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TNO report

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Progress report for 2013 on the Behaviour and Innovation Enabling Technology Programme Knowledge as Power with reference to the themes for 2011-2014

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Management summary

The ‘Behaviour and Innovation’ Enabling Technology Programme (ETP) was set up in 2011 with the object of developing generic knowledge concerning the explanation and modification of human behaviour, organizations and systems.
A multidisciplinary, multi-level approach embracing the whole of TNO is used to develop models, methods and toolboxes that can be used to bring about behavioural change, community interventions, system innovation and social change. The programme is structured according to seven research questions, each of which has yielded generic knowledge relevant and applicable to the key themes of TNO.

The main results achieved in 2013 are summarized in the table below, in comparison with the ambitions for the end of 2014 as laid down in the programme mission document for the period 2011-2014.

Level	Ambition for 2014	Main result in 2013
Micro	We are able to measure and model human behaviour and to develop personalized interventions on this basis.	The models and tools for behavioural change that have been developed have been used in various fields.
Meso	We provide insights and tools that can be used to improve the performance and learning of organizations.	A theory of behaviour in motivation and organization has been developed to underpin the concept of social innovation.
Macro	We develop and combine knowledge and methods that can be used to speed up complex social innovation processes.	A multi-level model has been developed to deal with mobility problems.

In line with the roadmaps each ETP-project has drawn up in 2013, the research issues are worked out in several projects.

At the micro level, the descriptive behavioural models developed by the ETP in previous years have in 2013 been largely converted into simulation models, and have been tested on a number of data sets. At the meso level, TNO has set up cooperation with a number of international partners to work on the theoretical underpinning of the general principles of social innovation. At the macro level,a start has been made with the empirical validation and application of a multi-level model of mobility behaviour.

The results of the ETP projects were used in national and international knowledge projects in 2013. Furthermorelinks exist with a large number of academic partners through joint supervision of PhD students, professorships and cooperation in various knowledge projects won in competitive tenders.

Contents

1 Introduction

Both TNO's demand-driven innovation objectives and the organization's Enabling Technology Programmes (ETPs) are described in TNO's Strategic Plan for the period 2011 – 2014. Apart from demand-driven knowledge development managed by the various departments, TNO has a number of exploratory research programmes aimed at renewal of its knowledge base: the ETPs.

The choice of topics dealt with in the various ETPs is based on an analysis by the TNO Themes, leading to identification of the knowledge breakthroughs needed for multiple Themes to achieve their objectives. These knowledge breakthroughs are further developed into new concepts.

The ETPs derived from this selection process must:

- be aimed at technology breakthroughs permitting faster realization of the innovation objectives in several themes;
- lead to a world-class knowledge position in terms of mass and focus in the medium to long term, which is distinctive and complements that of TNO's knowledge partners, reflecting the uniqueness of TNO's contribution;
- reflect TNO's multidisciplinary power by combining inputs from different disciplines so as to achieve real breakthroughs.

The ETPs started in 2011, and consist of the following six focused multidisciplinary programmes: Models, Sensor Networks, Material Technology, System Biology, Behaviour & Innovation and Strategy & Change.

The point of departure of the Behaviour and Innovation ETP is that the behaviour of individuals (at the micro level), organizations (at the meso level) and government and industrial clusters (at the macro level) determines the ultimate success of technological and social innovations[1]. The intended products of the Behaviour and Innovation ETP are instruments (such as innovation monitoring tools, human behavioural models and new organizational innovation methods) and evidence-based interventions (such as virtual coaches and the use of social media). These generic results will be tested by applying them to specific problems.

The present report shows at high level the progress made within the programme. The results of the individual projects are laid down in publications, reports and conference proceedings. As requested by the Dutch Ministry of Economic Affairs, this output can be viewed on TNO's website[2].

[1] OECD Industry, Innovation, and Entrepreneurship committee report, New Nature of Innovation, 2009.
[2] Insofar as this is allowed by security, copyright and similar constraints.

2 Objectives of the Behaviour and Innovation ETP

The ‘Behaviour and Innovation’ Enabling Technology Programme (ETP) develops generic knowledge about the explanation and modification of human behaviour in relation to system innovation. A multidisciplinary, multi-level approach is used to develop models, methods and toolboxes that can be used to bring about behavioural change, community interventions, system innovation and social change.

The objectives of the programme are twofold:

- Firstly, the programme uses an innovation management approach to deliver tools and methods that can be used to bring innovation to the application stage faster and more effectively. We know that there is a need for this, because innovations all too often fail along the pathway leading to the end-user (90% of all innovation investments do not achieve the desired result). Insufficient understanding of the nature of the pathway and of the means that can be used to promote flow along it, together with underinvestment in development (financing is mainly aimed at implementation and demonstration of the desired innovation), are important factors in this process.

- Secondly, the ETP develops generic instruments that can be used to influence and model behaviour, and studies the behavioural rules that govern the interaction between systems and individuals. There is a need for this because the forces driving human behaviour in a number of major social problems that afflict our society, and in the introduction of innovative technologies, are still insufficiently understood.

3 The main lines of the Behaviour and Innovation ETP

The ETP Behaviour and Innovation addresses research questions at three different levels – micro, meso and macro – and aims at a number of specific breakthroughs at each level (see Figure 1).

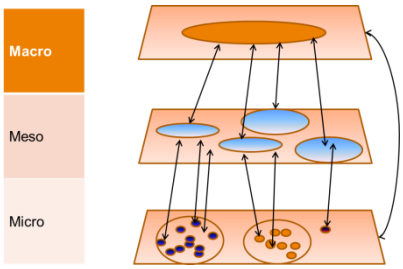


Figure 1 Multi-level approach to research questions in the Behaviour and Innovation ETP.

3.1 Micro level

The main lines of knowledge development in the area of behavioural research are:

- *Evidence-based interventions for individual and group behavioural change*: these projects focus on behavioural models for citizens. The traditional approach here is to influence citizens by means of regulations, facilities and information. It has been found in various fields that such measures do not have the desired effect. Behavioural models have two significant advantages here: they allow measures to be taken and modified to meet specific requirements; and they allow interventions to be evaluated in a “laboratory setting”, which is not possible in practice with most traditional measures. Laboratory tests can explain why the intended effects are or are not achieved. Finally, it may be noted that behavioural models can be used in combination with new media in micro-level projects, to enable measures to be adapted to suit the characteristics of the individual member of the public concerned. This approach allows tailored communication methods to be developed with minimum effort, to replace the universal communication that used to be dominant. A range of tools derived from these behavioural models may be marketable in the long term.
- *Optimisation of natural human-system interaction*: an understanding of human-system interaction (such as operator control of automatic chemical processes) is important for improving such interaction. The projects in this field make use of 4th-generation personified human-system interfaces, with the aim of building three demonstration set-ups incorporating such interfaces for use in different sectors – in particular education (a smart playroom and learning environment), and care (virtual companions for the elderly and virtual coaches to provide guidance and feedback for professionals).

3.2 Meso level

The main lines of knowledge development at the meso level are:

- *An organizational model to reinforce innovative capacity*: current innovation models pay insufficient attention to the details of organizations. The existing models tend to regard an organization as a “black box”. Our projects in this field aim to give a more detailed description of the workings of this black box.
  The organizational model under development will help to enhance the innovative capacity of organizations and organizational networks, so that organizations have a better idea of the conditions they need to monitor when introducing innovations and the steps that need to be taken to increase the acceptance of such innovations. The model will be delivered together with a set of tools that can be used for effective management of innovation processes in an organization or network of organizations, including:
  - Tools for diagnosis of innovative capacity;
  - Tools for effective organization of innovation processes, bearing in mind the complexity and dynamic nature of such processes;
  - Tools for monitoring innovation processes, with a built-in learning function;
  - Tools for scaling an innovation, so that it has more impact than a mere successful pilot project.

3.3 Macro level

The main lines of knowledge development at the macro level are aimed at building an *innovation model at the society level, based on a complexity and emergence approach*. This approach is needed because existing models (of transition management, planned social change and the like) largely assume unicausal relationships. This model is made applicableby way of of a toolbox (a set of well-founded, effective methods and instruments) comprising the following elements:

- An innovation diagnosis tool for recognizing basic patterns during the implementation phase and pinpointing expected opportunities and difficulties.
- An innovation strategy design tool, using the output from the diagnostic tool and taking the complexity and dynamics of the innovation process into account.
- Innovation monitoring and evaluation tools with a built-in learning function, which help to address one of the key problems in this field of research: the actual ability to measure the implementation or use of innovation. The learning function also helps those most directly involved in the innovation process to take corrective action in situations characterized by complexity and emergence.
- Intervention tools, mainly intended to influence the acceptance and use of innovative products and services at the micro (end-user) level. Apart from this, interventions such as “living labs” or niche experiments provide very useful learning opportunities in preparation for the upscaling and diffusion of innovation.

3.4 Behaviour and Innovation ETP Portfolio for 2013

The objectives of the following three research projects were updated in 2013, on the basis of the transfer of the built-up “mature” knowledge to TNO’s demand-driven research programmes and the annual portfolio evaluation:

- Innovation in the health promotion sector;
- Organizational behaviour;
- Complex systems.

Monitoring indicators for the ETP portfolio include the technology development level of each project and the extent to which the knowledge objectives have been achieved.

The technology development level is assessed with the aid of the Technology Readiness Level (TRL). This measure is on a scale from 1 (a basis for development has been laid) to 9 (the knowledge or other product in question is fully developed and ready for deployment). Research topics that have reached the level TRL>6 are in principle allotted to one of TNO’s demand-driven programmes for further development.

Plotting the TRL score of all projects against percentage completion as shown in Figure 2 indicates that the topics dealt with in three projects have reached the stage where they are ready for transfer to the demand-driven programmes.

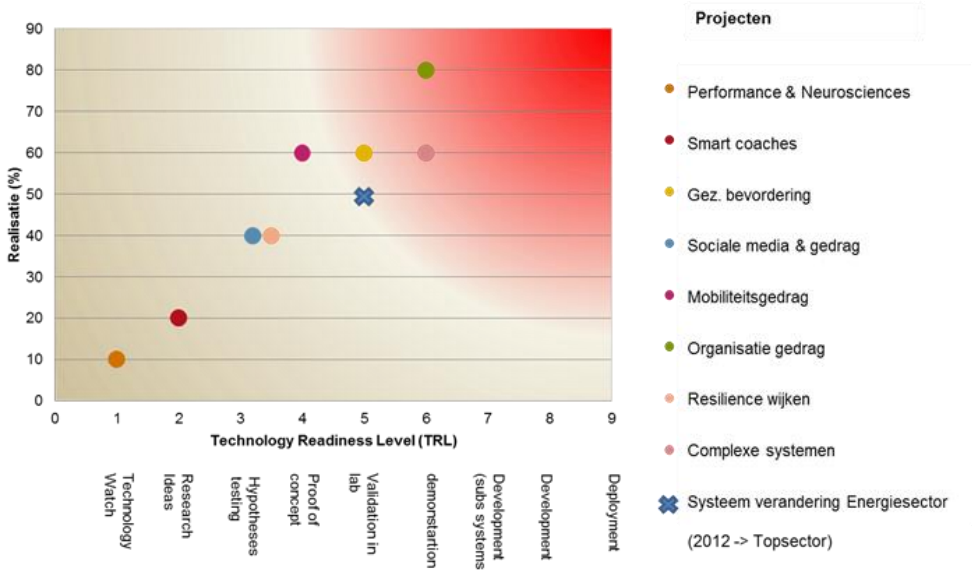


Figure 2 Classification of the ETP projects in 2013 on the basis of the Technology Readiness Level (TRL) scale and the extent to which the knowledge objectives have been achieved.

4 Implementation in 2013

4.1 Governance

The progress made by Behaviour and Innovation ETP in 2013 was discussed with the ETP steering committee, which has as its members representatives of the relevant TNO themes: Prof. E. Fledderus (Information Society), Prof. P. Bongers (Healthy Living), Dr. B. Don (Defence, Safety & Security), Dr. ir. M. Jak (Transport & Mobility), Dr. M. Linde (Built Environment), Dr. A. van Berkel (Industrial Innovation) and Drs. S. van Kooten (Energy). The steering committee is chaired by Dr. A. Sanderman, Managing Director of TNO Behavioural and Societal Sciences (TNO BSS)[3].

The steering committee has a number of formal meetings, where minutes were taken. The relationship with demand-driven TNO programmes is structured by the input from the representatives of the various TNO Themes.

The ETP is subject to a certain degree of demand-side management from the Dutch government, in the sense that a coordination meeting attended by representatives of various government departments is held twice a year under the aegis of the Ministry of Economic Affairs.

4.2 Progress compared to planning

The seven ETP programme lines were implemented in 2013 largely as laid down in the 2013 plan as regards content and budget. Four of these were associated with a research case within a TNO theme, and three were methodologically integrated with most or all themes at all research levels (micro, meso and macro) as shown in Figure 3. A new research project introduced in 2013 explored applications of neurocognitive sciences to speed up and improve learning, as part of the “Smart coaches” research line.

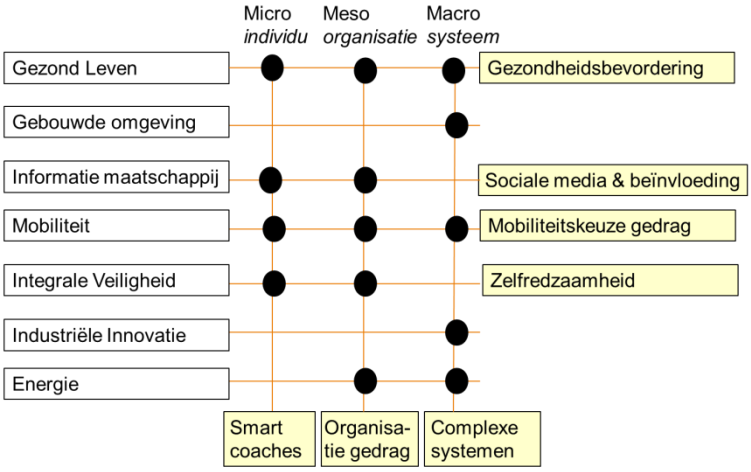
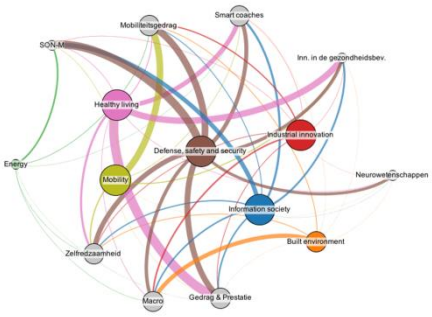


Figure 3 The ETP projects (yellow) linked with a research case within a TNO Theme (grey).

[3] P. Schülein replaced Dr. Sanderman from mid-2013, and holds the position of acting chairman.

4.3 Cooperation with other ETP programmes

The ETP Behaviour and Innovation is working together with the ETP System Biology on a joint study of system change in diabetes care. Behaviour and Innovation will apply knowledge of system transitions and behavioural change methodology to this problem. Behaviour and Innovation is also working together with the ETP Models to apply theoretical knowledge on agent-based modelling to the simulation of human behaviour.



4.4 Cooperation with academic institutions and major Dutch research institutes

The ETP Behaviour and Innovation has an active policy of maintaining existing links with major academic and research centres, and building up new ones in the research fields of interest. The four professors and 11 PhD students mentioned in Table 1 play a major role in this connection, and provide the basis for the influx of high-quality fundamental knowledge.

Table 1 Academic relationships with the Behaviour and Innovation ETP.

(part-time) professors	PhD students
Prof. S. Dhondt (University of Leuven)	2 from University of Twente
Prof. J.M. Schraagen (Univ. of Twente)	1 from Groningen University
Prof. J. Kerstholt (Univ. of Twente)	1 from Erasmus University Rotterdam
Prof. M. Martens (Univ. of Twente)	1 from VU University Amsterdam
	1 from Maastricht University
	4 from University of Leuven
	1 from Utrecht University

The ETP Behaviour and Innovation recognizes the importance of maintaining contacts with The Dutch National Institute for Public Health and the Environment (RIVM), the Energy Research Centre of the Netherlands (ECN) and Wageningen University & Research Centre (WUR) in order to monitor their shared fields of interest.
Behaviour and Innovation exchanges developed methodologies and the results of care system modelling with RIVM. We work together with ECN to explore the possibility of using our behavioural models in combination with ECN's insights and data on household energy consumption. The various knowledge project teams maintain contact with Dutch academic institutions and expertise centres (such as the Netherlands Organisation for Health Research and Development ZonMw, Utrecht University, Erasmus University Rotterdam and the University of Maastricht) and leading academic centres abroad (MIT and the University of Leuven), and has participated in competitive knowledge calls (see section 4.6).

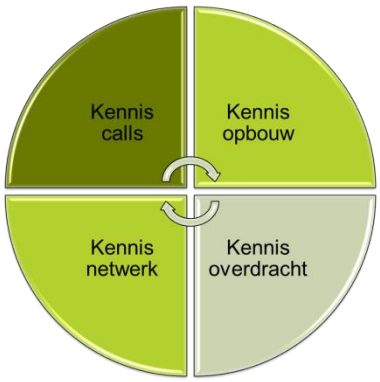
4.5 Participation in consortia and networks

TNO staff working on the ETP Behaviour and Innovation projects have participated in joint initiatives and networks, as evidenced by::

- PhD positions
- Participation in the National Dutch Expert Group on Self-reliance
- Participation in the Mobility Knowledge Institute;
- The Dutch Centre for Social Innovation;
- Smart Work Smart Travel Platform;
- Knowledge Centre for Behaviour-oriented Health Promotion (together with the University of Maastricht);
- European Workplace Innovation Network.

4.6 Initiatives in national and international knowledge calls

In order to improve cooperation with third parties and add mass and focus to the issues addressed in the ETP, a large number of proposals in competitive knowledge calls for 2013 are submitted together with partners:



- Human Capital programme funded by the Dutch scientific research organization NWO: 2 proposals together with Inscope;
- EU-funded CORTEXS multidisciplinary research project on Care Organization: proposals for the strategic basic research (SBO) project organized by the Flemish Agency for Innovation, Science and Technology, by TNO together with the universities of Leuven, Amsterdam, Ghent, Brussels (VUB), Hasselt and Singapore;
- Seventh EU Framework Programme for Research and Technological Development (FP7)-SSH 2013 SI-DRIVE Social Innovation: Driving Force of Social Change: joint proposal with 25 partners;
- FP7-SSH 2013 SIMPACT Boosting the Impact of Social Innovation in Europe through Economic Underpinning: joint proposal with 8 partners;
- FP7-ICT 2013 Collaboration Capabilities: proposal concerning the SSL-erate project for speeding up the uptake of high-quality solid-state lighting (SSL) in Europe;
- RESCAS Supporting organizational resilience in complex adaptive systems (part of the Liideri programme for workplace well-being, supported by TEKES, the Finnish Innovation Funding agency): joint proposal with VTT Finland;
- Norway: Dialogues on Innovation proposal (University of Agder);
- Spain: “Programma Estatal de I+D+I orientada a los Retos de la Sociedad”, Social Innovation Maps (SIM) project;
- Netherlands: NUTS/OHRA insurance: social touch for the elderly;
- KP7 ICT 2013 With-Me;
- KP7 ICT 2013 Social innovation and health promotion;
- KP7-ICT 2013 Ibelive;
- FP7-ICT 2013 Collaboration Capabilities: proposal concerning the ARTEMIS (Advanced Research & Technology for Embedded Intelligence and Systems) project;

- Joint Programming Initiative A Healthy Diet for a Healthy Life: proposal concerning DEDIPAC, a knowledge hub on the Determinants of Diet and Physical Activity Choice;
- US Applied Research Laboratory (ARL). Proposal on PhD research in Neuroscience;
- R&T EU: Social Media for Defence (SOMED);
- Modelling Online herding Behaviour – Strategies for empowering crisis communication (project co-financed by the Dutch Ministry of Economic Affairs): joint proposal with KPN, Achmea, SNS Reaal;
- FP7 Security 2013 DP2. Aftermath Crisis Management: joint proposal with 10 partners.

4.7 Dissemination of knowledge

The knowledge built up in the Behaviour and Innovation ETP is shared with our peers in various ways (see Figure 4). Apart from peer-reviewed publications (20) and books or book chapters (3), our staff published in Dutch professional journals (9),and TNO reports (12). Also, the results of the various projects were presented at a large number of national and international congresses (38).

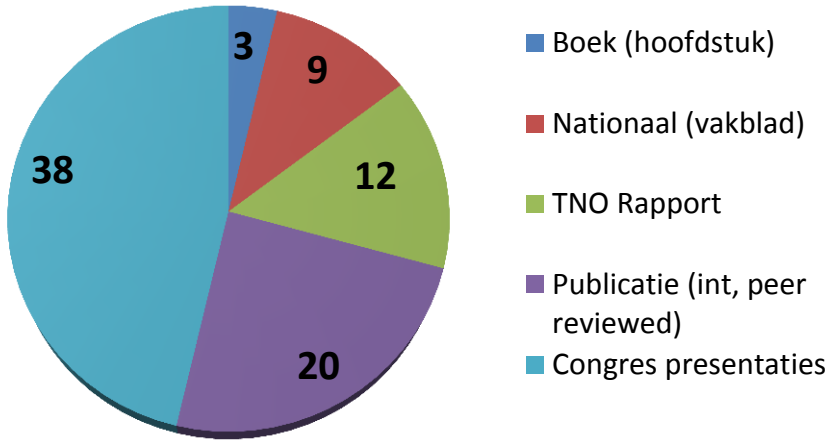


Figure 4 Knowledge dissemination in 2013.

A detailed list of the various types of output is given in Appendix A. The TNO reports and publications will be available on the TNO website, as far as copyright and other constraints permit this.

5 Highlights

Below, the highlights of the results obtained in 2013 at the three levels of the Behaviour and Innovation ETP are given.

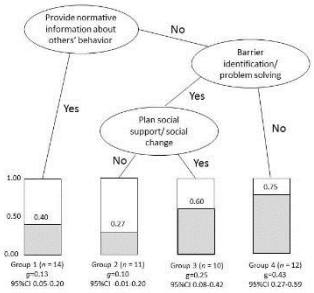
5.1 Micro level

5.1.1 Health promotion

It is becoming increasingly obvious that people's health-related behaviour is strongly influenced by their social environment, and that behavioural change is easier to achieve if people are properly motivated. This demands complex, tailor-made interventions to support people in situations and at moments when they find it difficult to behave in the right way.
These interventions should where possible bring about changes in the environment that benefit the desired behaviour. The methods of behavioural change studied in the ETP include the learning of self-regulation skills (planning, monitoring, evaluation and (social) rewards), implicit behavioural change (for example, teaching desired cue-response associations), avoiding undesired responses (for example, by attentional retraining) and facilitating desired choices by timely use of nudge techniques.

A multi-level model for the prediction of snacking behaviour was developed in 2013 based on a data set concerning the eating behaviour of secondary vocational school pupils in the Netherlands. The model showed that snacking behaviour depended strongly on the location, the social context and the availability of snacks, and was not the result of a deliberate decision to enjoy a snack.
The factors used in the model provide a basis for the application of implicit behavioural change techniques. A new statistical method has been used to create the optimum mix of the various interventions. This approach makes it possible to investigate which combination of factors enhances the effectiveness of interventions, and which combinations actually cancel one another out; this had not been possible in the past using conventional meta-regression techniques.
Evaluation of more than 200 studies allowed us to identify the optimum combination of techniques and to develop a prototype serious game tool offering maximum user interaction in the form of real-time situational feedback based on presentation of obstacles or encouragement derived from analysis of the gaming results achieved by individual players.

This game application, known as “Balance it”, is not restricted to the snacking behaviour mentioned above but permits dynamic evaluation of self-regulation techniques in the wider field of diet and physical activity.



The principles can be applied to various situations where self- regulation and failure to achieve adequate self-regulation play a role: this wide range of applicability was one of the main aims and challenges in the development of this game. “Balance it” permits the identification of behavioural and personality profiles, and yields insights into the dynamics of behavioural change. Real-time gaming helps the players to achieve behavioural change and at the same time offers them a game that is enjoyable to play; it is designed to enhance the persuasive effect of the self-regulation strategies – in other words, the game itself as well as the change achieved is intended to contribute to the players’ intrinsic motivation.

5.1.2 Open innovation platform on smart coaches

The development of IT resources that help users to initiate behavioural change and that offer support in task performance and in implementing individualized health promotion schemes is one of the spear points of TNO.
“Smart coaches”, such as apps on a smart phone that help people to perform certain tasks, or social robots, are in this category.
The combination of insights from the fields of technology and the social sciences relating to adaptive user interaction, behavioural and intervention models and interfaces can provide a basis for evidence-based design methods for smart coaches or similar systems.
The Situated Cognitive Engineering development environment for smart coaches and similar tools was expanded in 2013 by the addition of the Intervention Mapping method for analysis of the determinants of behavioural issues. At the same time, an evaluation module and a visualization system for a logic model have been developed, allowing the causal links between the objectives, change methodologies, claims and requirements involved in the implementation of such tools to be worked out in a systematic manner. The evaluation module helps researchers to describe the type of evaluation,the measuring instruments used, and the results.
Furthermore, a taxonomy has been developed linking the usability features of a smart coach needed for various behavioural change techniques and the implementation factors of the intervention. Much of the knowledge gained in this way has been applied in the KP7-funded Aliz-e project.

5.1.3 Self-reliance in members of the public

The results of evaluations have shown that policies and interventions aimed at increasing public self-reliance in dealing with physical and social safety issues have so far had little effect. One of the main reasons for this is probably a lack of insight into the mechanisms underlying self-reliance, leading to an inability to develop the

right kind of interventions and/or to predict the outcome of such interventions accurately. Interventions will be more effective if they are based on a better understanding of the factors influencing the behaviour in question, such as the way people think and make decisions. It is not enough to give the public information in order to influence their behaviour: it is also necessary to understand how they behave within a group or community. Group effects can be determinants of behaviour in various ways, for example through social support, social norms, peer pressure and social networking. The importance of this phenomenon for safety in society among other things has led us to consider group effects in this project, where the group under consideration may for example be an urban neighbourhood but may also be a virtual social network.

The previously developed descriptive model of social resilience has been converted into the causal model illustrated in Figure 5 with the aid of a number of expert meetings. This model shows the relationship between the various factors that together determine the resilience of a given local group. A distinction is drawn between two types of networks in this model, basic networks and targeted networks. The latter are formed when residents get together to tackle a problem in an organized way. The ability to do this may be expressed by the “targeted network capacity”, which describes the number and quality of the networks aimed at solving the problem in question. The factors that influence social resilience may be clustered in the following five sectors:

- Communication
- Institutions
- Individuals
- Networks
- Society

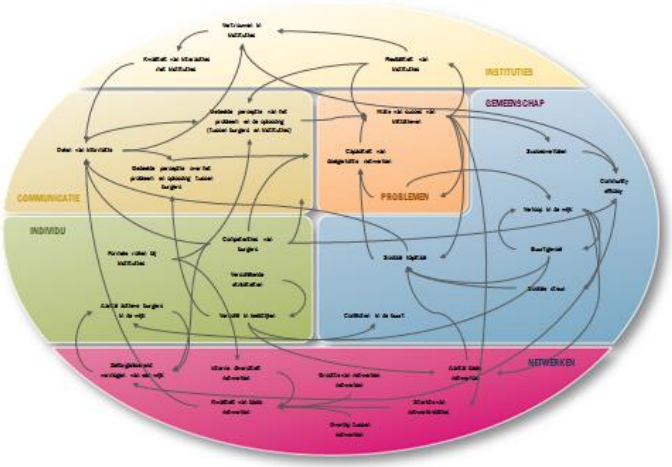


Figure 5 Causal model of social resilience.

The model will undergo further testing by experts from knowledge centres such as The Hague Centre for Strategic Studies (HCSS), the Verwey-Jonker Institute for social science research and MOVISIE, the Netherlands Centre for Social Development, in 2014. A qualitative social resilience index will also be developed by identifying the relevant indicators and ways of measuring them and by aggregating them to form an index. This instrument will be compatible with the Dutch National Risk Assessment guidelines, and is designed for use by the Dutch government to measure the social resilience of communities at various levels (national, regional and local).

5.1.4 Influencing strategic travel behaviour

The scope of mobility control measures in the Netherlands is shifting, partly under the influence of the *Beter Benutten* (Make better use of traffic facilities) programme set up by the Ministry of Infrastructure and the Environment, from pure dynamic traffic management (DTM) measures to a mix of DTM and mobility management measures. Knowledge of the motives underlying the behaviour of travellers (by car, public transport and bicycle) and ways of influencing this behaviour is essential in both these sectors. Previously developed behavioural psychology models have been converted into a semi-quantitative travel behaviour model in order to make it possible to use theoretical knowledge concerning the determinants of behaviour. This model is suitable for use as a basis for policy development. This conversion took into account the determinants of behaviour at the micro level (that of the individual traveller), the meso level (the working and living environment of the travellers) and the macro level (relevant legislation and regulations).

The purpose of such a behavioural model is to be able to simulate behavioural changes at population level and to show which determinants of behavioural change are relevant and which boundary conditions can make their influence felt more quickly. Two aspects of behaviour are relevant when considering how behavioural change can occur, namely:

1 The invariant aspects – that is, the aspects of behaviour that play a role in any kind of behavioural change. For example, people's motivation to change their behaviour is relevant in any process of behavioural change, but the intensity of the motivation will vary depending on a number of factors that differ from one behavioural change process to another.
2 The variable aspects – that is, the aspects of behaviour that only play a role in some kinds of behavioural change. For example, the target group whose behaviour has to be changed varies according to the type of behaviour to be changed. Knowledge of the target group helps to determine the intensity of the motivation that forms part of the invariant aspect of the behavioural model.

The FOUNTAIN model (Figure 6), an agent-based model, has been expanded by including the effects of physical infrastructure and social networks, and a simulation and visualization module has been added to show the behavioural changes as a function of time produced by specific policy interventions. A great deal of data collected from four congestion avoidance projects, the Dutch National Survey of Working Conditions and an experiment performed by the ANWB automobile club has been used to calculate the parameters for this model.

Figure 6 Output of the FOUNTAIN model.

5.2 Meso level

5.2.1 Workplace innovation

Corporate growth is too low, both in the Netherlands and in Europe as a whole. One of the reasons for this is that many companies do not innovate enough – partly because they do not make sufficiently effective use of their most important asset, being their employees. Smarter organization of work can enhance the deployment of this asset, not only by helping to use employees‘ knowledge and initiative better but also by improving the links between employees (with the aid of social media, among other things), applying technology more effectively and stimulating intrapreneurship.

These possible ways of promoting innovation are known collectively as social innovation or workplace innovation (see Figure 7). The European Commission has prioritized workplace innovation by setting up the European Workplace Innovation Network (EUWIN), with TNO as its coordinator.

Figure 7 Social innovation model (Volberda 2004).

The objective of this project is to strengthen the theoretical foundation of workplace innovation by developing a set of concepts and tools that organizations can use to diagnose and improve their innovation capacity and performance.

In 2013, the Behaviour and Innovation ETP converted the principles of “New Organization” (as described by Kuipers & Van Amelsvoort, 2010), organizational economics (Bloom & Van Reenen, 2011) and psychological behaviour theories such as self-efficacy’ (Ajzen, 1991) and trust (Blau, 1967) into institutional and organizational intrapreneurship competencies.

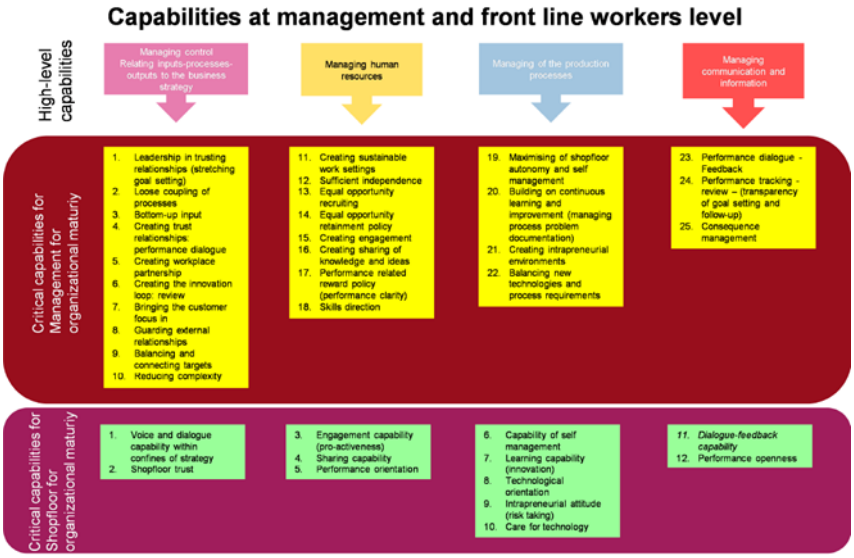


Figure 8 The TNO capability maturity framework of workplace innovation.

Organizations need to change the behaviour of both managers and employees in order to make social innovation possible. Four control variables can be used to influence the behaviour of managers and employees: management processes, production processes, provision of information and employee loyalty. The model shown in Figure 8 distinguishes 25 components of management behaviour and 12 components of employee behaviour. The unique features of this model are the linkage with the control variables and the management/employee split.
As mentioned above, it is precisely by influencing the behaviour of employees and management that social innovation can be brought about. This model, developed by TNO under the name of the “capability maturity framework”, provides companies with a means of determining how much progress they have made in supporting and developing these various components of workplace innovation.

5.2.2 Social media and the development of collective emergent behaviour

Social networks play an important role in human behaviour. Social media have facilitated the creation of such networks. Online social media such as Twitter, Facebook and LinkedIn play an important part in this connection. Apart from their role in bringing people together, they offer unique opportunities for the observation and study of phenomena in this field, since part of the communication via these networks is in the public domain, allowing information to be collected on the actors involved, the messages they convey and the structure of the social networks linking them – three key factors determining the extent and nature of the influence on social relationships.

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The objective of this project, called SON-M (Social Networks and Social Media) is to develop a model that can be used to explain the effects of social media on human behaviour and to locate where it is possible to influence this behaviour.
The following questions are central to this project:

- What is the effect of the characteristics of the actors, messages and networks involved on the impact of social media communications?
- Which social media interventions are most effective in influencing behaviour?
- What is the best way to achieve early interpretation and prediction of certain phenomena on social media?

In 2013 an agent-based model was developed that can be used to quantify the impact of planned social media campaigns and compare it with the effect of unplanned social media communications. The model provides insight into the effects on various target groups - an organization's employees, politicians, journalists and citizens. Based on the data collected, it was found that the effects of the social media campaigns on the organization's own employees was greatest. Also, it is easier to influence journalists than citizens. Furthermore, organizations that want to influence behaviour by way of social media should focus more on the network of followers than on the characteristics of the message. The agent-based model based on social psychology developed to simulate the course of Twitter behaviour is not yet able to predict fast variations in this behaviour adequately.

5.3 Macro level

5.3.1 Complex systems and governance

Solutions to social problems are becoming increasingly complex because of the multi-party nature of the issues involved and the need for changes in large (sometimes international) systems with long time horizons. Such complex social problems are characterized as "wicked" problems. Sustainable innovation may offer a solution to issues such as rising energy costs. Knowledge of the course of previous successful sustainable innovation processes may yield insights that contribute to the solution of such social problems by revealing the underlying success factors or bottlenecks.
Theoretically there are already many insights available on (sustainable) transition and diffusion processes, in particular the Multi-Level Perspective (MLP) by Frank Geels. This theory explains the course of transition pathways, and how existing technological systems are replaced by others in the course of time. It is however descriptive and qualitative, and does not give concrete governance recommendations.

This study is data-driven. The data was collected in 2013 and cover Germany, England, the Netherlands and Spain. In total, 4.500 events covering a period of 10 to 15 years are gathered concerning efficient lighting, solar panels and electric cars. The collection of data was preceded by the development of a literature-based scheme for coding events from newspapers and magazines. The data collected in this way provides insight in questions such as: Which actor did what when? What action was taken by the authorities – and by industry? How did the public react? Initial analysis shows that the data collected do provide a basis for modelling relationships between actors and for determining which actions the various actors involved take in response to government legislation in a particular field. This makes it possible to model the effect not only of market pricing but also of the actions taken by various actors.

6 Signature

Soesterberg, January 2014

TNO

A. Sanderman
Managing Director of TNO ELSS

M. Holewijn
Manager of Behaviour & Innovation ETP

A Publications

Publication (international, peer reviewed)

1. Bakker, M.H., Kerstholt, J & Giebels, E. (submitted). Features and drivers of active citizenship why are some citizens active, whereas others are not? Journal of Community Psychology.
2. Boonstra, B. (in review) Mapping the Trajectories of Self-organization – Four Types of Behavior and two Danish Eco-Villages. In: Town Planning Review, Special Issue on Self-organization.
3. Brouwer, A.-M., Hogervorst, M. A., Holewijn, M., & van Erp, J.B.F. (2013, submitted). Task requirements but not learning affect neurophysiological variables associated with effort. International Journal of Psychophysiology.
4. Brouwer, A.-M., van Wouwe, N., Muehl, C., van Erp, J.B.F., & Toet, A. (2013) Perceiving blocks of emotional pictures and sounds: effects on physiological variables. Frontiers in Human Neuroscience, 7:295, doi:10.3389/fnhum.2013.00295.
5. Cremers, van der Beek, Roelofs & Kerstholt (2013, submitted). B-safe!: does playing a serious game make citizens more aware of man-made and natural risks in their environment? Risk Analysis.
6. Dusseldorp, E., van Genugten, L., van Buuren, S., Verheijden, M.W., van Empelen, P. (in press). Combinations of Techniques That Effectively Change Health Behavior: Evidence From Meta-CART Analysis. Health Psychology. doi: 10.1037/hea0000018.
7. Hendriks, A.M., M.W.J. Jansen, J.S. Gubbels, N.K. de Vries, T. Paulussen, S.P.J. Kremers (2013). Proposing a conceptual framework for integrated local public health policy, applied to childhood obesity-the behavior change ball. Implementation Science 8 (1), 46.
8. Kerstholt, J.H., Brouwer, A.M. & Otten, W. (2013 submitted). Influence of social capital and community competence on active citizenship and subjective safety. Journal of Community and Applied Social Psychology.
9. Kleinknecht, A., Naastepad, C.W.M., Storm, S. & Vergeer, R. (2013): 'Schadet die Flexibilisierung des Arbeitsmarkts der Innovation? WSI-Mitteilungen, Vol. 66 (4).
10. Langley, D.J., Hoeve, M., Vecht, B. van der, Ortt, J.R. & Pals, N. (2013, in press). E-herding: patterns of online mass-behavior. Journal of Interactive Marketing.
11. Meerkerk, I.F. van, Buuren, M.W. van & Edelenbos, J. (2013). Water Managers' Boundary Judgments and Adaptive Water Governance. An Analysis of the Dutch Haringvliet Sluices Case. Water Resources Management, 27 (7): 2179-2194.
12. Preenen, P.T.Y., Van Vianen, A.E.M., & De Pater, I.E. (submitted 2013). To shrivel or to thrive on high or low challenging tasks: the influence of goal orientations. Journal of Applied Social Psychology.
13. Schraagen, J.M., Schmettow, M., Barth, S. (submitted 2013). Network measures for characterising team adaptation processes. Ergonomics.

14. Schreuder, E.J.A., van Erp, J., Toet, A. & Kallen, V.L. (2013, submitted). Affective responses to multisensory environmental stimuli. Emotion, Space and Society.
15. Smit, S., van der Vecht, B. et al., (submitted 2013). Fountain: An agent based model for upschaling transitions and innovations. Journal of Artificial Societies and Social Simulation.
16. Spook, J.E., Paulussen, T., Kok, G., & Van Empelen, P. (2013). Monitoring dietary intake and physical activity electronically: feasibility, usability and ecological validity of a mobile-based ecological momentary assessment tool. Journal of Medical Internet Research, 15(9):e214.
17. Steen, M. (submitted 2013) Benefits of human-centred design in joint innovation projects, studied from within. Creativity and Innovation Management.
18. Steen, M. (submitted 2013). Organizing design-for-wellbeing projects. International Journal of Design.
19. Steen, M. (submitted 2013). Upon Opening the Black Box and Finding it Full: Exploring the Ethics of Design. Practices, Science, Technology, and Human Values.
20. Jonkers E., Martens M. (submitted 2013). Determinants of Commuters' Behaviour. Transport Policy.

Publications in Dutch journals

1. Dhondt, S., Broekman, C., Torre, W. van der, Berg, C. van de, Wiezer, N. (2013). Co-creatie met consumenten. Management & Organisatie.
2. Boonstra, B. (2013), Ondernemerscollectieven als ruimtelijke planners - Een update van de Business Improvement Districts in Engeland en Nederland. Tijdschrift voor Stedenbouw & Ruimtelijke Ordening 2013(3).
3. Duijnhoven, H., Lousberg, M. & Huis in 't Veld, M.A.A. (2013). Onderzoek naar wijkinterventies helpt de praktijk. Sociale Vraagstukken, juli 2013.
4. van Erp, J.B.F. & Brouwer, A.M. (in press). Neuroscience in ergonomics and human factors research and practice. Tijdschrift voor Ergonomie.
5. Kerstholt, J.H. (2013). De beslissende burger. Oratie Universiteit Twente.
6. Kerstholt, J.H. (ingediend 2013). Meer burgers zelfredzaam. Tijdschrift voor Sociale Vraagstukken.
7. Kleinknecht, A., Naastepad, R., Storm, S., Vergeer, R. (2013) Soepel ontslag en innovatie. ESB Ondernemerschap en innovatie. Jaargang 98 (4655), 8 maart, 2013.
8. Paradies, G. & Huis in 't Veld, M.A.A.(2013, in druk) "Ondersteunen van burgerinitiatieven gericht op sociale veiligheid" vaktijdschrift NVVK (Nederlandse Vereniging van Veiligheidskundigen).
9. Steen, M. (2013) Doelgericht samenwerken aan het oplossen van maatschappelijke problemen en vergroten van welzijn, Essay AWT, Den Haag: Adviesraad voor Wetenschaps- en Technologiebeleid (AWT)).

Books or chapters of books

1. Boonstra, B. and Specht, M. (in press) The Appropriated City - Self-organized civic initiatives as rehearsal spaces for co-evolutionary urban planning? In: De Roo, G. and Boelens, L., Spatial Planning in a Complex Unpredictable World of Change – towards a proactive co-evolutionary planning. Ashgate, forthcoming.
2. Edelenbos, J., I. van Meerkerk and E.H. Klijn (2013). Creating legitimacy in water governance networks through complexity sensitive management. In: Edelenbos, J., N. Bressers and P. Scholten (ed.). Connective Capacity in Water Governance. Pp. 267-289. Ashgate.
3. Kerstholt, J. & Berlo, M. van (in press). A Dutch perspective on community resilience. Paper prepared for the forthcoming book by the Multinational Resilience Policy Group, Edited by R. Bach (DHS/FEMA).

TNO reports

1. Van den Broek, H., Roelofs, Preenen, P. & Van der Kleij, R. (2013). The influence of social media on intrapreneurship: a theoretical framework and propositions. TNO Report 2013 R11361.
2. Corbalan Perez G., Esmeijer J., van der Plas A.P., de Penning H.L.H. (2013). Learning Analytics to support self-directed learning and learning transfer. Report TNO 2013 R11647.
3. Dhondt, S., Oeij, P.R.A., Van der Meulen, F.A., Preenen, P.T.Y., Vergeer, R., Van der Kleij, R., Steen, M.G.D. (2013). Platform Workplace Innovation: Workplace Innovation in a Capability Maturity Framework. Hoofddorp: TNO Report 2013 R11645. Confidential.
4. Eckartz, S., Spitzer, B., Steen, M., Van de Kleij, R., Vos, P., Zwartkruis, J. (2013). Collaboration Capabilities: An interim report. TNO Report 2013 R11798.
5. van der Klauw, D., Slinger, J., Engbers, L., & van Empelen, P. (2013). Intersectorale samenwerking voor de realisatie van de Beweegvriendelijke Omgeving: TNO Rapport 2013 R11534.
6. Liebregts ,W.J., Vergeer, R. (2013). Workplace Innovation and Matching Modellen. Een poging tot integratie van WPI-mechanismen in een matching model. TNO Report R13124.
7. Looije, R., Neerincx, M.A., Paulissen, R., Paulussen, T.W.G.M. and Rypkema, J (2013). How to coach teachers for professional development. TNO Report 2013 R11475.
8. Neerincx, M., Theunissen, N., Paulissen, R. & Paulussen, T.W.G.M. (2013). E-coaching on teacher's competencies and situated lessons: The example of sex education. TNO Report 2013 R11527.
9. van Overloop, Otten, & Paradies (2013). DT2-1 SOTA on human motivation theory and coaching strategies. WithMe. TNO Rapport.
10. Preenen, P., Meulen, F. van der (2013). Factoren van invloed op intrapreneurship: Een verkennende studie. TNO Report R111685.
11. Smit S.K., van der Vecht B., Lebesque L. (2013). Predictive Mapping of Anti-Social Behaviour. Report TNO 2014 R10371.

12. Suurs et al., (2013). FOUNTAIN (Framework for Upscaling Transitions And Innovations): doelstellingen, achtergronden en ontwikkelperspectief. TNO Report 2013 R10413.

Presentations at congresses, symposia and workshops

1. Bakker, M.H., Kerstholt, J & Giebels, E. (2013). Features and drivers of active citizenship why are some citizens active, whereas others are not? Proceedings of the European Urban Research Association Conference Enschede 2013.
2. Brouwer, A.-M., van Schaik, M., van Erp, J.B.F., & Korteling, H. (2013). Neuroticism, extraversion and stress: Physiological correlates. Humaine Association Conference on Affective Computing and Intelligent Interaction, pp. 429-434, IEEE Computer Society, DOI 10.1109/ACII.2013.77.
3. Boonstra, B. en Rauws, W., (2013), Zelforganisatie in de strak geplande polder. Over de (on)mogelijkheden van een organische ontwikkel strategie. Symposium Tussen tijd / gebruik van ruimte in transitie 2013: Podium voor Architectuur Haarlemmermeer en Schiphol, Jap Sam Books: Heijningen.
4. van Dommelen, P., & van Buuren, S. (2013). Alternatieven voor Randomized Controlled Trials. Lunchbijeenkomst presentatie 28 november 2013, TNO Leiden.
5. Dhondt, S. Workplace Innovation: a connecting concept for organisational psychology and sociology. Abstract for Topic/Track: 'Social innovation and improved wellbeing'. Wellbeing at Work 2014 Conference, Copenhagen, 26 - 28 May 2014.
6. Dhondt, S. The 'European Learning Network for Workplace Innovation' (2013 – 2017). SESSION 2. Supporting Workplace Innovation – The European challenge and the company/institutional response. Regional conference EUWIN. Triple Helix X Conference at Linköping. 13 June 2013.
7. Dhondt, S. Chair "The European Learning Network for Workplace Innovation. Creating a mass movement". Regional conference EUWIN. Triple Helix X Conference at Linköping. 13 June 2013.
8. Dhondt, S. The European Learning Network for Workplace Innovation. Creating a mass movement". Keynote during Launch Event EUWIN. Brussels, European Parliament. April, 10th, 2013.
9. Dhondt, S. Chair "The European Learning Network for Workplace Innovation. Creating a mass movement". Launch Event EUWIN. Brussels, European Parliament. April, 10th, 2013.
10. Dhondt, S. Workplace Innovation. Impacts for OSH and for productivity. Invited speaker to EANPC (Zilina), April, 25th 2013.
11. Dhondt, S. Sociale Innovatie. Een rol voor de Directie Ondernemerschap? Presentatie aan Directie Ondernemerschap Ministerie van Economische Zaken, 28 mei 2013.
12. Dhondt, S. Keynote lecture: Workplace innovation: virgin territory for the Dutch process industry. IPIT Symposium, September 24th 2013. Creating higher added value with process innovation.
13. Dusseldorp, E., van Genugten, L., van Buuren, S., Verheijden, M., & van Empelen, P. (2013) Combinations of techniques that effectively change health behavior: Evidence from meta-analysis.Conference European Health Psychology Society, Bordeaux 2013.

14. van Empelen, P. (27 juni 2013). Erkenning en Games for Health. Presentatie Ministerie VWS bijeenkomst Game als interventie.
15. van Empelen, P. (4 sept 2013). Interview theoretisch raamwerk. Presentatie Ministerie van Infrastructuur en Milieu.
16. van Empelen, P (8 november 2013). Participatie Invitational Conference Werkzame Principes. Utrecht. RIVM.
17. van Erp, J.B.F. & Toet, A. (2013). How to touch humans. Guidelines for social agents and robots that can touch. Proceedings of the 2013 Humaine Association Conference on Affective Computing and Intelligent Interaction (pp. 780-785). IEEE Computer Society.
18. van Erp, J. B. F. & Brouwer, A.-M. (2014). Touch-based Brain Computer Interfaces. Haptics Symposium. February 23-26. Houston, Texas.
19. Eckartz, S., Spitzer, B., Steen, M., Van de Kleij, R., Vos, P., Zwartkruis, J. (2013). Collaboration Capabilities. Conference ISPIM 2014.
20. van Genugten, L., van Empelen, P., Johnston, M., Prestwich, A., & Kok, G. (2013) Behaviour change techniques: New directions in coding, analyses and effectiveness. Conference European Health Psychology Society, Bordeaux 2013.
21. Hogervorst, M.A., Brouwer, A.-M., & Vos, W. (2013) Physiological correlates of stress in individuals about to undergo eye laser surgery. Humaine Association Conference on Affective Computing and Intelligent Interaction, pp. 473-478, IEEE Computer Society, DOI 10.1109/ACII.2013.84.
22. Kerstholt J. Zelfredzaamheid. Symposium zelfredzaamheid GGD Zeeland.
23. Kerstholt J. Burgerparticipatie. Voordracht Vereniging Directeuren Publiekszaken.
24. Kerstholt & Bakker. Workshop congres 'Zelfredzaamheid' VR IJsselland.
25. Kerstholt J. KNAW symposium 'de zelfredzame burger in de doe-democratie'.
26. Koster, S. & Langley, D.J. (2013). Modeling individual and collective opinion in online social networks: drivers of choice behavior and effects of marketing interventions. European Marketing Academy, 42nd Annual Conference, Istanbul, 4-7 June (Special Interest Group Online Opinion Dynamics).
27. Maanen, P.-P. van, Aarts, O., Boertjes, E., Wijn, R., Influence of Controlled and Uncontrolled Interventions on Twitter in Different Target Groups, Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2013), IEEE Computer Society Press, Niagara Falls, Canada, 25-28 August, 2013.
28. Maanen, P.-P. van, Vecht, B. van der, An Agent-Based Approach to Modeling Online Social Influence, Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2013), IEEE Computer Society Press, Niagara Falls, Canada, 25-28 August, 2013.
29. Preenen, P. T. Y. , Vergeer, R., Kraan, K., Dhondt, S. (2013). Internal Labour Flexibility Practices and Innovation Performance: A study among Dutch companies. IWOT 17 - International Workshop on Team Working, 28-29 November 2013. Leiden.
30. Preenen, P., Kraan, K., Oeij, P., Dhondt, S. (2013). Workplace innovation and consequences for employees and organisational performance in the Netherlands. XVIII ISA World Congress of Sociology (July 13-19, 2014).

31. Pot, F., Dhondt, S., Kraan, K. The Importance of Organisational Level Decision Latitude for Wellbeing and Organisational Commitment. Abstract for Topic/Track: 'Social Innovation and improved wellbeing'. Wellbeing at Work 2014 Conference, Copenhagen, 26 - 28 May 2014.
32. Raaijmakers, S.F., Steel, F.W., de Goede, M., van Wouwe, N.C., van Erp, J.B.F. & Brouwer, A.-M. (2013). Heart rate variability and skin conductance biofeedback: A triple-blind randomized controlled study. Humaine Association Conference on Affective Computing and Intelligent Interaction, pp. 289-293, IEEE Computer Society, DOI 10.1109/ACII.2013.54.
33. Spook, J., Paulussen, Th, Kok, G., & van Empelen (2013). Systematic development of a persuasive smartphone-game intervention. Poster presented at Conference European Health Psychology Society, Bordeaux 2013.
34. Spook, J (2013). Feasibility of mEMA Association for Researchers in Psychology & Health (ARPH): 2013 Enschede.
35. Spook J. (2013). Systematic development of a game intervention. ASPO/ARPH: Symposium: Taking it to the streets: 2013 Amsterdam.
36. Spook J. (2013). Game interventie Balance it. Games for Health Congress Europe 2013, Amsterdam.
37. Toet, A., van Erp, J.B.F., Petrignani, F.F., Dufrasnes, M.H., Sadhashivan, A., van Alphen, D., Boeree, F., de Gruijter, H.O., Hoeksema, J. et al., (2013). Reach out and touch somebody's virtual hand. Affectively connected through mediated touch. Proceedings of the 2013 Humaine Association Conference on Affective Computing and Intelligent Interaction (pp. 786-791). IEEE Computer Society.
38. Vries, N. de, Liebregts, W., Stel, A. van (2013). Explaining entrepreneurial performance of solo self-employed from a motivational perspective. (Lyon: SCALES-conference).
39. van der Vlies R.D. and Felix E.(2013). Technology Transfer within the Telecare; Technology Innovation System. Proceedings of the 12th biennial European conference of the Association for the Advancement of Assistive Technology in Europe, AAATE 2013, Vilamoura, Portugal.

B Media Exposure 2013

Self-reliance
Animatie actief onderzoek burgerschap: on-line feb 2013.
'Zorgende burger kan niet zoveel extra doen' Haarlems Dagblad, 27 september 2013.
Interview Radio Enschede 22 november 2013.
Quest101: ' Waarom bergt iedereen zijn waardevolle spullen op dezelfde plek op in huis?'

Neuroscience
Volkskrant: Meer over Arnon Grunberg doorgemeten.
NOS Nieuwsuur: Meekijken in het brein van Arnon Grunberg.
New York Times: Wired: Putting a Writer and Readers to a Test.
BLOG's: 4nieuws, drimble, mustreads, nieuwstwitter, boekennieuws, scientias, hanta.

Corporate performance
Dhondt. BNR, Darwin, Interview met Steven Dhondt, 17 september 2013 (http://bit.ly/19XPA7O).
ABU lanceert webzine Flex & Figures. ABU.nl, 9 april 2013. (Anneke Goudswaard). http://www.abu.nl/nieuwsberichten/website/persberichten/abu-lanceert-webzine-flex-figures.
Alle cijfers over flexwerk en flexwerkers verzameld. (2013). Goed werk: Projecten van het Innovatiegebied Arbeid (pp. 106-107). S.l.: TNO. (Anneke Goudswaard).
Doet u mee? Expeditie Sociale Innovatie, MVO Nederland. YouTube, 22 juli 2013. (Anneke Goudswaard).
Flexbarometer. (2013). Uitzendwerk, 1, 1. (Anneke Goudswaard).
Flexbarometer bewijst: eenderde werkt op tijdelijk contract. FNV.NL, april 2013. (Anneke Goudswaard).
Flexbarometer biedt inzicht. Maxflex Uitzendbureau, 26 februari 2013. (Anneke Goudswaard).
Flexbarometer maakt flexibilisering van arbeid, omvang en positie van flexwerkers inzichtelijk. Needsfacility.nl, 13 februari 2013. (Anneke Goudswaard).
Flexbarometer. Invoorzorg.nl, 20 februari 2013. (Anneke Goudswaard).
Flexbarometer. Vrijondernemend.nl, 8 februari 2013. (Anneke Goudswaard).
Flexbarometer. Flexpoint.eu, 20 februari 2013. (Anneke Goudswaard)..
Flexbarometer. Match4u.nl, 2 april 2013. (Anneke Goudswaard).
Flexbarometer. ABU Flex&Figures Onderzoek, april 2013. (Anneke Goudswaard).
Flexbarometer. De bron voor informatie over flexibele arbeid. ABU Flex&Figures Interview, april 2013. (Anneke Goudswaard).
Flexbarometer: (bijna) alle cijfers over flexwerkers. Personeelslog.nl, 8 februari 2013. (Anneke Goudswaard).
Flexbarometer: alle cijfers over flexwerk en flexwerkers. Arbo-online.nl, 8 februari 2013. (Anneke Goudswaard).
Flexbarometer: voor basale arbeidsmarktinformatie Recruitmentmatters.nl, 8 februari 2013. (Anneke Goudswaard).

Flexbarmeter. Nieuwe Flexbarometer geeft inzicht in flexwerk Flexmarkt.nl, 11 februari 2013. (Anneke Goudswaard).

Mobility and Behaviour
Dag van Verkeer en Mobiliteit 2013 in Houten. Interview met Marieke Martens, TNO.