such as ‘run’ and ‘jump’ in election brochures stimulates people to go to a polling station more than ‘sleep’ and ‘relax’. If such a weak stimulus has a measurable effect, there must be more powerful ones.
Our research focuses on the relationship between citizens and their government in multilevel political systems. Core topics include the legitimacy of government and administration and its relationship with the innovation of governance. In our research, we draw on a broad range of theoretical frameworks and build on insights from a number of social science disciplines. An emphasis on social science methodology is common to all our research endeavours.

Key publications

The research of the group concentrates on governance issues for a wide range of topics related to sustainable development. A first research theme is “sustainable energy transition”. The group provides the social science component of the related UT Route 14 theme and focuses on biobased economy and smart energy systems. A large new FP7 project COMPLEX studies modeling issues in climate mitigation. The extensive work on “water governance” studies the qualities of the governance context in various Dutch, European and global cases of water management and developed its Contextual Interaction Theory into a methodology of analysis. Within the Topsector Water business case Building with Nature also the governance studies are contributed. The group manages the IGS supported Twente Water Centre, representing the whole of the UT water research. The same holds for the global research network “Greening of Industry”. Continuous attention is paid to “regional sustainable development”, that can relate to energy and water, but also often have a broader sustainability outlook including economic and social viability.

Key publications

The research of the department is conducted in the centre for Ehealth & well-being. The mission of the centre is to improve health and well-being of individuals and communities by user-friendly, meaningful, persuasive and adaptive technologies. The center creates synergy in health & wellbeing research through the combination of 4 research labs: Positive Psychology and Technology, Story Lab, Persuasive Health Technology, Self-Management and Health Assessment Lab. These labs capture the available scientific expertise within the department Psychology, Health and Technology to meet interdisciplinary challenge in research and education. When we speak of labs we do not refer to well-controlled situations experiments but to research in the context of daily life and practice. This is where new technologies have to prove themselves.

Key publications
My research focuses on local and regional governance. Major topics include the effectiveness and legitimacy of local democracy, the citizen–government relations, citizens’ initiatives and citizen participation and the constitution of collaborative governance and regional governance.

**Key publications**


The research focuses on public private partnering, strategic planning, and asset management. The research emphasis is on the integration of planning and design and the way interests of stakeholders of the construction process are managed in the planning and design phase. The research group received several grants from NWO, STW and is involved in various EU research projects.

**Key publications**


The research program of the department Research Methodology, Measurement and Data Analysis focusses on the development and application of innovative research methods, measurement methods and statistical methods in educational evaluation and evaluation in health psychology. Regarding educational evaluation, the program focuses on the relation of school factors and educational productivity and effectiveness, and on educational assessment in examinations, tests and educational surveys. Regarding health psychology, the program focusses on innovative measurement methods (such as computerized adaptive testing) of the patient perspective (such as quality of life and physical disabilities). The development of statistical methods focusses on latent variable modeling in a Bayesian framework using Markov chain Monte Carlo (MCMC) computational methods.

**Key publications**


**PROFILED CHAIRS**

Prof. J.I.M. (Joop) Halman is professor of technical innovation, in particular innovation in construction. The research focuses on the organization and management of innovation projects and innovation programs, the methods of decision-making within innovation projects and the diagnosis and management of risks in innovation projects. A specific focus of research concerns the development and implementation of sustainable and cradle-to-cradle concepts in construction.

**Key publications**


Research builds upon Public Law (esp. Constitutional and Administrative Law), and addresses issues of Public Governance in Europe. Core theme is that of ‘Smart Rules & Regimes’, concerning the role of law & regulation in technological innovation. This calls for special attention to: the concept of the regulatory state (e.g. matching public & private interests); the role of hybrid organizations (e.g. PPP) and hybrid regulation (e.g. tradable certificates); legal design methodology (e.g. models & guidelines). Main areas of application are Sustainable Energy, Safety & Security and Telecommunication

**Key publications**

Heldeweg, Michiel A., Maurits Ph.Th. Sanders & Marc Harmsen, Public-Private or Private-Private Energy partnerships? Towards Good Energy Governance in Regional and Local Green gas Projects, Energy, Sustainability and Society, april 2015 (open access/pdf)

Heldeweg, M.A. (2010), Smart Rules & Regimes, Publiekrechtelijk(e) ontwerpen voor privatisering en technologische innovatie, uitgewerkte oratie t.g.v. aanvaarding benoeming op de leerstoel Publiekrecht voor het Openbaar bestuur (Public Governance Law), Universiteit Twente (ISBN 978-90-9025517-0 (194 pp.); tevens open access/pdf)

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Rezaul Kabir is professor and chair of corporate finance and risk management at the Department of Business Administration. The Chair undertakes scientific and applied research related to financial policies of both small and large firms. The research is focused on five themes: corporate finance, entrepreneurial finance, corporate governance, corporate social responsibility and financial risk management.

**Key publications**


The Chair 'Foundations of Science, Technology and Society' takes the assessment and governance of innovations and emerging technologies as its central theme of multidisciplinary research: How do science, technology, politics, and society interact? Studies link analytical and normative perspectives, and consider not only technological innovations but also innovations in governance.

Key publications


His expertise lies in the epidemiology of chronic diseases, particularly rheumatic diseases, analysis of the perception of health and the development of computer adaptive testing by using modern test theory.

Key publications

Sociology of Public Governance studies why some political systems (or subsystems) in complex, technologically advanced societies are quick to adopt certain policies, while others are slower or may never adopt. Beyond observing policy adoption patterns, the Sociology of Public Governance examines if and how such policies are implemented in practice.

Theoretically, the group builds on work in the fields of sociology and public administration, with an emphasis on three strong fields in public administration: (a) inter-organizational diffusion and adoption; policy implementation; and street-level bureaucracy and professional-client interactions.

Key publications


The goal of my research cluster is to place scientific and technological developments - particularly issues of innovation and governance - in historical perspective. With the support of two NWO awards (Free Competition and Internationalisation), special attention is currently given to the long-term development of chemistry; how chemical innovation is embedded in everyday life; the governance of chemical practices and innovation; chemistry and global networks of exchange; chemistry as historical intermediary between science and technology.
PROFILED CHAIRS

The chair Technology Management – Innovation of Operations has three main research lines, mainly at the intersection of innovation and supply management: innovation from and with suppliers (how to recognize and integrate innovative suppliers, the role of the purchasing department in this and its linkages to R&D, the importance of being a preferred customer in order to attract innovations from suppliers), global sourcing and innovative clusters as well as methods of academic-practitioner collaboration (development of consortium benchmarking and world café methods). A typical project is an NRS and industry financed project on “sustainability and innovation in the supply chain”. The chair is member of UTIPS – University of Twente Initiative for Purchasing Studies, one of the two on "sustainability and innovation in the supply chain". The chair is member of IPSERA as one of four global centres of excellence in its business administration related centres of expertise of IGS, also recognized by the academic association IPSELA as one of four global centres of excellence in its field.

The research concerns procurement in the public sector. Topics such as optimal use of the European procurement rules, effective commissioning and purchasing management are central themes. In recent years, special attention is paid to the social domain: the role of the municipality as principal in a triad with care providers and clients. This is not only theoretically interesting, but also has great practical relevance.

Key publications


Key publications


The Center for Higher Education Policy Studies (CHEPS) is research-institute within IGS that is mainly involved in research on higher education policy from an international comparative perspective. Next to the analysis of funding, quality assurance, accreditation, internationalization, study success, academic careers and governance, CHEPS is involved in developing multidimensional classification and ranking systems (U-Map and U-Multirank). Through its policy oriented research approach, CHEPS also strongly contributes to the valorization agenda of IGS. Within the Dutch Review Committee on Education and Research, CHEPS is the driving force behind the content of the Performance Agreements between the higher education institutions and the Dutch Ministry of Education, Culture and Science.

Key publications


Olmos-Penuela, Julia and Benneworth, Paul and Castro-Martinez, Elena (2014) Are ‘STEM from Mars and SSH from Venus’?: Challenging disciplinary stereotypes of research’s social value. Science and public policy, 41 (3). 384 - 400. ISSN 0302-3427


Public management studies how management, collaboration, and regulation promote the public interest. Two specific areas are distinguished: (1) performance and innovations in the public sector, (2) decision-making and policy implementation in complex policy processes. Examples are crisis decision-making, safety, European Union governance, education management, urban studies, policy-learning and experts, industrial relations, and health management. Central to our research are questions how to pursue the public interest in the face of increasing challenges and increasing interdependencies in complex, technologically advanced societies.

Key publications


Our research focuses on the organization of innovation in established firms. We study innovation processes and practices in teams, organizations, and industry networks. In many of our research projects we collaborate with middle-sized and large high-tech companies.

**Key publications**


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How human talent within work settings may be led in ways that result in highly-performing organizations and, at the same time, in the well-being of their key organizational stakeholders such as their employees and clients. This includes change effectiveness (e.g. Lean), effective (employee- and client-) participation modes, and various forms of effective consulting & development and leader interventions: both in (knowledge-intensive) firms and in the public and non-profit sectors. For various firms and organizations, we are engaged in video-taping and analyzing the effective behaviors of leaders and followers during business meetings. In terms of associated teaching, this chair is covering the areas Organizational Behavior and Change Management which is rooted in the areas of I/O Psychology and the Human Organizational sides of Business Administration.

**Key publications**


First author. Co-authors: Younghee Hur, Uco Wiersma, Peter van den Berg & Jaehoon Lee (IPF: 3,262)

2012 A longitudinal study of the effects of charismatic leadership and organizational culture on objective and perceived corporate performance Leadership Quarterly 23, 5, 835-848. First author. Co-authors: Peter van den Berg & Uco Wiersma (IPF: 2,705)

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The research theme of the Chair is: Innovating the Governance of Multilevel Regulation. Research expertise lies in the field of international and European institutional law, with a focus on international and European legal governance, the relationship between the national, EU and global legal order in the context of constitutional questions. These themes are approached from the perspective of new developments and innovations in EU and global governance and multilevel regulation.

**Key publications**

J. Pauwelyn, R.A. Wessel and J. Wouters (Eds.), Informal International Lawmaking, Oxford: Oxford University Press, 2012 (over innovaties in internationaal bestuur)

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