Work Programme 2015-2016

Rathenau Instituut

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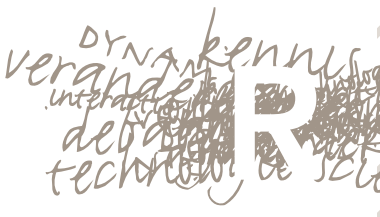

The Rathenau Instituut promotes the formation of political and public opinion on science and technology. To this end, the institute studies the organization and development of science systems, publishes about social impact of new technologies, and organizes debates on issues and dilemmas in science and technology.

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Rathenau Instituut

May 2015

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Work Programme 2015-2016
Rathenau Instituut

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Foreword

The Rathenau Instituut investigates trends in science and technology, interprets their implications for society and policymaking, and encourages public debate and informed decision-making. The institute carries out these tasks in a dynamic arena in which science, technology and innovation are becoming increasingly international, if not global, in nature, the role of government is highly subject to change, and the public is demanding a say in the debate. The institute aspires to serve as an intermediary in this context by building bridges between the often separate worlds of politics and policymaking, science, enterprise, and the public.

The Work Programme 2015-2016 describes the themes and topics that the Rathenau Instituut intends to focus on in the period ahead. To prepare the work programme, we consulted with various parties in the field. We spoke to MPs, policymakers and other stakeholders; we organized focus groups in which citizens were asked to express their opinions about a number of themes for the work programme; and we launched a suggestion box to probe interested parties for their ideas.

These consultations provide an important inspiration for new topics and new emphases within existing topics. They also reaffirm the importance of themes that we are already exploring. The new work programme builds on activities that we carried out within the context of the previous work programme, in that sense offering continuity as well as new avenues of exploration.

We will continue to consult various parties as we implement our work programme. We are seeking to collaborate with partners and stakeholders both in the Netherlands and elsewhere, allowing all parties to derive maximum benefits from one another's experience and expertise. We are further eager to help involve society more closely in the national science agenda, one of the aims identified by the Ministry of Education, Culture and Science in its policy document *Wetenschapsvisie 2025* (Vision for Science 2025).

The Rathenau Instituut's new director, Melanie Peters, will oversee the implementation of this work programme. As the institute's board, we are delighted by her arrival and look forward to a productive partnership.

Gerdi Verbeet
Chair of the Rathenau Instituut Board

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Introduction

Our society is changing rapidly and is facing enormous challenges in many different areas. How do we transition to a sustainable economy that puts much less pressure on our natural resources? How can we get the most out of the advancing digitisation of products and services? What incentives are needed to get an innovative knowledge economy to flourish?

The context in which these challenges are arising is an emphatically international one. Increasingly, the economies of the West must compete with such new economic powerhouses as China, India and Brazil. Greenhouse gas emissions and terrorism are international, if not global, problems. Research too is increasingly taking place within a European and global context. That has become apparent from the ‘Grand Challenges’ that the European Union is addressing in its multi-year research and innovation programme, Horizon 2020.

Science and technology play an important role in tackling these challenges. The expectation is that new research findings and technological innovations will help people live longer, healthier lives, give us safe, healthy food, and provide a secure environment in which to live.

But these trends also raise new questions. Public protests against exploratory drilling for shale gas or ethical questions about genetic screening for health prevention reasons force us to reflect, time and again, on how to incorporate new technologies into society. And how can research at universities be organised in a manner that contributes to economic innovation and addresses public issues?

Trends in science and technology also affect the position of national government. Specifically, they tend to outpace government. In addition, the battle for the world market is increasingly being fought by innovative regions that have been successful at clustering knowledge institutions and economic activity. And there is a growing tendency for businesses, civil society organisations and the public to take the lead in new initiatives, for example the sustainability projects that are being set up by local platforms. All this demands that we reconsider the role of national government and the way responsibilities are divided between government, enterprises and citizens.

The Rathenau Instituut’s mission

The Rathenau Instituut’s task is to contribute to public debate and to help shape political opinion about trends in science and technology. In this work programme, we describe the topics that the Rathenau Instituut intends to focus on in the 2015-2016 period. We have chosen these topics out of the myriad scientific, technological, societal and political/policymaking trends and developments that intersect with the institute’s field of interest, and that we have sketched briefly above.

The Rathenau Instituut plays a role in setting the agenda for public and political debate. We identify trends in science and technology and explore their present or future significance for the public, enterprise, and government. In that sense, we have positioned ourselves in the vanguard of new developments. To do this, we engage with a range of different stakeholders, from ministries to businesses and from environmental protection and patient organisations to experts.

Independent
The Rathenau Instituut is an independent body. We ourselves have no vested interest in the topics that we study and raise for debate. We do wish to see the results of our work make a palpable contribution to public and political debate.

Our independence means we are capable of:

- conducting unfettered research
- shining new light on volatile issues that could end in stalemate
- bridging the distance between academia, politics and policymaking, and society
- bringing diverse parties together to explore solutions
- advising politicians, policymakers and other stakeholders (research and academic institutions, enterprises, civil society organisations), either upon request or at our own initiative
- encouraging the formation of public opinion.

Selection criteria
In choosing the topics that we wish to address, we have applied the following selection criteria, in line with the institute's mission:

- the topics must be related to science, technology and innovation
- the topics must be relevant to society and provoke debate
- the topics must focus on:
  - urgent policy issues over the next two to three years
  - emerging trends that will gain political and policy relevance in the next four to ten years
- the topic must be addressed from a specific vantage point which demonstrates the added value of the Rathenau Instituut's input.

Work Programme 2015-2016 themes
In addition to the selection criteria, we have identified five themes that will provide the basis for our contribution to public and political debate about science, technology and innovation over the next few years.

The themes are:

1. Intimate technology
2. System innovation under pressure
3. Borderless innovation, regional ambitions
4. Science for policymaking
5. Between science policy and research practice

To some extent, these themes build on prior activities carried out within the context of our Work Programme 2013-2014. Appendix 1 shows how the two work programmes are related.

External consultations for the work programme
The Rathenau Instituut consulted various external parties as it prepared its Work Programme 2015-2016. As was the case for previous work programmes, we held meetings with MPs, policymakers, experts, stakeholders and potential partners. Appendix 2 lists the individuals and organisations consulted.

We also created a suggestion box on our website to encourage interested parties to suggest topics for the work programme and indicate the themes and topics that they considered important. Appendix 3 provides a brief description.

We further arranged focus groups in which citizens were asked to express their opinions about a number of provisional themes for the work programme. Appendix 4 provides a brief description.

We used the meetings, suggestion box and focus groups to identify any blind spots in our thinking about work programme topics, and to examine whether what we have emphasised in our themes and topics in fact reflects the concerns expressed in society and in our network. The consultations have led us to introduce new topics (smart farming, smart cities) and emphasise different factors within existing topics (changing balance of power owing to the use of Big Data, the role of higher professional education in innovation), and have reaffirmed the importance of certain topics (facts and figures, privacy, the circular economy, how to deal with data in the medical system, trust in science).

Appendix 5 contains a diagram of the many different topics and trends that appeared on the institute's radar while preparing this work programme.

Methods
The Rathenau Instituut uses a wide variety of methods in developing its themes. We collect and analyse facts and figures about the workings of our innovation and science system; we study new technological trends and the related opportunities and risks; we survey the public's opinions, analyse policy issues, and organise expert meetings, stakeholder dialogues and public debates. In the years ahead, we intend to concentrate on foresight and early warning activities as well, in order to survey future trends in science, technology and innovation and the associated issues that will arise for society.

International collaboration
The Rathenau Instituut is also active beyond the borders of the Netherlands. We collaborate with sister organisations in the EPTA network (European Parliamentary Technology Assessment) and conduct research for the office of Science and Technology Options Assessment (STOA) of the European Parliament and the European Commission. We also participate in EU research programmes along with our sister organisations and other research institutes.

In addition, the Rathenau Instituut is part of a growing international network of embassies and academic partners. For example, we have teamed up with the Karlsruhe Institute of Technology and the University of Tokyo to found the Fellowship for Evidence Based Policy, which organises international seminars.

External assignments
Most of the activities that we describe are funded by the Dutch Ministry of Education, Culture and Science (in the form of direct institutional funding). Other activities are supported by means of project funding awarded by ministries and the European Union. As this work programme gets under way, the institute is awaiting responses to a number of proposals that have been submitted for external funding.

Because the expertise accrued by the institute over time is relevant within a wide circle, the contents of this work programme should be regarded as an invitation to the authorities, research and

academic institutions, partner organisations, enterprises and civil society organisations to utilise our knowledge and experience.

We also wish to create leeway to respond to new developments. For example, in 2014 we joined forces with the Dutch Senate in organising an expert meeting on cyber intelligence.

Reading guide
The present document describes the five themes that will underpin the Rathenau Instituut's contribution to public and political debate about science, technology and innovation over the next few years. It introduces each theme and puts it into context. It then explains the Rathenau Instituut's specific agenda for the theme and describes the topics and activities that will make up the agenda.

The topics and activities are not strictly divided. There is also some overlap between themes. Topics may unite elements taken from different main themes. These overlaps and connections show that current trends in science, technology, society and policy cannot be viewed separately but in fact are interrelated.

The Rathenau Instituut is an independent institute established in 1986 by the then Ministry of Education and Science. Originally, it was called the Netherlands Organisation for Technological Assessment (NOTA). In 1994, NOTA was renamed the Rathenau Instituut in honour of Prof. G.W. Rathenau (1911–1989), Professor of Experimental Physics at the University of Amsterdam and Director of the Philips Physics Laboratory. In 2004, the institute's remit was extended to include the task of Science System Assessment.

The institute is one of the research institutes managed by the Royal Netherlands Academy of Arts and Sciences (KNAW). In 2014, the Rathenau Instituut had 53 employees.

The Rathenau Instituut has four departments. The department of Technology Assessment conducts research into the social significance of scientific and technological trends for society. The Science System Assessment department studies the way in which the science system functions in order to broaden the knowledge base for science policy. The department of Communications is responsible for project and corporate communications. The department of Management and Support is responsible for financial affairs, human resources, secretarial support, IT, and the institute's premises. This department also manages financial affairs and human resources for two other Royal Academy institutes, Data Archiving and Networked Services (DANS) and the Huygens Institute for Netherlands History (Huygens ING).

The institute's director and the four department heads make up the management team. The director reports to the institute's board – which in turn reports to the Minister of Education, Culture and Science – and to the Royal Academy. The director functions as the board's secretary.

The board of the institute adopts a new work programme every other year. The Minister of Education, Culture and Science sends this programme to the House of Representatives and the Senate, along with his or her opinion.

1 Intimate technology

Wearable heart rate monitors, sensors embedded into the walls of senior housing, robots in healthcare, internet dating, implants that monitor and influence behaviour: technology is infiltrating ever further into the private domain. It has made its way into our homes, our relationships, our bodies – even our thoughts and feelings. In other words, it is getting closer to us all the time and has even crept under our skin. It is becoming intimate.

There are many advantages to this trend. It offers us ease, personalisation, independence and safety. The large-scale analysis of personal data can go a long way towards personalising health care, for example. It also offers new avenues for digital criminal investigation and crime-fighting.

But it also raises certain questions and poses certain risks. The loss of privacy has become a widely shared concern in society, according to the focus groups that the Rathenau Instituut held when preparing its new work programme. After all, who will have access to all this personal data and how will it be analysed, combined and shared? What is and is not permissible? Where is the boundary between agreeably intimate and intimidating?

Agenda Rathenau Instituut
In its previous work programme, the Rathenau Instituut described the ever-closer relationship between humans and technology as an intimate-technology revolution. We wish to explore this relationship in greater depth in the coming years.

The public and political debate about encroaching digitisation often focuses on the matter of privacy. But mass data collection can also have huge implications for social relationships. Smart, networked devices that allow people to communicate more rapidly, compellingly and conveniently can give them more control over their lives and empower individuals. However, the growing capacity to track and model individual and collective behaviour can also be used to monitor and influence that behaviour, often without a citizen, consumer or patient being aware of it. The result is a possible loss of autonomy and control. As technology penetrates deeper into our private lives it raises questions about personal identity, social relationships and citizenship.

In the 2015-2016 period, the Rathenau Instituut wishes to put the consequences of the intimate-technology revolution for the relationships between consumers and businesses, citizens and government, and patient and care provider on the political and public agenda. Data profiling, data ownership and the rights of consumers, patients and citizens are key issues in this context.

The hyperconnective consumer
Data-driven business is becoming the new revenue model. Big Data and data profiling promise a more effective, personalised form of service, one that generates more sales and increases consumer ease. But it also raises questions about customer privacy and about data ownership, data quality and data security. What is permissible when marketing products and services based on mass data collection and data combining, for example when deciding on a consumer’s creditworthiness? One relevant point in this regard is the influence of complex algorithms that underpin data profiling and are not always transparent to consumers.

Based on these questions, we wish to explore what conditions must be put into place to exploit the innovative potential of Big Data in a responsible manner. We are working with Eindhoven University of Technology in this context.

The digital citizen
Digitalisation is making the relationship between citizen and government closer. The effect goes both ways: e-participation offers citizens new opportunities to influence political decision-making; e-security gives government more tools to monitor and influence citizens' behaviour. The topic 'The digital citizen' follows from the e-democracy project in our previous work programme and studies how the digital participation of citizens impacts the relationship between voters and those elected and the workings of representative democracy. For example, does e-participation actually lead to a more direct form of democracy?

In today's digital age, it is becoming much easier for crime investigation and security services to track citizens. Investigators hack web forums, link large-scale databases, and use risk profiling as important tools to protect our security. But are there limits to the war on crime and terror? The Rathenau Instituut wishes to consider when the defence of our security conflicts with the legal position of citizens. Where is the dividing line between 'non-conformist behaviour' – which must be tolerated in a liberal system of law – and 'potentially threatening behaviour'? We are building on earlier activities carried out for the Dutch Senate and the European Parliament in this regard.

Dealing with medical data
The healthcare sector and biomedical research are making more and more use of large medical datasets. Besides bodily material, they are storing, sharing and combining digital patient data on DNA, health, illness, and lifestyle. Data-driven research promises to tailor treatment and prevention to our individual health risks. It is also leading to an increase in the number of devices and apps that people can use to monitor their health and fitness. More and more commercial parties are entering this domain; companies like Google, for example, are pushing services designed to store and process personal health data.

In the years ahead, we wish to study what these trends mean for privacy protection, data access and data control. Relevant questions (in this respect) include (the following): Does data-driven research make patients more dependent, or does it empower them? What health benefits can be derived from data-driven research, and who actually benefits? This topic builds on earlier research into public health genomics, e-coaching and the quantified self.

2 System innovation under pressure

A steady stream of new medical devices is allowing for more precise medical diagnoses and care practices that focus increasingly on monitoring and prevention. Smart grids streamline our use of energy, and the self-driving automobile makes more efficient use of the road, reducing traffic congestion. These examples of scientific and technological innovations play a key role in the development of social systems such as healthcare, energy supply or mobility systems.

Such innovations promise improved efficiency, better public health or more sustainable use of raw materials. But experience has shown that new scientific findings and technological innovations do not automatically lead to greater prosperity. Recent discussions have confirmed this, for example about the risk of overtreatment owing to increasingly refined medical diagnostics, or the use of shale gas as a transitional fuel en route to a sustainable energy supply. Innovations can offer new prospects and at the same time be a bone of contention. That is why innovative trends must be properly embedded into society before we can enjoy their benefits.

Agenda Rathenau Instituut
The Rathenau Instituut wishes to focus in this work programme on the use of science and technology for developing system innovations that affect fundamental standards and values. This forces us to reflect on the practices to which such innovations relate. We will look in particular at the use of key technologies for a more sustainable economy and at smart solutions to societal issues. Key technologies such as biotechnology, nanotechnology and synthetic biology allow for more streamlined and sustainable production processes. The chemical industry is already making full use of such technologies, but their application in other areas is often a sensitive issue. We have seen that in the public outcry concerning the use of genetically modified organisms (GMOs) in food. Technological innovations force us to think about what society's concepts of sustainability and naturalness actually mean.

Digital networks, large-scale data processing, computers and robots are being exploited in many different domains to come up with new solutions to societal problems. All these efforts are a powerful boost for innovation. Examples are the smart grids used to create a more sustainable energy supply, the use of robots in healthcare, and the rise of smart cities. One significant pitfall, however, is 'Big Data optimism'. In the meetings that we held with experts to prepare this work programme, it became clear that the use of large-scale databases and their associated algorithms by no means always lead to the desired results. 'Smart' solutions to complex problems require not only technical but also social innovation.

The application of new key technologies such as synthetic biology or the advent of smart solutions are putting pressure on existing regulatory frameworks, for example because it is difficult to predict which problems will arise, because the nature of the stakeholders changes, or because existing regulations do not cover new product categories. Prior research by the Rathenau Instituut shows that system innovation often occurs through platforms on which producers, customers and users of products and services work together in new ways. The question for government is how to ensure that public interests (access to digital infrastructures, anti-monopoly measures) are served in these

networks. That is why one of the Rathenau Instituut's key concerns is regulation as part of system innovation.

The Rathenau Instituut aims to feed the political and public debate with a well-considered analysis of responsible system innovation that takes into account both the potential of innovation and stakeholder input. The promise held out by innovation, whether technological or otherwise, must be seen within its broader societal context. Social innovation and the regulatory issues associated with complex technological innovation play a vital role in this regard. In addressing these matters we intend to focus on the following topics.

Synthetic biology
The European Commission wishes to employ synthetic biology to stimulate a sustainable and internationally competitive bio-economy. For example, oil derived from modified algae can be used to make cleaning products, replacing fossil fuels or palm oil. Environmental protection organisations are revolting against this, however, because they believe that 'synthetic' is incompatible with 'natural'.

The Rathenau Instituut has kept a close eye on the synthetic biology debate in the past few years. We want to take this debate to a deeper level by asking what an ecological and socially sustainable world would be like and whether there is a role for biotechnology in that world. We will work with the National Institute for Public Health and the Environment (RIVM) and the Committee for Genetic Modification (CoGEM) to broaden the stakeholder dialogue about synthetic biology.

Smart Farming
Farmers are making increasing use of automation combined with networks of sensors to precisely monitor and manage the conditions of agricultural production. Precision Livestock Farming, for example, allows them to track and record animal behaviour so that they can fine-tune feeding and dosages of antibiotics to each individual animal while increasing productivity at the same time. Smart farming of this kind fits into the trend of agricultural rationalisation, upscaling and industrialisation.

We wish to explore what this trend means in terms of society's growing interest in sustainability and animal welfare. Is rationalisation and upscaling in agriculture compatible with these values, or do they clash? Smart farming is making this a pressing issue.

Smart city
The smart city is on the rise. The urban fabric is slowly acquiring a digital layer of networks and smart devices that monitor, scrutinise and influence the behaviour of residents, motorists, or pickpockets. Smart local solutions play an additional role in efforts to develop a circular economy, where the aim is large-scale waste reduction and recycling. These 'smart' innovations have many advantages but also raise critical questions: who has access to the data being used? Who owns it? How transparent are the decisions that are taken? How desirable is nudging? Is there a danger that society will be divided into two groups: well-educated 'smart citizens' and lower-educated ones?

By raising these questions, we are building on earlier projects concerning smart mobility and e-coaching. We will elaborate this topic further based on current trends and partners with which we may collaborate.

3 Borderless innovation, regional ambitions

We can observe two interesting but seemingly contradictory trends in the dynamic of research and innovation. The first is globalisation. Research and innovation are not constricted by national or regional borders. Science has traditionally been an international endeavour and is becoming increasingly global in nature with the emergence of China, India, Brazil and similar economies. Top international universities, for example, recruit the best researchers and students from around the world. Corporate R&D activities have also gone global in recent decades.

The second trend is regionalisation. To come up with new, innovative products and services and to find answers to societal issues, knowledge institutions, enterprises and authorities must seek one another out and work together. Their partnerships are often best established if the parties involved are located within close proximity. Clustering knowledge and economic activity leads to innovation hubs and hotspots such as Silicon Valley in the USA or Brainport Eindhoven in the Netherlands. The European Union is also looking to promote regional innovation, with regions building on their existing knowledge and economic activity.

In Europe, a third trend has also emerged: an expanding EU policy on research, innovation and higher education. The European Research Area (ERA) promotes the free movement of knowledge and researchers, coordination between the Member States' research policies, and the development of an EU-wide research policy. Approximately ten percent of the research funding received by Dutch knowledge institutions now comes from EU research programmes.

Agenda Rathenau Instituut
In the 2015-2016 period, the Rathenau Instituut wishes to launch a debate about the meaning of regionalisation, Europeanisation and globalisation for the Netherlands' national science and innovation policy. We are building on our prior research into the globalisation of industrial R&D and the future of Dutch universities. We are also drawing on other studies and reports, including *Naar een lerende economie*(Towards a learning economy) by the Scientific Council for Government Policy (WRR), the survey of top economic sectors by the Advisory Council for Science and Technology Policy (AWT), and studies on the regional economy by the Netherlands Environmental Assessment Agency (PBL).

We also wish to look at the potential for developing a science and innovation policy at the regional level. Given our expertise in the area of science policy, public participation and knowledge co-creation, we can support authorities, knowledge institutions and other stakeholders in developing effective, socially responsible knowledge and innovation policy. Already the Institute receives many requests to do so from both regional and international authorities.

Regional innovation
The economic battle for the world market is increasingly being waged between a relatively small number of globalised, urban regions. Enterprises that operate internationally are seeking out suitable locations around the world for their R&D departments. Regions and large cities are keying into this trend by offering favourable business location factors, including the presence of knowledge

institutions and the availability of knowledge workers. These initiatives are often based on coalitions of universities, research institutes, businesses and governments.

One good example of a regional partnership is Kennis/As Limburg, which asked us to assist in developing its innovation policy. Kennis/As Limburg is made up of an array of parties, including the authorities of the Province of Limburg, Maastricht University, Zuyd University of Professional Education, and University Hospital Maastricht. Together they are investing more than a billion euros in knowledge and innovation in order to boost employment, improve public health and promote education in the region. The dynamic forces that their partnership set off are not only reinforcing the relationship between knowledge institutions and knowledge users in the region, but are also leading to new alliances, for example with the universities of technology in Aachen (Germany) and Eindhoven. They are also boosting Limburg's international reputation, making it easier for the provincial authorities to attract knowledge-intensive businesses.

The Rathenau Instituut wishes to study the precise nature of regional innovation processes, how alliances between public and private parties are created, and what role knowledge institutions play in that regard. We intend to consider the role of universities, non-academic knowledge institutions, and institutes of higher professional and secondary vocational education. One concern is that not every region can move to the top of the international rankings. At present, Dutch regional innovation centres may be too small to compete with other regions in the world marketplace.

European science and innovation policy

The EU's science and innovation policy is one of its strongest and most successful pillars. We need only consider how much European research funding Dutch knowledge institutions and enterprises have been awarded – a sum approximately equal to the budget of the Netherlands Organisation for Scientific Research, the Dutch government's research funding body and a key player in the Dutch science system. But the importance of the international playing field goes beyond the amount of research funding awarded by Brussels. European initiatives such as the European Research Council, the European Institute of Technology, the Joint Programme Initiatives and the Marie Sklodowska-Curie Actions (MSCA) enhance knowledge circulation within the European Union. They are creating dynamic European systems of knowledge-sharing, researcher and student mobility, reputation distribution and alliances.

The growing role of the Union raises various questions that we wish to investigate. The first is how Dutch universities and non-academic institutions can remain or become sufficiently appealing to Dutch and international students, researchers, enterprises and other European authorities.

The second question is how the European areas for research, higher education and innovation relate to Dutch science policy. Smaller EU Member States have long been adapting their research agendas to the priorities of the European Framework Programmes, but that was not, until very recently, the case for the larger Member States. However, the introduction of the European Research Council and the ESFRI Roadmap (published by the European Strategy Forum on Research Infrastructures, ESFRI) is putting increasing pressure on the larger Member States to align their national policy with that of the EU. This trend may mean that national science policy institutions will lose their hitherto uncontested monopoly.

4 Science for policymaking

Government policy has become increasingly evidence-based in the past few decades. Policymakers make more and more use of scientific findings to substantiate their policy decisions. There is much to be said for evidence-based policy of this kind. Many of the issues that we face in our high-tech society are so complex that scientific evidence is indispensable to the policymaking process. Examples include developments in biomedicine, food safety, sustainable energy supply or the opportunities and risks inherent to the information society.

It is often advantageous for policymakers to draw on scientific evidence, but sometimes it can also lead to controversy. The uproar concerning the IPCC's climate assessment reports and the public unrest about the HPV vaccine have led many to ask whether public trust in science is declining.

Research carried out by the Rathenau Instituut shows that the public still holds 'science' in high regard. But its trust declines as soon as research is conducted on behalf of government or businesses. Civil society groups are also critical of what they consider to be 'policy-friendly' interpretations of research results. That became clear during the series of debates on trust in science that the institute organised in cooperation with the Scientific Council for Government Policy (WRR) and the Ministry of Education, Culture and Science in 2014. This triggers the question under what conditions scientific evidence can be used for policymaking purposes without undermining the trust of citizens.

Agenda Rathenau Instituut
The Rathenau Instituut wishes to continue its critical examination of evidence-based policy. We wish to do that by exploring the following questions: how can new relationships be forged between science, policy and society in evidence-based policymaking? What types of public dialogue will that require, and which are feasible? And what do the new relationships entail for the role of publicly financed knowledge institutions and for independent knowledge acquisition?

Non-academic knowledge institutions
Non-academic knowledge institutions – examples include the Royal Netherlands Meteorological Institute (KNMI), the National Institute for Public Health and the Environment (RIVM) and the Netherlands Forensic Institute (NFI) – play an intermediate role between science and policy. They deliver evidence for policymaking or for policy implementation. Earlier research by the Rathenau Instituut shows that these non-academic knowledge institutions are often hybrids: on the one hand they are held to university standards, and on the other are expected to operate as commercial parties. In the meantime, their specific public knowledge function is neglected. In the period ahead, we wish to examine the tension between 'scientific' and 'policy-driven' in more depth, including the question of how best to manage and fund non-academic knowledge institutions.

Independent research
In 'science for policymaking' there is also the question of 'independent' research. Civil society groups are inclined to criticise policy supporting research (often carried out by non-academic knowledge institutions) as 'not independent'. At the same time, universities are increasingly being expected to do their share to solve society's problems, as became clear in the Ministry of Education, Culture and Science's policy paper *Wetenschapsvisie 2025*. The question is how increased social engagement will impact the universities' scientific autonomy.

What is important for both non-academic knowledge institutions and universities is to know what independent research entails and when the independence of research is at risk. We wish to examine what scientific and societal conditions independent research must satisfy. A further question is whether independence is actually the issue , or whether something else is at stake.

Extending the public dialogue

In recent years the Rathenau Instituut has involved itself in forms of citizen participation and stakeholder dialogue. Engaging in dialogue with the public and stakeholders allows us to survey their worries and expectations about societal trends and explore which policy options will have their support.

The institute would like to extend its expertise concerning public participation methods by organising a societal dialogue about controversial energy solutions. Underground storage of carbon dioxide, exploratory drilling for shale gas and wind farms have all met with public resistance. But what does that resistance say about what the public prefers for its future energy supply? What precisely are people worried about? What are the main reasons behind their objections? What types of solutions are most promising? A question in this context is whether citizen participation is always the best response to public resistance. A stakeholder dialogue may be preferable.

How to deal with public resistance is also a key concern within the Fellowship for Evidence Based Policy that the Rathenau Instituut set up with Karlsruhe Institute of Technology and the University of Tokyo in 2013. The Fellowship is an international platform for sharing knowledge and pooling experience with respect to evidence-based policy. In 2015, the Fellowship will organise an international seminar for the second time on the practice of evidence-based policy.

Another activity related to public dialogue is the foresight study on science journalism, which the institute is organising in cooperation with Dutch science journalists. The study focuses on the contribution that science journalism can make to the dialogue between science and society.

5 Between science policy and research practice

The role of universities in the Dutch knowledge society will change dramatically in the future. Student numbers are rising, competition for research funding is growing fiercer, regionalisation and Europeanisation are changing the playing field, and universities are expected to contribute more to innovation. Academic staff are further critical about the disproportionate pressure to publish and what they see as an unfair talent incentive policy.

Nevertheless, the Dutch science system is in a strong starting position: it operates efficiently and performs well in international rankings. In its *Wetenschapsvisie 2025*, the Ministry of Education, Culture and Science looks at ways to continue improving the international position of Dutch science and increase the benefits of research for society.

Studies by the Rathenau Instituut show that it is far from easy to control scientific research through targeted policy. Very often, policymakers have no notion of the effects of policy measures on research practice. For example, 'valorisation' – the purpose of which is to make research findings suitable and available to third parties – has led to a great deal of confusion among researchers. It is often unclear to them what valorisation actually means. Researchers also often feel that their successful attempts at valorisation go unappreciated. Another example is the talent incentive policy in academia, meant to encourage talented researchers as a means of stimulating innovation in science. In practice, that policy often turns out much differently than policymakers had envisaged. It has resulted mainly in fierce competition and standardised notions of what 'being talented' means.

These trends are sparking off a lively debate about the Dutch science policy. But such debate is not unique to the Netherlands; it is also taking place abroad, about such subjects as research funding, the quest for 'excellence', and the benefits of the PhD system. What is striking is that Dutch science policy is often seen elsewhere as a shining example, whereas in the Netherlands we have a tendency to admire the science policy of other countries.

Agenda Rathenau Instituut
The mission of the Rathenau Instituut is to improve our understanding of the workings of the science system, to make the available data accessible, and to collect any data that is lacking. In this work programme, we will therefore continue delivering facts and figures meant to provide an empirical basis for the Netherlands' science policy, and go on tracking the effects of policy measures on the research practice. We would like to offer a more comparative view by examining the differences between disciplines, research areas and societal and economic sectors. We also intend to focus more on international comparisons.

Facts and Figures
In recent years we have invested in our *Facts and Figures* series and our information website www.denederlandsewetenschap.nl (English-language version: www.rathenau.nl/en/web-specials/the-dutch-science-system). This has led to various studies about academic careers, science and innovation funding, patenting, and research evaluation. The emphasis has been on collecting data and making it accessible. In our preparatory meetings for this work programme, various parties stressed the importance of these efforts.

At the request of the Ministry of Education, Culture and Science, we will expand our data collection and knowledge-sharing activities, basing ourselves on the outcomes of the 2014 Inter-ministerial Policy Study (IBO) on scientific research. We will go on issuing our *Facts and Figures* on current policy themes, and intend to expand our information website. Because scientific research is now becoming an international affair, we will expand our work domain by considering international studies, for example by the OECD, and by benchmarking. These and other activities will be implemented in close consultation with a wide variety of partners, including the Ministry, MPs, university administrators, research organisations, journalists, and associations of researchers.

Long-term analyses

To better understand the workings of the Dutch science system, we have conducted various long-term analyses of recurring policy themes in recent years, including research specialisation (focus and mass), research coordination (top economic sectors policy) and the cooperation between scientific and non-scientific parties (knowledge co-creation). Our analyses have produced some new insights, for example that each university develops its own unique arrangement for implementing national policy.

We will be following up these analyses in our new work programme. We are particularly interested in the way that research funding, the research infrastructure budget, and research programming affect the research practice at universities.

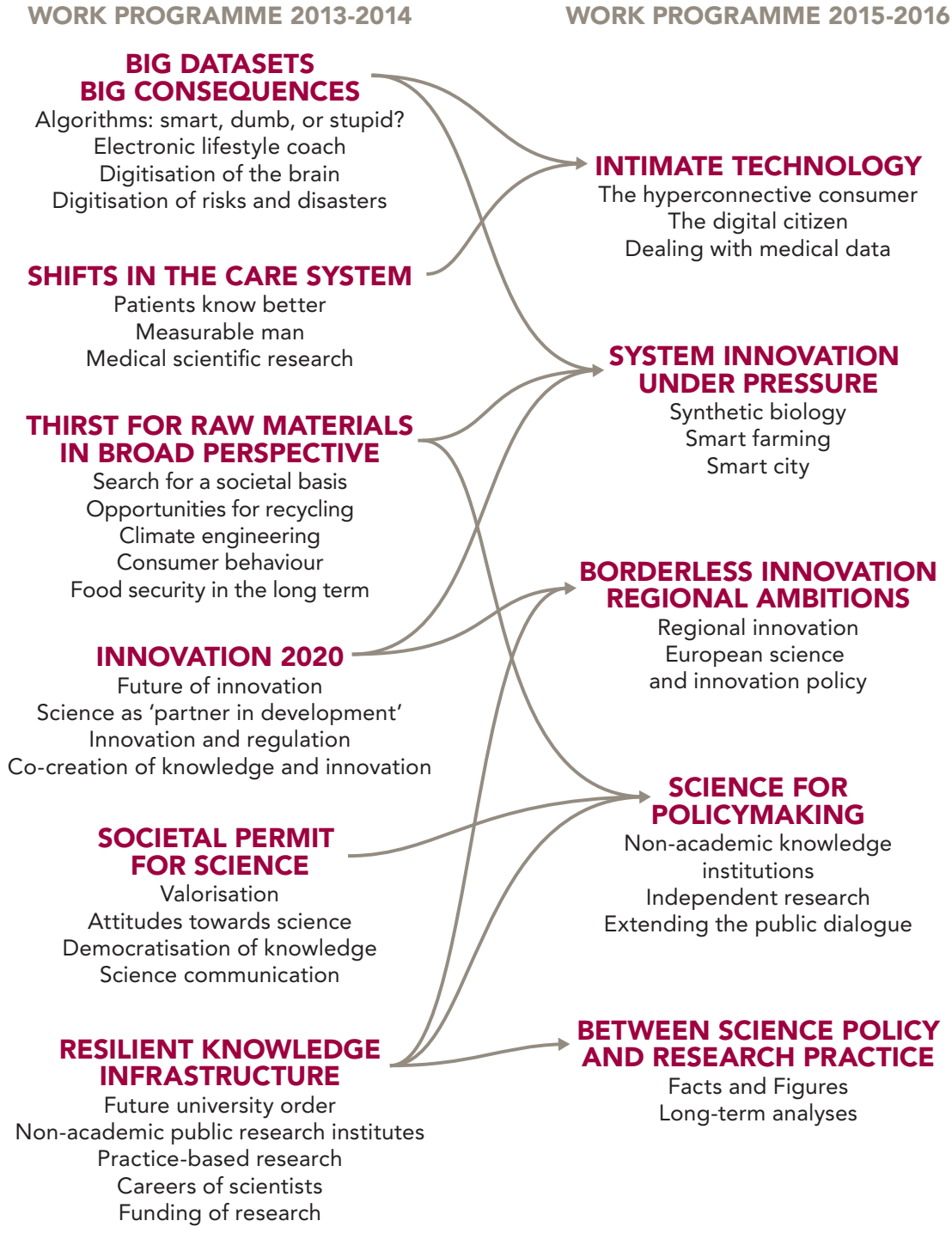
Researchers obtain funding for their work from various sources: direct government funding through the Ministry of Education, Culture and Science, indirect funding through NWO or European research programmes, or third-party funding through businesses, other ministries or fundraising organisations. These sources are becoming increasingly intertwined owing to matching, co-financing and joint programming obligations. We would like to explore the relationship between the various forms of funding and the use that researchers and research groups make of these sources. We also wish to analyse how shifts in research funding are impacting the creation of national and international research facilities, research programmes for knowledge co-creation, and the quest for research excellence. We expect these analyses to further provide input for discussions about the relationship between education and research at universities.

Various policy instruments have been developed in recent years to guide strategic decision-making within research organisations and universities. They include the top economic sectors policy, the ‘Gravitation’ funding programme, and the research infrastructure ‘roadmaps’. The Royal Academy’s ‘Blank Spots’ Committee, which advises the Minister of Education, Culture and Science on potential gaps that could arise in research areas owing to government science policy, has asked the Rathenau Instituut to provide empirical evidence for its follow-up report. We will take this opportunity to study the effects of the policy instruments listed above. The results of our research will also be relevant for the national science agenda envisaged by the Ministry of Education, Culture and Science.

Appendixes

Appendix 1

Relationship to Work Programme 2013-2014



Appendix 2

Consultation partners

Wendy Asbeek	Scientific Council for Government Policy (WRR)
Sebastiaan den Bak	Neth-ER
Ernst Hirsch Ballin	WRR
Jacky Bax	Ministry of Education, Culture and Science
Reinier van den Berg	Netherlands Environmental Assessment Agency (PBL)
Rob Bertholee	General Intelligence and Security Service (AIVD)
Corrien Blom	Royal Netherlands Academy of Arts and Sciences (KNAW)
Annelien Bredenoord	UMC Utrecht, Young Health Council, The Young Academy
Ton de Bruin	Dutch Association of Insurers
Marc Chavannes	journalist, Rathenau Instituut Programme Council
Dorette Corbey	Advisory Council for Science, Technology and Innovation (AWTI)
Hans Dagevos	Agricultural Economics Research Institute (LEI), Wageningen University and Research Centre
Wim Deetman	Netherlands Council of State, Rathenau Instituut Programme Council
Richard Derksen	Ministry of Education, Culture and Science
Paul Diederen	AWTI
Lianne Doeswijk	Council for the Environment and Infrastructure (Rli)
Gert Eggink	PBL
Emiel Elferink	CLM
Mariken Elsen	Netherlands Organisation for Scientific Research (NWO)
Koen Frenken	Utrecht University
Hans de Groene	NWO
Thomas Grosfeld	Confederation of Netherlands Industry and Employers VNO-NCW, Dutch Association of Small and Medium-Sized Enterprises (MKB-Nederland)
Willem Halffman	Radboud University, H.NU
René Hageman	Association of Universities (VSNU)
Charlotte van Hees	VSNU
Tom van der Horst	Netherlands Organisation for Applied Scientific Research (TNO), The Hague
Caroline Keulemans	House of Representatives
André Knottnerus	WRR
Coenraad Krijger	NWO
PG Kroeger	ScienceGuide
Nicole Lemmen	Dutch Association of Insurers
Leendert Looijenga	Federa, UMC Erasmus
Jennifer Lynch	Electronic Frontier Foundation (EFF)
Lian Merkx	Association of Netherlands Municipalities (VNG)
Emmo Mijer	Friesland Campina, AWTI, TI Food & Nutrition
Wijnand Mijnhardt	Utrecht University, Science in Transition

Theo Mulder	KNAW
Helga Nowotny	former chair of the European Research Council (ERC)
Hans van Oers	National Institute for Public Health and the Environment (RIVM)
Yvette Oostendorp	Rli
Jeannette Ridder	Ministry of Education, Culture and Science
Sybe Schaap	Senate, Liberal party (VVD), Committee for Genetic Modification (CoGEM)
Willem Schinkel	Erasmus Universiteit Rotterdam, The Young Academy
Tineke Slagter	Senate, Socialist Party (SP)
Jack Spaapen	KNAW
Hendrik Steringa	Nederland Krijgt Nieuwe Energie (NKNE)
Geert Jan Sweers	Centrum Valorisatie en Ondernemerschap, HAN University of Applied Sciences
Kees Verhoeven	House of Representatives, Democrats 66 party (D66)
Jan Vos	House of Representatives, Labour Party (PvdA)
Marijke Vos	Senate, Green Party (GroenLinks), Rathenau Instituut Programme Council
Aline Wanrooij	Ministry of Education, Culture and Science
Wouter van der Weijden	CLM
Rob Weterings	Assurance Committee for the SER Energy Agreement for Sustainable Growth
Tal Zarsky	University of Haifa, Israel

Appendix 3

Suggestion box

To prepare for the work of assembling the Work Programme 2015-2016, the Rathenau Instituut asked Bureau Veldkamp to set up a suggestion box to find out what members of the institute's own network (its stakeholders) thought of a number of provisional work programme themes.

The suggestion box took the form of an online questionnaire (Computer Assisted Web Interviewing, CAWI) hosted on Bureau Veldkamp's server. The questionnaire was online from 27 August to 2 October 2014.

The Rathenau Instituut drew attention to the suggestion box within its own network, for example in its online newsletter and on the popular science news website Scientias.nl. A link provided easy access to the questionnaire.

The first item of the questionnaire was an open question and asked respondents to suggest topics for the new work programme. They were also asked to explain their suggestions. The questionnaire then presented a number of themes in random order that the Rathenau Instituut had selected in advance. Respondents could indicate how important they found these themes. The questionnaire then listed a number of topics belonging to themes that respondents had marked as important, once again asking them how important these topics were to them. The questionnaire concluded with a request to provide certain demographic details.

A total of 127 respondents completed the questionnaire. There were also respondents who only answered the first, open question. Their suggestions were included in the report on the findings.

That report can be found (in Dutch only) at www.rathenau.nl/wpideeenbus.

Appendix 4

Focus groups

To prepare for the work of assembling the Work Programme 2015-2016, the Rathenau Instituut asked Bureau Veldkamp to arrange a series of focus groups exploring what the public thought of a number of provisional work programme themes.

A total of 48 persons took part in the focus groups. The participants were recruited by a professional selection agency. To ensure that the discussions went smoothly and provided useful information, the participants were grouped according to educational background. A total of six group discussions took place, three with participants with an education level of secondary vocational education or lower and three with participants who had received higher education. Each group was evenly balanced in terms of gender, age and occupation.

In each focus group, Bureau Veldkamp raised two provisional themes for discussion that the Rathenau Instituut had selected in advance. The sessions took place on 26 August, 28 August and 2 September 2014 and lasted two hours. Two sessions took place in Amsterdam, and four in Amersfoort.

The table below provides the date, location and theme of each interview.

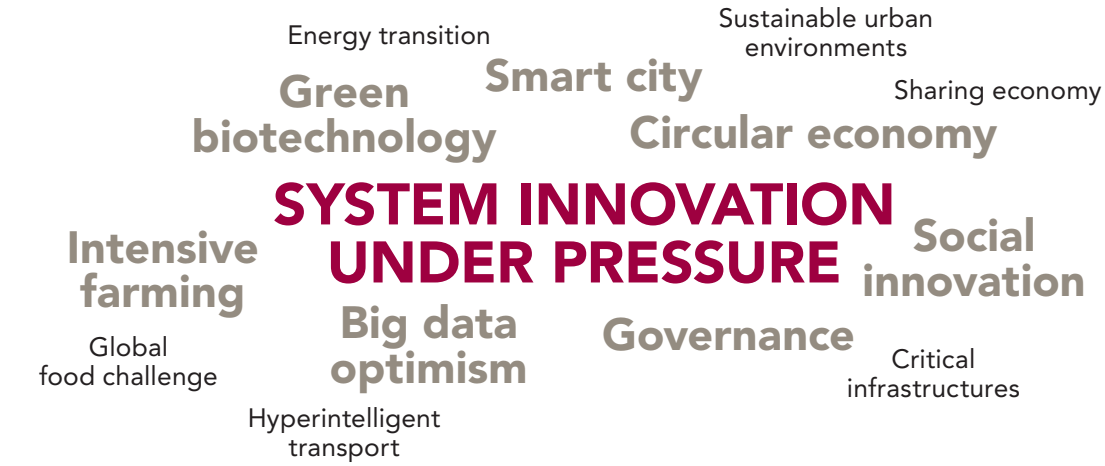
datum	locatie	thema's
Tuesday 26 August 2014	Amsterdam	• surrounded by technology • university and society
Thursday 28 August 2014	Amersfoort	• sustainability • useful science
Tuesday 2 September 2014	Amersfoort	• innovation: regional development • medical care in the future

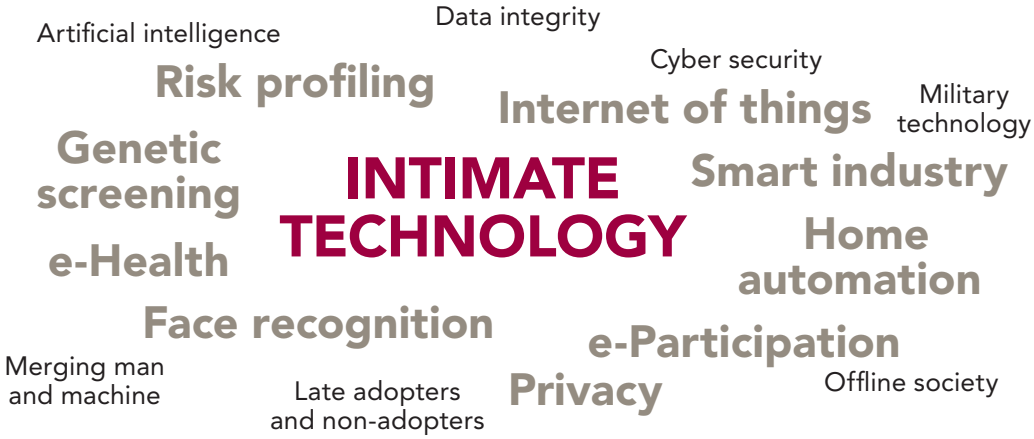
A report on the interview findings can be found (in Dutch only) at www.rathenau.nl/wpfocusgroep.

Appendix 5

Summary of themes

Summary of the five themes and related subjects




Artificial intelligence
Data integrity
Cyber security
Risk profiling
Internet of things
Military technology
Genetic screening
INTIMATE TECHNOLOGY
Smart industry
e-Health
Home automation
Face recognition
e-Participation
Merging man and machine
Late adopters and non-adopters
Privacy
Offline society

Risk communication
Independent research
Market-based competition
Public engagement of scientists
Changing roles of government
Winners and losers of innovation
SCIENCE FOR POLICYMAKING
Citizen participation
Evidence based policy
Trust in science
DIY democracy
Social media hypes
Public controversies
Responsible Research and Innovation

Big data in research
Synergy between education and research
Open data
Absorptive capacity (for knowledge)
Vision for science 2025
Large-scale research facilities
BETWEEN SCIENCE POLICY AND RESEARCH PRACTICE
Europeanisation
Scientific excellence
Public function universities
Career perspectives of PhD's
Amateur science
Social sciences and humanities
Brain circulation

Who was Rathenau?

The Rathenau Instituut is named after Professor G.W. Rathenau (1911-1989), who was successively professor of experimental physics at the University of Amsterdam, director of the Philips Physics Laboratory in Eindhoven, and a member of the Scientific Advisory Council on Government Policy. He achieved national fame as chairman of the commission formed in 1978 to investigate the societal implications of micro-electronics. One of the commission's recommendations was that there should be ongoing and systematic monitoring of the societal significance of all technological advances. Rathenau's activities led to the foundation of the Netherlands Organization for Technology Assessment (NOTA) in 1986. On 2 June 1994, this organization was renamed 'the Rathenau Instituut'.

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