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TPM QUARTERLY

Market forces in health care: A subtle operation

Adrie Dumaij, Jos Blank

Market forces in the healthcare sector are a difficult issue. Jos Blank and Adrie Dumaij of the section for Innovation and Public Sector Efficiency (IPSE) Studies immerse themselves in the subject on a daily basis, but without taking up any particular position. "The symptoms are varied and complex, so we prefer to give a more subtle picture."

Together with their colleagues, Blank and Dumaij conduct research into productivity issues in the public sector, with a particular focus on healthcare. They are currently very much in demand. "A lot of our work is on behalf of the government, the Ministry of Health, Welfare and Sport, the Ministry of Education, Culture and Science, the Council for Public Health and Health Care, and the NVZ Dutch Hospitals Association, but also the Flemish government, for example. Many issues affect government and policy, such as financial systems and planning systems. This also covers market forces: will they work in the way that we think they will, and what conditions should be attached, if they are introduced?"

IPSE Studies has carried out various research projects into how the healthcare sector functions. An example of such a project is the Flemish hospitals planning instrument, on behalf of the Flemish health and care agency. This concerns a scientifically supported recommendation about possible instruments to be used for programming and planning the provision of care in hospitals. Blank: "The key question is how the supply of hospital care can be matched as closely as possible to demand, with special attention for basic care, rehabilitation, and radiotherapy. This calls for a balance to be made between different, sometimes contradictory, criteria. Examples include the costs and quality of services, the required level of expertise, the optimal level of activity, and accessibility. There is a conflict between an optimal scale from the point of view of cost, minimal scale requirements from the point of view of quality, and as short as possible travelling times for patients." The issue of planning for expensive infrastructure in the healthcare sector will undoubtedly play an important part in the Netherlands. The possibility cannot be excluded that, under the pressure of market forces, an overcapacity of infrastructure will arise.

This is also determined, in part, by management culture. Blank: "By way of illustration, Flemish managers have a tendency to consent to investment applications fairly readily, so that radiotherapy, for example, is provided at far too small (and therefore costly) a scale. So you therefore have to determine when this is needed, and also take accessibility into account, for example. We have developed a model for this, that describes the relationship between demand for healthcare and an optimal distribution of hospital facilities. The model is being applied to Flemish hospitals, but it can also be used in the Netherlands."

> "If you have to undergo an operation, then you often do not know what to expect - which doctors are good at that particular operation, and what alternatives are available.."

Voting with their feet

Market forces will only really come into their own when patients can vote with their feet: if they are not happy with a particular location, they can go somewhere else next time, where the standard of care is better. This means, however, that patients have to know where good (and poor) standards of care are available. Dumaij: "There is a major information deficit among patients. By way of example, if your healthy leg is amputated during an operation, then of course you know that something has gone wrong. But in the vast majority of cases, you do not know if anything has gone wrong. So the need for product information in advance is considerable. If you drink milk from a cup, then you know exactly what to expect. But if you have to undergo an operation, then you often do not know what to expect – which doctors are good at that particular operation, and what alternatives are available – even though it is precisely these conditions that are so important for market forces to work successfully in the healthcare sector."

Apart from the lack of information, a major problem is that patients have few disincentives from using healthcare services extensively: they perceive healthcare as a free service. There is also the question of whether there is sufficient competition on the hospital market, which is actually more like a series of local monopolies and cartels of medical specialists. "We attempt to correct aspects like this in our studies. We try to obtain an objective ranking in terms of productivity of care institutions, for example. Why is one better than another? Is it because the available resources are better used? Or perhaps the management uses its tools more effectively? Whatever it is, our aim is to learn from it and publish it so that policymakers are better placed to do their job."

IPSE Studies also examines the systems used in the diagnosis-treatment combination similar to the Diagnosis Related Group payment system in the USA (abbreviated in Dutch as DBC). Some 30,000 product definitions are used in this system, with each treatment having its own code and cost. This leads to enormous administrative burdens and also encourages fraud. This information has now reached the powers-that-be in The Hague, and a new system is currently being developed - DOT (which stands for 'the road to transparency in DBC') - the aim of which is to reduce the number of product definitions to 3,500. "But even that is still far too many," says Blank. What is needed

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Health Infra

TPM is a synonym for working in an interdisciplinary context: the link between science and humanities. This involves focusing on themes like infrastructure, mobility, energy, water and ICT, but the subject of healthcare does not automatically feature on this list - wrongly, as far as I am concerned. My view was confirmed in the light of the structure of the partnership programme between TU Delft and the Ministry of Infrastructure and the Environment (previously the Ministry of Public Works, Transport and Water Management). The aim of the partnership is to encourage innovation in the physical living environment and to better provide the ministry, which is so crucial to this field, with knowledge, competencies and talented individuals with management qualifications.

Our prosperity depends to a significant degree on infrastructures and mobility, and the future of our society lies in high-quality sustainable urbanisation. To that end we, together with the ministry, can gather knowledge, develop managerial strategies and launch policy and market-based initiatives. It is against this background that TPM is organising master classes, while the ministry is providing practical courses. We recently carried out a bibliometric exploration for the partnership programme. We wanted to know what is being published about the physical living environment, urban delta infrastructures and mobility, and in what form. It revealed that academics are publishing articles on transport, mobility and accessibility in journals (including leading journals) that deal with matters other than urban development. These interrelated topics, which are so important for the Netherlands, are covered by academics at an international level through various platforms. There is so much to be achieved here by TPM researchers.

The analysis showed that the sectors did indeed have an overlapping theme. The articles on mobility, water and large cities often featured another subject, which we had not originally looked for: health. It is not illogical that health should feature in this way: what could be more closely related to the structure of our living environment than healthcare? The most important amenities of any urban environment - clean water, sanitation, clean air, safety, dealing with emergencies, specialised and accessible care facilities (like specialised burn centres) - all are directly related to health. You could say that health is an important strategic aspect of urban development.

Moreover, the healthcare sector is transformed from a chain organisation into a network system. Specialist treatment is being carried out more and more frequently by various specialised teams, and often at different locations. State-of-the-art knowledge about network systems is derived from the TPM fields of infrastructure, mobility, energy, water and ICT. For the strategic positioning of the drastically reformed Ministry of Infrastructure and Environment, a link with the healthcare sector is the next stage of renewal. In short, there is an outstanding opportunity here for genuine innovation for academics and practitioners alike: linking the theme of health management with other fields.

Prof. Theo Toonen, dean

column

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Market forces in health care: A subtle operation

is a simple and transparent system of no more than fifteen care attributes. This is because more than 95 per cent of the variations in cost is attributable to no more than five indicators. I recently wrote a critical article on the subject in the newspaper *Het Financieele Dagblad*, which unleashed a wave of responses. Most were very positive, including those from managers, specialists and patients. They were so pleased that the system was being exposed. That was a very remarkable experience: normally we only get responses from policymakers."

Culture problem

Blank and Dumaij also refer to the culture problem in the healthcare sector. "In the healthcare sector in this country, we are used to working everything out to the last penny. By way of comparison, in the education sector, teachers have a certain budget for their teaching activities. So there may be one student who dutifully attends every lesson and passes his exams with flying colours, and therefore hardly needs any supervision. Another student, by contrast, is always asking the teacher for help, struggles through his exams at the third time of asking, and even then complains about his mark - a high-maintenance student, in other words. But you can't suddenly ask for more money to deal with the latter student: it is a question of 'balancing out', and that is how it should be in the healthcare sector as well. If one person never requires a jab and someone else needs two, then that has to be averaged out. As it is now, every extra jab has to be paid for."

A few years ago, Blank also investigated upscaling and mergers in healthcare: what impact does this have on the efficiency, quality and accessibility of healthcare? Does upscaling result in greater efficiency? And as far as quality is concerned: is this enhanced when knowledge is pooled or undermined, due to greater bureaucracy? With regard to market forces, do we have enough hospitals, so that we have enough to offer at local level? One of the overall conclusions was that, with the exception of the hospital sector, things were not too bad. There are many places where good, efficient and accessible care is available. It is only in the hospital sector where upscaling has been taken much too far. This, and many other recommendations, are in the report that he wrote on the subject for the Council for Public Health and Health Care.

"But this is not about our opinions," emphasises Dumaij. "It's about what the effects are in terms of productivity. What are the pros and cons? We have no view: we are simply painting a considered picture. What I do like is that our kind of productivity research has an effect on policies. This puts us in the spotlight as far as the Ministry of Health, Welfare and Sport is concerned, with regard to social topics like affordability, accessibility, employment market problems, quality of healthcare, less nursing staff for greater numbers of people needing care. This means we can produce a spin-off: influencing innovation agendas, providing information to the Ministry - and to healthcare providers and insurance companies- about which important measures are effective. In the future, I also envisage a spin-off for TU Delft. Should you focus on sharper knives for surgeons in order to increase productivity, or on other technological innovations? There is still so much that needs improving."

Healthcare projects

One of the research projects with which IPSE Studies is involved for the healthcare sector is Innovation in Healthcare. "Bart van Hulst, one of our PhD students, is conducting research on behalf of TPM into the relationship between the productivity of hospitals and innovations applied by hospitals. His research is aimed at the contribution of innovation, features of the innovative organisation and features of the productive organisation." Another research project is Scale and Healthcare, which sought to make an inventory of the relationship between scale, accessibility, quality and efficiency in healthcare. The project was carried out by the Council for Public Health and Health Care. "The study attempted to create understanding of the relationship between the scale, efficiency, quality and accessibility of a number of care institutions in the Netherlands. The final report contains several important outcomes. It appears, for example, that the upscaling in healthcare in the last twenty years has not led to a sharp decrease in the accessibility of care institutions. The number of institutions in the hospital sector, for example, has fallen markedly, but the number of locations has actually increased. From an international perspective, Dutch care institutions are on the large size. They are also more efficient. There is therefore no place for arguments about efficiency in mergers between healthcare institutions."

DBC performance assessment and strategic behaviour

Since 2006, the performances of hospitals and medical specialists have been funded on the basis of Diagnosis Treatment Combinations (DBC). Research by POLG PhD student Emiel Kerpershoek shows that DBC performance funding leads not just to transparency and greater incentives for staff to work more efficiently, but also to misuse in the form of strategic record keeping. Contrary to what is often thought, this strategic behaviour is not entirely due to financial incentives. Specialists who are not linked to any particular institution - and whose income depends on DBC production - as well as those who are employed by a single institution, treat DBC record keeping from a strategic perspective. Strategic registration appears to be passed off as 'professional problem solving', especially when the DBC method clashes with the professional reality faced by medical specialists. Following a review of the DBC system (a process referred to as DOT - the road to transparency in DBC), the degree of administrative freedom for specialists has been curtailed in order to combat fraud. However, this also restricts the capacity of medical professionals to make corrections for systemic faults in relation to quality and innovation. It is precisely because there is no system that can do full justice to the complexities of reality that room for manoeuvre for professionals is very important.

Diehards when it comes to working with figures

IPSE Studies conducts research into the efficiency and effectiveness of the public sector on behalf of a wide variety of commissioning parties: from ministries and umbrella organisations to regulatory bodies and public organisations. The majority of its employees have a background in economics and econometrics, so the research projects often have a strongly quantitative character. Blank and Dumaij: "We try to calculate things, to quantify them. To do that, we work with huge databases, including at micro level. We are real diehards when it comes to working with figures. That, plus the fact that we work together with our management, legal and technical experts at TPM, attracts a good many commissioning parties."

TPM alumnus Yannick Smits combines IT with healthcare

TPM alumnus Yannick Smits has two academic passions: information technology and healthcare. Even when he was on his Systems Engineering, Policy Analysis and Management (SEPAM) programme, he pooled his expertise in and experience of both subjects in his own IT companies. And today, having graduated last August, he is still reaping the rewards.

Yannick, who is 31, gained his Master's degree with a thesis entitled, 'Verbeterde Informatie-Uitwisseling in de Gezondheidszorg, Applicatie Integratie en Data Uitwisseling met behulp van zorgportals', which he carried out at the Erasmus Medical Center. "Patients are becoming more vocal and want to be more involved in the care process. There is therefore a greater need for two-way traffic: it has to be possible to share and compile information about patients beyond the confines of individual organisations. Many hospitals decide on a solution that only allows for automation of their own internal processes; Erasmus MC would like to be able to exchange data with external care providers and patients."

Managing

The key question, then, was this: how can doctors and patients communicate via a portal? "That requires an architecture that reaches beyond the responsibility of any one particular party and takes account of such matters as authentication, authorisation, and existing software and systems. I discovered that the technology is just a part of the picture. As I learned when studying MSc SEPAM, it is more especially about how you manage the whole process: how do you get the right partners round the table, with everyone singing from the same hymn sheet? It is also about how you promote the project, how you secure a budget and how you fit in with the management structure? In addition to all of that, it is essential to have the right people, the right terminology and the right timing."
Yannick devised a framework for integrating applications and data that can be used by existing software. "Old systems usually have to be linked up with each other, even though that is not a practical option. The average hospital has a few hundred! The patient-cum-healthcare professional portal for the Erasmus MC has created a central point for exchanging information between doctors and patients, without there being a need for a new system every time."
Even at a young age Yannick, whose father was a homeopathic doctor and mother a nurse and astrologist, was fascinated by healthcare. Nevertheless, he originally chose his second passion, IT, although he did train to be a therapist while on his Systems Engineering, Policy Analysis and Management programme. He also became a board member of the CEASE organisation, which concentrates on new knowledge in relation to cures. Nowadays, Yannick spreads his talents across all these activities, and is a professional saxophonist to boot! However, he devotes most of his time to his IT company, Goyaweb, which develops ingenious internet applications.

Challenges galore

His attention is focused especially on the healthcare sector. "This is a market that is still in its infancy: the complexity of the problems is enormous. The nice thing is that the SEPAM programme helps you find, and tackle, the right bottlenecks. Considerable emphasis is laid on the relevance of the bottlenecks - after all, if you tackle the wrong problems, you're wasting your time. Another point of focus is that the context of medical information is crucial. If a GP takes a patient's blood pressure and enters it in to the electronic health record, the information is only useful to a specialist if he is aware of the relevant circumstances: was the blood pressure measured when the patient was lying down, for example, or was the patient sober? Otherwise a new test will be necessary, and that costs extra time and money.
In that area, too, there is much room for improvement, and there are challenges in many other respects as well."

DRI HEALTH IS RESEARCHING INNOVATIVE MEDICAL TECHNOLOGIES

How do we stay healthy longer?

The Delft Research Initiative Health (DRI Health for short) is where scientific knowledge about medical technology and social needs in the field of healthcare come together. The initiative is underpinned by a complex world in which science, the government and business are looking for answers to a simple question: how do we stay healthy longer? There is also the question of how we continue to provide healthcare and keep it affordable. Innovative medical technology plays a crucial role in answering these questions.

Lucas van Vliet is the chairman of DRI Health, in which the Faculty of TPM is also taking part with respect to healthcare issues. Van Vliet sees opportunities for deploying new communication and information technologies (such as e-health) and gaming. "Games form an important means for testing the applicability of future scenarios and innovative technologies," says Van Vliet. We are already familiar with artificial hips, MRI and CT scans, and the benefits of keyhole or minimally invasive surgery are also well known. But what about a sensor inside your body to monitor how well your organs are functioning? Or a robot that can lift you out of bed and look after you, or an exoskeleton that can help people affected by strokes, for example, to recover? This technology exists, but how do we make the best possible use of it?

Quality and safety

Anything is possible with technology, is what Van Vliet appears to be saying. "But it is people that matter most. The fact is that an ageing population places more demands on healthcare, while at the same time there are fewer people to deliver it. We are looking for solutions by which the quality and safety of healthcare can be improved, and which make healthcare more accessible for subsequent generations, while keeping costs under control. Most healthcare is devoted to the elderly. The secret is to push back the moment at which demand for healthcare increases."

This can be done in different ways, such as through early and accurate diagnosis, preferably before the first symptoms occur. This is the first pillar on which research by DRI Health is based. Van Vliet: "This means that patients can be treated earlier and in a more targeted fashion, and therefore better. Interventions of this kind are less costly and more effective, and they are less burdensome for the patient." As well as the training of the next generation of scientists and specialists (medical technicians and medical practitioners with a technical grounding), this is also about lifestyle and prevention. Van Vliet expects a change in the way people think about their health. "In the future, we will have more money available to use new knowledge and new developments that will improve the quality of life. We will have to give up our third or fourth annual holiday in order to make an extra contribution to our health."

A second DRI Health pillar is 'treatment and care'. There are many ways of allowing people to live longer at home. "Although the idea is not to leave them isolated," adds Van Vliet. He refers to ICT and e-health as an example, as well as all kinds of bodily support, from autonomous robots to biosensors. The third pillar is that of targeted molecular technology. "Understanding at the smallest level how illnesses come about will lead to tailor-made medicines and therapies that will be more successful as a result."

Prof. L.J. van Vliet

Collaboration

DRI Health is, in turn, a partner in larger-scale collaborations. At national level, it is in Medical Delta, the unique concentration of universities, hospitals, cities and business in the Leiden-Delft-Rotterdam region (www.medicaldelta.nl), while internationally, it is in collaborative partnerships with, among others, Oxford, Zürich and Catalonia. The HealthTIES Regions of Knowledge programme involves the exchange of best practices in order to boost the innovative power of Medical Delta.

TPM cares

Dr Luuk Simons:

“Staying healthy is at the heart of our e-health pilot”

“After a career in ICT, I have for the last five years been active in the healthcare industry, focusing on e-health. By that, I don’t mean the automation of various processes, but on bringing the process of health promotion closer to patients. Our starting point is that many conditions are largely avoidable and even reversible, such as age-related diabetes, obesity and cardiovascular disease. The emphasis is not on getting better, but on staying healthy. Behaviour is critical here and lifestyle interventions can help in the process.

> “Our starting point is that many conditions are largely avoidable and even reversible.”

In order to investigate the effects of health management, we have carried out an e-health pilot at TU Delft during the past six months. It was instigated by Paul Rullmann (of the Executive Board) and Nynke Jansen (the head of HRM), in collaboration with the occupational health and safety organisation and university health service doctors. The main aspects of this electronically supported health programme are Awareness, Focus and Result. A personal dashboard is used to monitor people’s habits relating to the health aspects of exercise, stress, nutrition, and social support. We also measure progress in terms of weight, blood pressure, cholesterol, etc., and the results form the basis for the individual coaching sessions.

The results are very promising. For example, eighty per cent of those taking part appeared to be motivated to make major changes. Two out of three made significant steps, including medically. Surprisingly enough, age-related ailments disappeared too, while physical and mental fitness improved. We are definitely going to follow this up. The next stage is for us to make the dashboard and the e-sensors more mobile. In the future, it will be possible for example to carry out blood tests using a plaster with a chip in it, linked to the dashboard. In the meantime we are starting to work together with major care industry organisations. Our in-house insurance company, OHRA, is very enthusiastic, for example.

We should also mention that it is not just TPM that is carrying out all this hard work: the same applies to the IDE and EEMCS faculties as well. This is about ‘Design for Healthy Living’, which is also ICT supported. It all fits neatly in the TRANS-research partnership between KPN-TNO-TU Delft (EEMCS and TPM), the Cor Wit Chair of Professor Felix Hampe and a coalition roadmap for the next few years.”

Dr Luuk Simons is Sr. Researcher in Services Innovation, and specialises in Service Innovation and Design for Healthy Living. He is also a director of the Cancer health coach company.

Dr Erik Pruyt:

“Health will form an increasingly large part of our work”

“The Policy Analysis section at TPM consists of methodologists who concentrate primarily on strategic long-term research into complex multi-actor system problems. Personally, I, together with a number of colleagues, focus on the complex system dynamics of our uncertain system issues - it does not matter to us whether it is about energy transitions, financial crises, shortage of minerals or problems in healthcare, provided it concerns system issues that are important, complex, and uncertain.

In all these cases, we make explorative simulation models that we use on the one hand to get an idea of possible system behaviour through time (what we refer to as a scenario), while on the other, we ‘misuse’ them in order to generate and analyse thousands or millions of plausible scenarios for the purpose of testing the robustness of policies in the enormous artificial research space we have created.

An example of this is our work involving (flu-) pandemics, and more specifically A(H1N1)v (‘swine flu’). Shortly after it became known that a new flu variant may have appeared, I devised a flu model with which all kinds of flu pandemics could be simulated. We later used the model to carry out deep uncertainty analyses and to test policies. This clearly showed that concerted adaptive vaccination policies were needed, and that additional information was needed before decisions relating to vaccinations could be taken. With the experiences gained from A(H1N1)v, the advice was well received by the countries in the OECD.

Another good example is that of the problem facing society with regard to undiagnosed chronic Lyme disease. In spite of the many uncertainties, I have managed to model and explore this worsening ‘invisible’ problem in a short period of time. This suggests that Lyme disease is a much greater social problem than is generally assumed.

Models of this kind can not only be developed quickly, but they can also be recalibrated relatively simply to related contexts: my Zimbabwean cholera models, for example, can be speedily adapted to the current cholera epidemic in Haiti.

Although ‘health’ accounted for only a limited proportion of our work in the past, this will undoubtedly increase in the interests of society, complex and uncertain system dynamics, and the need for adaptive policies. Next year, for example, we will be taking part in a larger-scale research project into the increasingly ageing population and the resultant pressure on our healthcare system. And I can well imagine that there will be even more work in the near future, in the field of obesity, bacterial resistance, etc.”

As an assistant professor, Dr Erik Pruyt teaches such subjects as Continuous Modelling and Foundations of Engineering and Design at the TPM faculty. He was recently appointed chairman of the Special Interest Group on Health Policy of the System Dynamics Society.

Dr Jan van den Berg:

“Time for TPM to tackle the vexed question of ICT in the healthcare sector”

“Modern hospitals seem to be fabulously well-oiled organisations with smoothly running care processes. However, the situation behind the scenes is not so rosy: patients sometimes have to put up with long waiting lists, nursing staff can find it difficult to communicate with doctors who think they know best, managers do not always get the information they need to be able to make the right decisions, and the introduction of the electronic health record (abbreviated in Dutch as EPD) is constantly being postponed. And yet, is it not the EPD that is supposed to be the answer to so many problems and bring about a major improvement in quality?

In recent years, I worked with various students on ICT problems in the healthcare industry, in particular at the Erasmus Medical Center (EMC). Research made clear that the issues were complex, with the challenge being to make available ICT solutions as compatible as possible with healthcare processes. As well as organisational problems, there are many complex technical matters. For example, how do you ensure that accurate data is entered into the standardised EPD, but without compromising flexibility? What data warehouses should be set up in order to generate effectively and efficiently the correct information that is needed for decision-makers? And how do you guarantee that the requirements for keeping information secure and human values (especially privacy) are respected?

In addition, there are all kinds of non-technical issues at play in the multi-actor context of the healthcare industry. The information directorate of the EMC apparently finds it difficult to attract the right kind of IT knowledge for developing a long-term strategy and for effectively resolving existing IT problems. The power of doctors is often another factor: some doctors interfere with the introduction of specific new ICT products, even though they have no business doing so, or they invoke their professional secrecy, claiming that there is no place for the EPD as the technical provisions safeguarding privacy are insufficient. Furthermore, many doctors are of the opinion that insurance companies and patient organisations should not be able to gain access to the EPD.

> “How do you guarantee that the requirements for keeping information secure and human values (especially privacy) are respected?

It is high time that the TPM faculty took a serious look at the vexed question of ‘ICT in the healthcare sector’. The nature of the problem demands a multidisciplinary approach of the kind that is so typical of our faculty: the problem is characterised by countless technical-organisational-ethical dilemmas that need to be thoroughly examined, and quickly. Hopefully the results will contribute towards a more balanced and more effective decision-making process, not only in hospitals and other care organisations, but also in the Dutch Parliament.”

Dr Jan van den Berg is an associate professor of Information and Communications Technology at TPM.

_Ir._ Inge van Bruinessen:

“We challenge students using present-day problems from the healthcare sector”

“Health, technology and entrepreneurship make up an interesting combination, and with the increasingly ageing of society, health is very much a hot topic. At TU Delft, too, the subject is a key area of focus, as shown by the ‘health innovation & entrepreneurship (HIE) minor, for example, developed by the Delft Centre for Entrepreneurship. It was launched this academic year, with twenty enterprising students from various faculties taking part.

The reason for the creation of the minor is that enterprise in the healthcare sector requires a different approach and specific knowledge, as compared with doing market-based business. In addition, TU Delft offers a range of Master’s-level opportunities for studying health-related subjects, but not at Bachelor’s level. The purpose of the minor is to provide students with a firm basis from which they can apply their technical knowledge and skills in a medical context. The key words here are innovation and multidisciplinary knowledge.
We consider challenges in the healthcare sector from a variety of perspectives, throwing the spotlight on medical and technological entrepreneurs, hospital specialists and various home care organisations. There are no fictional case studies in the minor: the students are challenged using real-life problems in the healthcare sector.

The minor is composed of five subjects: medical instruments, medical design, finance for entrepreneurs, health system management and HIE case study. The latter is an integrated module in which the knowledge and skills from the minor modules are brought together. It consists of two parts, with which external companies and organisations have an intensive involvement.
In the first part the students, working as a team, analyse a company in the medical-technological sector. The students presented their findings at the end of October. The second part is conducted in collaboration with the Living Lab Leiden and three different care institutions. The students will operate like a business - again, working as a team. They will be given a current problem facing the healthcare sector, for which they will have to conduct research among patients in order to devise a sound solution, and add a business plan.”

Ir. Inge van Bruinesse is a project manager/teacher at the Delft Centre for Entrepreneurship (DCE) of TU Delft. She devised the ‘Health Innovation & Entrepreneurship’ programme for Bachelor’s students, which was launched last September.

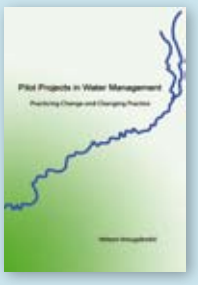
> “Students will be given a current problem facing the healthcare sector, for which they will have to conduct research among patients in order to devise a sound solution, and add a business plan.””

In short

Dissertations

GÖNENÇ YÜCEL

Analyzing Transition Dynamics: The Actor-Option Framework for Modelling Socio-Technical Systems 9 December 2010, Delft



HELEEN VREUGDENHIL

Pilot projects in water management - Practicing change and changing practice, 2 December 2010, Delft

JAN KWAKKEL

The Treatment of Uncertainty in Airport Strategic Planning, 6 December 2010, Delft

More information: www.dissertaties.tbm.tudelft.nl

System Dynamics & Health Care Conference

The 'System Dynamics & Health Care' conference was held at the faculty on 2 December. Under the supervision of B. Milstein and J. Homer, twenty participants played a 'serious game' involving healthcare systems (http://www.cdc.gov/healthbound/). Sixty-five others took part in presentations about the use of System Dynamics for healthcare and healthcare policies, more specifically about possible epidemics and pandemics, the effectiveness of healthcare systems, the creeping problem of obesity among young people and adults, the need to prevent depression, policies concerning medicine stocks for infectious diseases like polio and cholera, and recent insights regarding the effectiveness of group modelling.
The lectures can be seen at http://simulation.tbm.tudelft.nl/HPSIG/Events.html.

Master classes and interactive lectures with Ministry of Infrastructure and the Environment on 'Living and mobility in the Randstad Delta'

The first series of Ministry of Infrastructure and the Environment (previously Transport, Public Works and Water Management) and TU Delft master classes and interactive lectures, themed 'Living and mobility in the Randstad Delta', was a success. In five interactive lectures, leading officials from the ministry have, in the past year, taken part in discussions with students and teachers from TPM and other TU Delft faculties. 'Hot' topics, such as the pay-per-mile levy and the new coalition agreement, were covered. The questions asked by the TU Delft students were incisive and the discussions were of a high standard. This major success will be followed up in the new year with a second series of master classes and interactive lectures.

Integration technical innovations healthcare sector

It is rare for a technical innovation to be simply integrated into society without the involvement of any other external player. This is especially the case in relation to the healthcare sector, which has a complex network of interdependent actors. In order for technological innovations in the healthcare sector to be successfully integrated into society, all the relevant partners must act in a cohesive and coordinated manner, so that services of this kind can be utilised to their full potential. TPM PhD students Alireza Parandian and Fernao Beenkens have already organised two workshops on this subject. Their objective was to focus attention on the process of the social integration of technical innovations into the healthcare sector.

The theme of the workshops was aimed primarily at organising quality-of-life care for the elderly more efficiently, care with a focus on chronic illnesses like diabetes, and cardiological conditions. The workshop started with a discussion of five scenarios in which the roles of the interested parties were explained: the general practitioner, healthcare insurance company, technological developer, patient and monitoring centre. The purpose of the discussion was to make the participants aware of each other's interests when developing new technology.

Ideally, the backgrounds of those attending the workshops should be as varied as possible; the participants play the roles of people from every subsector of healthcare. The individual challenges and barriers in relation to each actor are then examined in more detail, with the participants themselves putting forward solutions, which are then placed in an overview. After the workshop, the solutions are included in a concise report that is sent on later to the participants.

Alireza Parandian graduated from the faculty in MSc Management of Technology in 2006. He is currently in the process of concluding his PhD research here as part of the Technology Assessment Nanoned programme, in which he is identifying the dynamics of disruptive technological developments. It is on the basis of these insights that he is developing complex scenarios and organising international strategy articulation workshops for interested parties. Alireza has organised workshops aimed at the social integration of Body Area Networks (BAN) for example, a term that is used to describe the application of mobile computer equipment that makes many different types of monitoring, diagnosis and analytical and therapeutic services possible. As part of his research project, he has also examined the effectiveness of different interactive processes on the learning process.

Fernao Beenkens graduated from the faculty in MSc Systems Engineering, Policy Analysis and Management in 2004, having developed business models for innovative e-health services. He then worked at the Netherlands Institute for Telemedicine, after which he started his PhD research project at the section Organisational Behaviour and Innovation. His research deals with the acceptance process of ICT-supported self-management services by patients with a chronic condition. During the first 'Nationale DenkTank' (national think tank), Fernao investigated how the healthcare system in the Netherlands might be sustained in spite of increasing demand. In addition, he also took part in the World Health Organization Priority Medical Devices project.

Ethics and software: always a healthy combination

How can you include ethical and social questions in the design phase of software systems, in the healthcare industry, for example? That is the core question posed by PhD candidate Christian Detweiler. He is concentrating on Value Sensitive Design in a collaborative partnership with the TPM Philosophy department, the Man-Machine Interaction Group at the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) and the Almende ICT research company in Rotterdam.

"The emphasis in the development of complex ICT systems is on technical aspects, cost, and functionality. Human values like autonomy, privacy, responsibility and trust do not get a look-in. This is also the case with the national electronic patient record system (abbreviated in Dutch as EPD). Every Dutch citizen is covered by this, but hardly any attention has been paid to their interests. Many people, for example, would like to decide for themselves what information from their records is shared with whom. But they do not have that option: either you take part, or you object, in which case you don't take part. There is no middle way." For Christian, who is greatly interested in man-machine interaction and ethics, this is an important motivator for his research work. "Questions of this kind do not usually present themselves until the technology has entered into use. That is why ethical matters should be addressed in the design phase. Unfortunately, there are not many resources available to software developers that enable them to do this in a systematic way. In my research, I look at ways of helping them in this. Ultimately, design decisions should take account of the values of the people such decisions will affect, and be underpinned by the same values."

One of his case studies concerns wireless sensor networks in care homes for the elderly. The networks make it easier to see where the residents are, the intention being to stimulate them to live more independently. A second prototype actually creates a Second Life environment, so that the activities of the elderly residents can be monitored, by family members, for example. "Of course the key question is whether that is what people want: being watched 24 hours a day. And does that outweigh the benefits? These are the concerns I identify, so that they can be taken on board during the design stage."

Christian hopes that his research work will result in software having greater respect for the values of users. His PhD dissertation is planned for early 2013. "I hope to be able to do many case studies until then, especially in the healthcare sector; this sector holds the promise of many benefits if we are able to arrive at a healthy combination of ethics and software."

Professor profile

NAME

Jeroen van den Hoven

POSITION

I am a professor of Ethics, chairman of the Values and Technology department and deputy dean at TPM. I am also the director of research at the 3TU Centre for Ethics and Technology.

Family?

I am married and have two children; a son of twenty, now in the second year of his medicine degree, and a daughter of eighteen. She is in the final year of her gymnasium ('pre-university education').

Favourite leisure time activity?

In my spare time, I enjoy playing the classical guitar. I also really like running. It's a must for me, as I spend so much time sitting down at meetings or dinners. I run around forty kilometres a week. A lap round the Kralingse Bos is my favourite.

The highlight of your career?

That has to be winning the World Technology Award 2009. This is an award for recognition of a person's work as a whole, and it covered many high points from my career: setting up the 3TU Centre for Ethics and Technology, building up the Netherlands Organisation for Scientific Research multidisciplinary 'Socially Responsible Innovation' research programme, and publications. The presentation took place in New York, with lots of American razzmatazz, but it was a wonderful moment.

Greatest challenge?

The 21st century is the century in which technology will play a key role, in the field of medicine, energy, sustainability, transport, construction and infrastructure, for example. That raises fundamental questions, such as what do technical systems mean for our freedom and for our responsibilities? How do we deal with security and risks? The world has changed beyond belief and our way of thinking about these issues therefore has to change as well. Conceptions of responsibility, privacy, autonomy and freedom have to be reappraised in the light of new developments, and we cannot begin soon enough. After all, technological developments move fast, while the process of reflecting upon them still takes a great deal of time.

Most enjoyable aspect of your work?

It is fantastic to be able to spend the whole day being involved with such interesting subjects. The people around me, too, are fascinated by issues of genuine substance. There are always plenty of new ideas being aired and interesting discussions going on. There are thirty philosophers here and we are becoming more and more international. We have PhD students from Oxford and Oslo, and for four PhD positions we received no fewer than 120 applications from the all over the world! Post-doc and assistant professors from Adelaide, Buenos Aires and New York, a visiting professor from Canberra. We are therefore in the luxurious position of being able to choose from the best. To work with them every day is truly fantastic: I feel tremendously privileged. I sometimes catch myself smiling in the morning as I enter the faculty, on account of the joy of working with so many young people using their talents and being so fully engaged in what they are doing.

Why Delft?

For a long time, ethics were in an exalted position in relation to the ordinary world. That has now changed, and that is no bad thing, in my opinion. Personally, I am convinced that ethics is a practical philosophical discipline. You have to be where everyday reality is determined: 'where the rubber meets the road' - that is where you can make a difference. Technology is one such field: it is here that we are literally developing the future. Delft is the right place to be for that. If you bring ethicists and engineers together at an early stage, moral values like privacy and autonomy can be included in the design phase of new technologies. If this had been done during the development of the smart electricity meter, for example, then it would not have been rejected by the Senate on privacy grounds. So I am very much in favour of value-sensitive design. One of our challenges is to make engineers at Delft more aware of the phenomenon.

Best characteristic?

I think it's important to create an atmosphere in which people feel at ease, so that they can develop and do the best possible justice to their talents. We seem to be getting it right, too, because our department is growing and we are successful in publishing the results of our research and in our applications for research grants from the Netherlands Organisation for Scientific Research. I sometimes also manage to introduce a new idea. In philosophy, you often work in the context of long traditions, which refer back to positions and problems from the history of philosophy and which elaborate on the work of important thinkers such as Aristotle or Wittgenstein. Moreover, so much has already been said and leading contemporary philosophers from Harvard, Oxford and Princeton are extremely smart and driven in their analyses of philosophical puzzles. That does not make it easy to add something that is even smarter. However, I do sometimes succeed in saying something new or providing a different insight, and that is relatively rare in philosophy. The reason for that, I think, is partly that we are inspired by everyday reality and that we are enormously motivated to say something useful about real problems in the world. We are not practitioners of philosophy for philosophy's sake, but because a philosophical analysis is sometimes the only sensible approach to problems that almost everyone regards as important, but about which nobody is able to say anything worthwhile from the point of view of their own disciplines.

Least good characteristic?

I find it difficult to move between a wide variety of tasks, such as writing a book or a paper, and very practical management issues. The process of switching from one thing to another does not always run as smoothly as I would like. Also, I occasionally find myself losing interest in a topic if I think I know all about it, even though an important part of academic work involves fleshing out, claiming and asking for attention for your ideas. You sometimes find that you only thought you knew all about a particular topic.

Which subject do you believe should be high up on the political agenda?

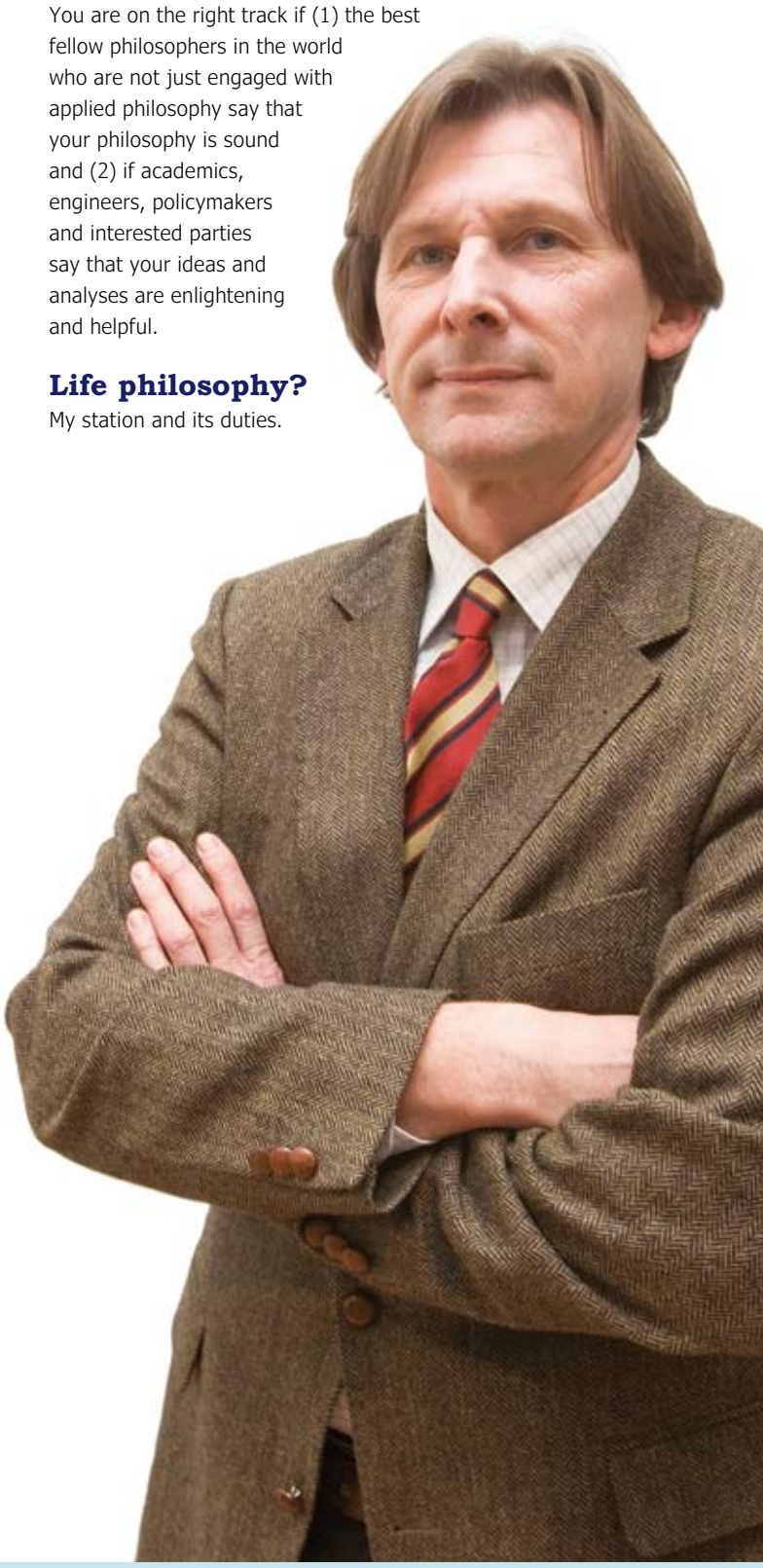
As far as I am concerned, Socially Responsible Innovation, the theme of an ethics research programme of the Netherlands Organisation for Scientific Research. We should be making products, services and systems in which 'soft' requirements like moral values and ethical considerations are combined with the 'hard' technical aspects. I reckon there are huge opportunities here for the Netherlands PLC and Europe PLC, because it is something that neither the Americans nor the Chinese are paying any attention to.

Source of inspiration?

I am fascinated by analytical philosophy, and by association, its founders like Bertrand Russell. The great analytical philosophers of today, like Thomas Nagel, are seeking clarity in articulation, formulation and argumentation with regard to very fundamental, substantial and difficult problems. Philosophical problems are by definition difficult, which causes other disciplines to avoid them. Quality standards in philosophy are controversial. I think the primary virtue of a philosopher should be to articulate, formulate and argue clearly and crisply. There is nothing to be gained from using profound language or philosophical jargon if it is not strictly necessary. For our work in Delft in the applied philosophy of technology, I would say that there is a dual quality requirement. You are on the right track if (1) the best fellow philosophers in the world who are not just engaged with applied philosophy say that your philosophy is sound and (2) if academics, engineers, policymakers and interested parties say that your ideas and analyses are enlightening and helpful.

Life philosophy?

My station and its duties.



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Colofon

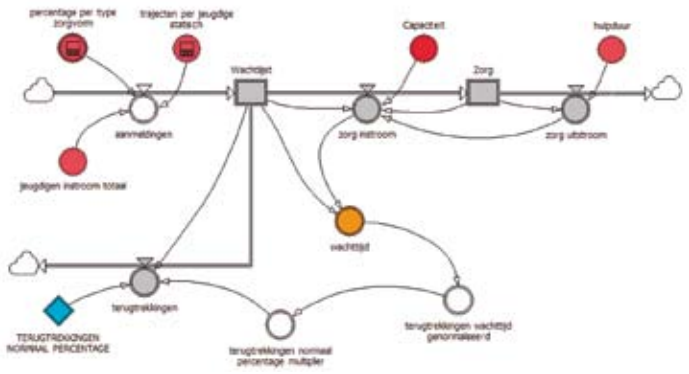
ALUMNUS BASTIAAN VAN DE RAKT – CARE LOGISTICS ENTREPRENEUR

Perfect simulations for the strategy most likely to succeed

His studies at the then newly formed Faculty of Technology, Policy and Management was, as far as he was concerned, a piece of cake. In his second year, for example, Bastiaan van de Rakt even managed a four-month trip round the Far East, but still obtained all his credits. With his characteristic sense of enterprise, he continued to make forays into the outside world during the following years of his studies, too. That led to orders from the Port of Rotterdam, after which Van de Rakt was no longer a frequent sight in the classrooms or lecture halls.

Nevertheless, this does not mean that TPM is no longer part of his life. "In my first two years here in particular, I was greatly inspired by the way of thinking, by my fellow students, by the teachers and by the professors. I learned a lot as well. TPM was an informal faculty, where people thought out of the box. That is the way people think in our company too."

In Rotterdam, he met Ian Miller and Marco Melis, who are now his business partners. Seven years ago, the three men launched their entrepreneurial careers with various projects, before setting up INITI8 two years later. They are going down a storm in the healthcare sector. "We want to be a large strategic consultancy in care logistics", explains Van de Rakt, making no attempt to hide his ambitions, which are underlined by the presence of the company in the Van Nelle Ontwerpfabriek, a monument to architecture and the power of enterprise.
INITI8 supplies products and services that assist policymakers in their strategy and management of their businesses. These include scenario analyses which, with the help of simulations, provide an insight into the consequences of policy decisions and changes in surroundings. "Together with our customers, we formulate and assess measures in order to create the strategy that is most likely to succeed. We then monitor how it is implemented, which in turn enables us to take our simulation models even closer to perfection."



Focus on care

"Originally, we used to work primarily for port-based companies, but our focus now is exclusively aimed at the healthcare sector. Our involvement has grown just like that. It seems that our products and mentality resonate well with healthcare," states Van de Rakt. Until now, INITI8 has been mostly active in the child welfare sector, which in recent years has made the news on account of long waiting lists and the failure of various bodies to coordinate their activities. "In the Netherlands, we are the specialists when it comes to 'managing the child welfare sector', but we expect to be able to grow significantly in other care sectors as well in the next few years. There is a great deal of potential there."

The alumnus visits TPM every month - sometimes for a chat with the thesis coordinator, but usually to discuss collaboration. "In recent years, four people have graduated at INITI8, and stayed with us," says the 32-year-old entrepreneur. This year was the first in which they were not joined by a new graduate. A great pity, he believes. Together with TPM, INITI8 is investigating the further integration of business intelligence and simulation. "We want to make sure that the applicability of our models remains top notch. In Delft they are very good at highlighting why one model works and the other does not. That interchange helps us maintain the quality of our services at a high level."

Bastiaan van de Rakt was one of the speakers at the Faculty of TPM Benelux System Dynamics Congress on 2 December. See also page 6 of this magazine, or go to the TPM website or www.initi8.nl.

Ask TPM

The campaign for vaccination against cervical cancer was overwhelmed by parents who had been alarmed by stories on various websites claiming that some girls had died as a result of being vaccinated. Many parents subsequently decided not to have their daughters vaccinated, in spite of the fact that experts emphasised that there was not a shred of truth in the accounts and that vaccinations were safe. Had the people involved become so emotional that they were impervious to scientific information? We asked Professor Sabine Roeser, associate professor from the Philosophy section and endowed professor at the University of Twente, where she teaches and researches Political Philosophy and the Ethics of Technology.

Political debates about risky technologies often regard emotions with mistrust, given that they appear to conflict with rational decision-making. Emotions can indeed hamper our understanding of quantitative information about risks. In my research, I show that moral emotions, like compassion and a sense of justice, are necessary to be able to assess the ethical aspects of technological risks, such as justice, fairness and autonomy. When it comes to vaccinating against cervical cancer, policymakers and scientists have underestimated the emotional, moral considerations that people have, instead of which they have bombarded people with information about so-called low risks. It has become a case of the blind leading the blind. A more productive approach would have been to use the emotions of laymen as the starting point, and to tackle the underlying moral considerations and concerns.
The proponents generally use 'old-fashioned' media: information based on figures, all unidirectional. This strengthens the notion of the gap between the experts who know it all and the ignorant man in the street who needs educating. However, new media, à la 'web 2.0', are interactive. They allow scope for dissenting voices and dialogue. What is it that opponents want to say? Let them speak up. And answer their worries by facing them head on, not by simply repeating the same information about low risks. Bear in mind, though, that opponents might put forward some convincing arguments that will require the original starting points to be reassessed. Risk-communication as dialogue instead of marketing, where emotions are not treated in an instrumental fashion 'in order to create support', but are taken seriously as a source of important insights. In the case of cervical cancer vaccinations, the emphasis should have been laid on the fact that the aim is to prevent a terrible disease, rather than focusing on the low likelihood of side effects. Even when the risk that something will happen to their daughters is so low, parents will still avoid the risk: their fear and concern is an understandable reaction - unless it can be shown to them that the alternative possibility is much more of a threat. More attention should have been paid to this latter aspect, and it would have been possible to appeal to people's emotions as well. This could have been achieved, for example, by putting a film on YouTube of a woman with cervical cancer explaining how dreadful the illness is.

TPM's educational programmes

■ **BSc Systems Engineering, Policy Analysis and Management ('Technische Bestuurskunde', TB)** ■ **MSc Systems Engineering, Policy Analysis and Management (SEPAM)** ■ **MSc Management of Technology (MoT)** ■ **MSc Engineering and Policy Analysis (EPA)** ■ **MSc Transport, Infrastructure and Logistics (TIL) (in cooperation with the Faculty of Civil Engineering & Geosciences and the Faculty of Mechanical, Maritime and Materials Engineering)** ■ **MSc Information Architecture (IA) (in cooperation with the Faculty of Electrical Engineering, Applied Mathematics and Computer Science)** ■ **MSc Geomatics (in cooperation with the Faculty of Civil Engineering & Geosciences and the Faculty of Aerospace Engineering)**

Did you thoroughly read the available information and are you considering enrollment in a TPM-programme? Are you not sure your educational background is sufficient? Then please contact one of our study advisors: Drs. Marja Brand ✉ (m.j.c.c.brand@tudelft.nl), Ir. Jeannette Blokland ✉ (a.h.blokland@tudelft.nl) or Drs. Danielle Rietdijk ✉ (d.rietdijk@tudelft.nl).