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RSM DISCOVERY 23

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Creating value through academic excellence

Welcome to issue 23 of *RSM Discovery* magazine. The purpose of this publication is to serve as a platform between the worlds of management science and business. Through this magazine, RSM researchers share the essence of their recent work in a way that makes the potential applications and benefits clear to business practitioners and their organisations.

This gives us as a business school the opportunity to share our latest scientific insights and endeavours with a wider audience – one that is in a position to make actual use of the new knowledge we create in ways that are practical and meaningful and which give credence to the principles of valorisation, which are value creation through knowledge transfer and meaningful business impact.

We certainly believe that the knowledge shared by our world-leading academics offers much for forward-looking and adaptive thinkers. In particular, the articles in this issue of *RSM Discovery* magazine explore:

How one of RSM's newest centres of excellence is addressing the important matter of public safety from a management perspective. How a new methodology can help us extract greater value from data. Why marketers should encourage gift-givers to think of themselves when making purchases. How industrial eco-systems offer major opportunities for port authorities. The threats to useful data collection posed by increasingly sophisticated internet users, and how understanding the big data gained public transport operators can be used to provide enriched and personalised experiences for customers.

I am sure that you will find these articles to be of great interest and look forward to hearing from you should you have any comments.

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Public safety from a management perspective

***Rebecca Morris** talks with Gabriele Jacobs and Saskia Bayerl*

Concerns over public safety, whether it is the threat of natural disasters, social unrest, radicalisation or illegal immigration, are everywhere in the public and political discourse. Essentially, how we manage public safety in Europe is problematic, which is why RSM's new Centre of Excellence in Public Safety Management hopes to contribute to its improvement.

Perhaps what should be concerning us more is not a lack of safety – in fact Europeans have never been safer, with crime rates falling in every country – but the problematic ways in which we are protecting our public.

Management of public safety, says Gabriele Jacobs, associate professor of social and organisational psychology at RSM and scientific director of the centre, while once the province of public institutions such as law enforcement, now involves a complex interplay between public, private and government bodies – and is a process fraught with communication, transparency, managerial and harmonisation problems.

Jacobs and her colleagues are among those who wish to change that. RSM's new Centre of Excellence in Public Safety Management (CESAM), led by Jacobs and her colleagues Saskia Bayerl, Elisabeth Brein, Kate Horton, Mark van der Giessen and Bep Klop – is dedicated to the study of public safety from a management perspective.

Their goal is to take the management solutions applied so effectively within the private sector and apply them to improve the management of public safety on a pan-European scale.

'Here we have an area of public life that urgently needs our attention,' says Jacobs. 'Management scholars are not only equipped to do this, but we have an obligation to do so.'

More than anything, says Saskia Bayerl, assistant professor in technology and organisational behaviour, and programme director of research stream technology, they want impact: 'For me the most valuable contribution

Public safety from a management perspective *(continued)*

***Rebecca Morris** talks with Gabriele Jacobs and Saskia Bayerl*

we can make is impact – to measurably improve the society we live in.'

Public safety is complex

New technologies, open borders, and the internationalisation of organisations and their supply chains have made protecting the public from crime or catastrophes infinitely more complicated than it was decades ago – and the boundaries as to whose responsibility it is, less clear.

When it comes to public safety, the private and public divide no longer applies, says Jacobs. Multiple stakeholders are now involved, says Bayerl, 'each with different and legitimate interests and ideas about how public safety should be achieved.'

Moreover, these stakeholders often operate in their own independent streams. 'We see technology companies not well connected to the legal discussion or societal discussion,' says Jacobs, 'and the public not properly informed of the activities of the police.'

Then there are the managerial challenges facing public institutions. Leaders of law enforcement organisations face the same strategic challenges – including massive organisational change – as the CEOs of major multinationals, yet with less public support, managerial training, and the pressure of serious austerity measures.

How business schools help

Business school academics are in a unique position to help: they know how organisations inter-relate and can facilitate collaboration between different stakeholders; they can provide leadership education; and work side-by-side with organisations to address their diverse challenges. And that's exactly what the team at CESAM are doing.

Prior to the formation of the centre, only a few small projects in the field of public safety had been conducted at RSM. Then came COMPOSITE (Comparative Police Studies in the EU), a four-year-long EU-funded initiative led by Jacobs and concluded in 2014.

Requiring the participation of 15 partners across ten European countries, the project identified the factors most conducive to organisational change within police forces throughout Europe: insights ranging from the technology, resources and capabilities available, to the leadership styles and institutional cultures. The findings were presented at numerous conferences to police forces, stakeholders, and fellow academics.

RSM is now in the process of developing executive education programmes for leaders of police forces and the stakeholders they work with. While COMPOSITE was initiated prior to the inauguration of the centre, the project led to a body of knowledge and networks that inspired the creation of CESAM. What followed was a passionate exploration of crisis management and a proliferation of projects relating to general questions of public safety.

Interdisciplinary solutions

A quick glance at the centre's project list captures the scale and breadth of its ambitions. In the 12 months since its inception, the centre has acquired another high-profile EU-sponsored project and three Dutch government grants. Several new national and EU proposals have been submitted.

One project recently completed was the evaluation of the much-publicised reorganisation of the Dutch national police force, conducted on behalf of the Dutch Ministry of Security and Justice, and won by the CESAM team in a public tender. A current project led by Elisabeth Brein involves evaluating the success of a change initiated in the Dutch law system.

Research at the centre is divided into two streams: the role of new technologies for the management of public safety, led by Bayerl, and the role of identity for organisational and inter-organisational practices, which is led by Kate Horton. An overarching theme is the evaluation of large-scale organisa-

> *"...the most valuable contribution we can make is impact – to measurably improve the society we live in."* ***Saskia Bayerl, programme director, CESAM.***

"We enter into a project with a public institution and develop solutions together."

Gabriele Jacobs, scientific director, CESAM.

tional changes and the management of international collaborations.

'The topics we tackle at CESAM are at the interface of the various communities that need to co-create public safety,' explains Bayerl. 'We can help facilitate the dialogue between these communities.'

Interdisciplinary work is something the CESAM team is passionate about. 'At Erasmus University Rotterdam a lot of valuable research has already conducted on public safety in other disciplines,' says Jacobs. 'Our goal is to work with these faculty members from other disciplines. We start with the topic, then organise expertise around it from different disciplines.'

All projects are conducted together with practitioners. 'We enter into a project with a public institution and develop solutions together,' says Jacobs. 'It is in this way we hope to contribute new knowledge both to academia and the organisations we work with'

The centre also actively contributes to academic discussions. A recent CESAM-led study investigating the effects of stakeholder feedback on police identity was published in the *Academy of Management Proceedings*. Other recent publications have targeted academic audiences in information systems, new media and communications.

Exploring crisis management

A good example of the impact of their work can be seen in CRISADMIN (Critical Infrastructure Simulation of Advanced Models on Interconnected Networks Resilience project). Researchers at CESAM – led by Brein – developed a simulation tool for exploring the impact of major catastrophic events (natural, industrial or terrorist in nature) on critical infrastructures.

The possibilities this tool affords are considerable. Practitioners can use it to assess the risks and impact of critical events on quality of life and the factors that trigger the domino effect between interdependent critical infrastructures. They can use it to assess possible intervention countermeasures and prevention policies. By simulating the effects of particular policies, the tool can be used to understand, evaluate and update already implemented process and procedures.

The model has been made freely available in a prototype form for both public (civil protection, fire brigades, for instance) and private organisations throughout EU member states. Practitioners have free use of the tool and will be able to customise it to meet their needs.

Improving engagement

The centre's current EU project is UNITY, which aims to improve the engagement of law enforcement agencies with citizens and will develop new technologies to facilitate the interaction between communities and police.

Under the leadership of Bayerl and Jacobs and involving PhD student Mark van der Giessen, CESAM is responsible for the collection of community policing best practices in at least six countries, for analysing the technology needs of stakeholders and evaluating the implementation of a technology tool. The project will run from May 2015 to April 2018.

'Management scholars can be useful within this area of public safety,' says Jacobs. 'Our goal is simple: to contribute to the improvement of an area that is at the core of public life.' ■

More information about the research priorities and aims of RSM's Centre of Excellence in Public Safety Management (CESAM) can be found at WEB www.erim.eur.nl/cesam

Necessary Condition Analysis: more value from data

By ***Jan Dul***

Data is often surprisingly short on real answers for managers, particularly if a problem is multi-causal. Sometimes we can measure all the relevant factors in a complex system to the fourth decimal place and yet still have no clear sense of which factors matter.

As a business school professor, I had long been frustrated that we know so much but can make so little use of what we know. Then about seven years ago, I had an idea for getting around this problem. It seemed to me that if we looked at the data from another angle, we could get much more useful answers. The solution lay not in sorting contributory factors, the normal result of a regression analysis, but in selecting only those factors that are absolutely essential to avoid failure: the necessary but not sufficient conditions.

A necessary but not sufficient condition is a factor that can't be left out – a "gotta have" as Americans say. It's a constraint that does not ensure success if it is present but guarantees failure if it is missing: a car stops moving if the fuel tank is empty; a brokerage collapses if trust is gone; contracts and trust are both necessary for a successful collaboration between firms (Sumo 2015).

Necessary Condition Analysis (NCA) transforms our ability to look at data from situations like this. Instead of expressing our findings in shades of grey as we would normally have to – this *could* happen; this is *likely* to result – NCA enables the analyst to look at the data and say, if you don't do this, you won't succeed. Or, if this metric does not pass that particular threshold, you will fail – full stop. It's a powerful statement that can give you more definitive, actionable answers than conventional statistics allows.

"A necessary but not sufficient condition is a factor that can't be left out – a "gotta have" as Americans say."

Three examples

Three examples illustrate how NCA can be used. Consider the Quantitative Graduate Record Exam scores of 342 students applying for admission to the Berkeley Sociology Graduate Program in 2009 (Goertz & Mahoney, 2012; Vaisey, 2009). A traditional data analysis would show a high correlation between GRE score and admission. The data would be used to justify the conclusion that success is more likely when the GRE score is at least 620.

However, the *necessary but not sufficient* interpretation of these same data points show that a score of at least 620 was almost always a necessary condition for admission, the one exception being a student admitted based on a faculty member's explicit testimony as to the student's quantitative abilities (Vaisey, personal communication, July 2, 2014). Scoring 620 or over did not guarantee success – in the end, only a few of the applicants with that score (14 per cent) were admitted – but scoring below 620 practically guaranteed failure.

Traditionally, admissions officers might advise students to 'score high on GRE to increase your chances for success', but if they advised them based on an NCA they could say flat out that the applicant won't make it without the specific high GRE score – a much more useful statement to the would-be applicant.

Many kinds of questions can be resolved in a similar way. For instance, consider the case of a pool of salespeople evaluated through the Hogan Personality Inventory (HPI), a widely used tool to assess employee personality in order to predict organisational performance (Hogan & Hogan, 2007).

For Level 4, a high level of sales ability, it is necessary to have an ambition level of at least 30, as rated by Hogan.

About 20 per cent of the sales representatives in the sample do not reach this level of ambition, which suggests that people with ambition levels below 30 will certainly fail to reach a sales ability level of four of higher. The other sales representatives who do have an ambition level of at least 30 (about 80 per cent), have the potential to reach a high level of sales ability.

In the end, only 10 per cent of the sales representatives in the sample reach this level of sales ability. In other words, an ambition level of at least 30 is necessary but not sufficient to achieve a sales ability level of at least four. This means that an ambition level below 30 is a bar to achieving a high level of sales ability (Hogan, 2007).

This technique can be useful in multi-causal analysis as well. Consider what happens in an analysis of sales rep personalities that not only includes ambition but sociability, interpersonal sensitivity, and learning. A traditional multiple regression analysis indicates that the four personality traits together hardly predict performance, but NCA makes it clear that all four plots, including the plot for learning, indicate that each personality trait is a necessary but not sufficient condition for above-average sales ability (Hogan, 2007).

Is this really new?

When I explain my NCA methodology to practitioners, they are typically less than thrilled. They say – correctly – this sounds very logical and consistent with the way we actually think and work. Hasn't anybody done this before?

Necessary Condition Analysis: more value from data *(continued)*

By ***Jan Dul***

For a long time, I wondered myself whether someone had. The method seems so intuitive to me I thought somebody must have used it already, but I still haven't found evidence of it. Surprisingly little has been done to turn the data in a way that allows us to sort exclusively for necessary but sufficient conditions.

Analysts in the social sciences often make theoretical statements that include the phrase "necessary but not sufficient", but the tool they use to demonstrate their hypothesis is multiple linear regression (Y= a + b1X1+ b2X2 + b3X3 + ...), a technique that only works in demonstrating additive causes, a series of factors that add up to an outcome, not a series of factors that all have to be present to produce an outcome.

Researchers in technology and medicine have thought a little more about necessary but not sufficient conditions. The kinds of complex systems doctors and engineers work on often operate with a number of non-negotiable factors.

Diseases, for instance, often have necessary but not sufficient conditions, such as the HIV virus that is always a precursor to AIDS, or the virus that accompanies cervical cancer – factors that must be present if a disease is to develop. However, even in these disciplines, people think more often in terms of trying to predict outcomes.

I think the reason people don't think this way is that psychologically we are much more attuned to looking for a recipe to produce an outcome: you generally don't look up a recipe about

"The method seems so intuitive to me I thought somebody must have used it already, but I still haven't found evidence of it."

how *not* to bake a cake. Most of the time, we want a positive prescription.

Using this method is not difficult – it can even be done visually, by drawing lines through a standard scatterplot X-Y graph (see Panel). I have also developed a software package for people who need more precision, and even this is simple to use for anyone familiar with statistical software. Whichever method the analyst uses, however, the most important aspect is the initial concept that instead of trying to find for a recipe to create an outcome, you look for the factors that will stop you.

A special tool

Of course, NCA is not the best way to solve every problem. Regression analysis and the other traditional analytics tools remain very useful for a variety of purposes. NCA is instead a very useful tool for analysts to add to their toolbox if they understand what it can and cannot do.

It cannot solve the commonly observed problem that 'observational data cannot ensure causality'. In other words, a data pattern that is consistent with the causal hypothesis is not evidence of a causal connection, only that a connection is possible, when it is theoretically justified.

It is easy to plot storks versus human newborns in a given region (Box, Hunter, & Hunter, 1978) and find what looks like a necessary but not sufficient condition, but is not. Nor can NCA overcome the difficulties of limited sample sizes, and indeed may be somewhat more sensitive to measurement error than other approaches.

What NCA does very well is prove negative statements: 'if you don't have X you will not get Y.' If the data suggest a definitive consequence of an absence of something, NCA is probably the right tool to demonstrate it.

For many problems, the combination of being able to suggest a positive, using traditional analysis, and a negative, using NCA, makes it much easier to win more substantial and practical insights than through traditional methods alone.

Evangelising

These days, I am spending a lot of time on further developing the method, and discussing and spreading the use of NCA. I have given up some administrative duties at RSM in order to focus on NCA. I am refining it to make the concept more precise, adding the ability, for example, to calculate confidence intervals, and I am also doing a lot of evangelising, speaking at conferences and talking to groups about how my method works.

I'm convinced that a lot of people could benefit from this technique, in more ways than we imagine now. We talk a lot these days about living in the era of big data, but big data is only worthwhile if we use it to generate big insights. ■

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Spotting the necessary but not sufficient

The starting point for finding a necessary but sufficient condition using NCA is a scatter plot of data that plots X (the determinant and potential necessary condition) against Y (the outcome) for each case.

If you see a largely empty zone in the upper left-hand corner (with the convention that the X-axis is "horizontal" and the Y-axis is "vertical" and that values increase "upwards" and "to the right"), you may have found a necessary condition of X for Y. At this point, draw a ceiling line between the empty zone without observations and the full zone with observations.

Whether this condition matters depends on comparing the size of the empty zone with the entire area of the graph. The larger the empty zone compared to the rest of the observations, the larger the size of the necessary condition.

Determining the best position for the line is not always easy. I have identified eight ways to do it in my academic paper on NCA, *Necessary Condition Analysis (NCA): Logic and methodology of 'necessary but not sufficient' causality*, which will be published in an upcoming edition of *Organizational Research Methods*.

Consumer insights: think of yourself when buying for others

By ***Gabriele Paolacci***

Although there has been research on matching gifts to recipients' tastes and the connection between the giver and the recipient, no one had really looked at how a perceived connection between the giver and the gift affected how the recipient felt about the gift – until now.

I had the idea for this project while trying to find a present for my mother. As I was looking around for the right gift, I began to wonder whether I should choose something I thought she would like, or something that I liked that I thought she would like too.

My field is consumer decision-making, not gift-giving, but I was curious about whether anyone had an answer to this question. I asked two colleagues who study gift-giving, Laura Straeter of RSM and Ilona de Hooge at Wageningen University in the Netherlands, but they didn't know either. It turned out we had given ourselves one of the best gifts an academic can receive: a fresh research question.

To find an answer to the question of whether people prefer gifts that have some connection to the giver, we undertook four studies with a variety of participants: students from Erasmus University Rotterdam, US residents recruited on Amazon Mechanical Turk and Dutch adults. Each of these groups answered one facet of this larger question:

- Do recipients appreciate a gift more when it contains references to the giver?
- Does the attractiveness of a giver-matched gift depend on recipients' inferences about the giver's motivations?
- Does disliking the giver affect how people feel about giver-matched gifts?
- Does it matter what aspect of the giver the gift matches?

The gifts described in our surveys were not functionally related to the giver's characteristics (eg, a mug received by a professional potter) but merely contained aesthetic references to the giver (eg, a mug with a picture referencing the giver's country of origin). This ruled out the alternative explanation that recipients might be particularly appreciative of giver-matched gifts because they infer higher quality from the giver's expertise.

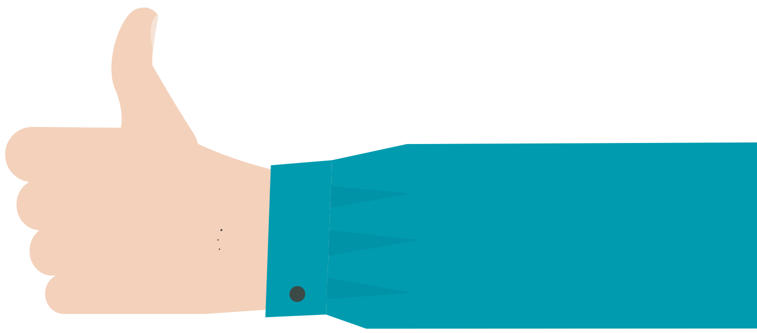
Giving yourself

Our respondents' answers to our hypothetical questions suggests that people preferred gifts that reflected some core quality of the giver – a reference to a place the giver knew well or something about their passions. Gifts that have some narrative information attached, such as a picture of Paris from somebody who loves Paris, or a CD from an avid music fan, meant more to the receiver than a present that had no personal connection at all. However, this reflective aspect of the present has to be a core quality. It can't be that you saw me playing baseball once (the one time I actually tried) so I gave you a baseball; it has to reflect something important about me.

Interestingly, this seems to be true regardless of whether we like the giver. Even when recipients aren't crazy about the giver, they still prefer a gift that shows some kind of consistency between the giver and the gift. There seems to be an innate enjoyment of this kind of correspondence.

Researchers have noted this effect in other contexts in the past: we tend to

"...our findings also suggest that retailers should encourage customers to buy things that they would like as gifts – perhaps among products that they've bought in the past."



make large and trivial decisions in ways that align with our self-image. Whether we are choosing a career or buying a detergent, we try to behave in ways that somehow fit our sense of ourselves. Further, not only do we appreciate consistency in our own attitudes and behaviours, we look for them in the attitudes and behaviour of other people. In fact, we like to see people acting in character even if we don't like the qualities of their character.

Buy for yourself

For gift-givers, the results of our study suggest that if you don't really know a person you are buying a present for, you may be better off trying to buy for your own taste (at least to a degree) than for that of your recipient. After all, you know yourself a lot better than you know them. As a marketing matter, our findings also suggest that retailers should encourage customers to buy things that they would like as gifts – perhaps among products that they've bought in the past.

The kind of thing given may matter too. For instance, it seems likely (though we didn't prove it in our studies) that the personal connection may be easier to establish in a gift that is mostly intellectual or cultural, such as a book or music.

One possible exception may have to do with the address on your package. In East Asia, for example, seeking interpersonal harmony tends to be valued more than being consistent and true to oneself, which may make the congruence between the gift and the giver's identity of less interest than it is in the West.

So what gift should you give next? That we can't tell you. My mother liked Daniel Kahneman's *Thinking Fast and Slow*, but if you're not a decision-making scholar, it might not be the best gift. ■

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This article draws its inspiration for the paper *Give Me Your Self: Gifts are Liked More When They Match the Giver's Characteristics*, written by Gabriele Paolacci, Laura Straeter and Ilona de Hooge, and published in the *Journal of Consumer Psychology*, Volume 25, Issue 3, July 2015, p487-494. DOI: http://dx.doi.org/10.1016/j.jcps.2015.01.006

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Industrial ecosystems: major opportunities for port authorities

By ***Rick M.A. Hollen, Frans A.J. Van Den Bosch and Henk W. Volberda***

Port authorities are faced with the challenge of boosting both the international competitiveness and environmental performance of their complex. Getting firms within these complexes to engage in "co-creation" via the development of industrial ecosystems offers a way out for port authorities fearful of losing out financially in an effort to keep their port green.

There is an undeniable and perfectly justifiable need for businesses to buy into the reduce-reuse-recycle concept, regardless of industry. Port authorities and the firms established upon port complexes are no more immune to this than any other, meaning that the traditional port business model has become anathema.

No longer can port authorities focus primarily on renting out terrain for business use where productivity and cost minimisation are the sole goals while not taking into strategic account the environmental consequences of such a way of working. More interestingly still, a new co-creative set-up via the development of so-called "industrial ecosystems" offers not only eco-friendly business opportunities but also enables profiting from innovative interfirm collaboration aimed at enhanced energy and resource efficiency along the way.

Green partnerships

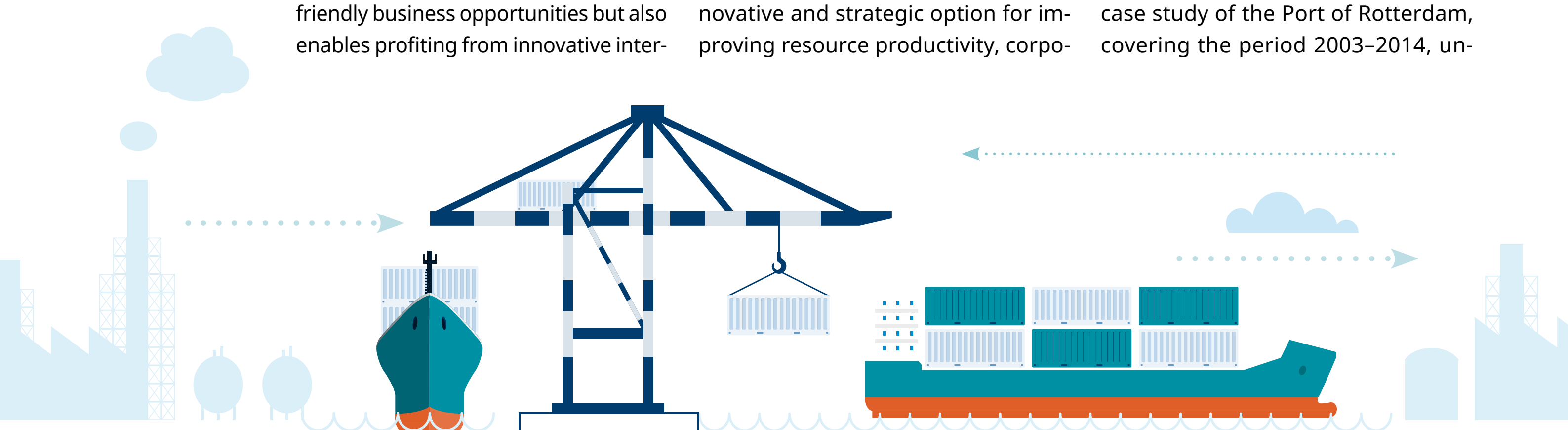
The need for ports to operate in a more environmentally-friendly way is by no means a passing trend – the pressure to reduce emissions and reuse waste as effectively as possible originates from regulations and a rising level of socio-political demand of the stakeholders involved. Within this climate (in all senses of the word), port authorities are increasingly forced to re-assess the way they go about their business with the firms implanted upon their complex. The development of "industrial ecosystems" has emerged as an innovative and strategic option for improving resource productivity, corporate environmental performance, and competitive advantage.

Industrial ecosystems usually comprise networks of legally autonomous firms, which, in most cases, are physically interconnected by pipelines that use one another's residual energy and chemical effluents as input for their own production process. Such a set-up provides an economical substitute for virgin materials, as well as enabling firms to reduce waste disposal and emissions in an innovative way.

However, some firms are reluctant to buy into this way of working together due to the increased interfirm dependence involved, in addition to the infrastructure investment required. These firms run the risk of not being able to cope effectively with new strategic challenges in time, and hence losing their competitive edge.

The role of port authorities

Whilst the expression "port of call" refers to a temporary stop-off, an industrial ecosystem benchmark could point towards a rather more permanent alternative for port authorities faced with the productivity-versus-environment quandary. Both prior literature and a case study of the Port of Rotterdam, covering the period 2003–2014, un-



derline the importance of investing on several fronts to realise the potentially complicated business of co-creating industrial ecosystems.

Key strategic levers for port authorities for pulling off such multi-partner alliance initiatives are to be found at infrastructural (both physical and knowledge-related) and land allocation policy levels. On the former point, seemingly promising actions include the laying of common carrier pipeline bundles and devising a "plug and play" set-up whereby bundled services such as power supply, waste water processing and tank storage are made available to arriving firms.

Infrastructure does not exclude the sharing of knowledge and expertise. Indeed, the development of industrial ecosystems may be further enhanced through, for instance, bringing together firms present on the complex via innovation platforms dedicated to energy efficiency, engaging in enhanced mapping of intra-port streams of energy and raw materials (thereby exploring new potential interfirm energy and resource exchanges), investing in open research and development facilities, and linking up with knowledge providers (such as SmartPort in the Port of Rotterdam). In this way, port authorities continue to explore new ways of working and the required management innovation.

The allocation of land and, above all, its subsequent use, besides investments in physical and knowledge infrastructure, are crucial to the success of industrial ecosystem development and, in turn, of a port complex in general. A purely "landlord" role is no longer tenable for port authorities in today's business environment. In particular, port authorities need to become more innovative in terms of raising a port's sustainable competitiveness.

In this vein, they should no longer look to establish policy based upon primarily financial concerns in land allocation but also by applying strategic value creating criteria, ie, with respect to expected contributions to the port's innovation-driven sustainable international competitiveness. This issue has been pointed out before in our research report on strategic value creation of ports for their country (see reference below).

Implications and challenges

Rotterdam is not the only standout case of a port complex working effectively in the spirit of innovative ways of interfirm collaboration aimed at enhanced resource productivity. Antwerp (Belgium) and Kalundborg (Denmark) are other cases in point, as are multiple in-land sites within Germany, to name just a few examples.

What various success stories have in common is their ability to put into question the more traditional landlord role and associated business model that port authorities – as well as other types of local or regional authorities – assumed in the past. However, the process of business model innovation does not come without complications and challenges.

Many firms are put off by the idea of "co-creation" as, by definition as well as in practice, such an approach involves firms relinquishing complete control over their business operations, be it from an infrastructural perspective

"The development of 'industrial ecosystems' has emerged as an innovative and strategic option for improving resource productivity, corporate environmental performance, and competitive advantage."

and/or the reality of sharing knowledge and expertise with other firms. For port authorities this also represents a different ball game as, once an ecosystem is in place, their role is no longer one of control and surveillance only, as in the "landlord" case.

They should therefore be prepared to act in a more open and collaborative spirit with a view to sharing know-how and encouraging news ways of enhancing resource productivity by, for instance, experimenting with different environmental regulations and compliance systems. Business associations representing port-related firms, such as Deltalinqs in the Port of Rotterdam, can be strategic partners in this endeavour.

Major opportunity

The creation and managing of industrial ecosystems represents a major opportunity for previously stand-alone firms to create added value, become more energy-efficient, reduce feedstock costs, and lower emissions and waste disposal levels and, by doing so, become more innovative. For energy hub ports and those located near residential areas, the eco-interests of such a set-up is even more attractive still, despite some of the initial uncertainty organisations may have about embarking upon a multi-organisational collaboration rather than "going it alone".

The future of industrial ecosystems does not stop here. For instance, further strategic efforts need to be made into the possibility of separate port complexes – such as the Port of Rotterdam and the Port of Antwerp – collaborating in a way similar to that which separate firms within the same port have so far managed with success. In this way, industrial ecosystems may cross the border of a single port complex, benefitting both the port complexes involved and the surrounding urban areas.

However, what emerges very clearly already at this stage of research and actual business practice is that the business model upon which port authorities and firms in the port operated in the past is no longer a viable option to create a sustainable competitive advantage. Partnering with other firms within and beyond the port complex in the form of industrial ecosystems carries certain complications but ultimately fewer risks than going it alone.

In this connection, the conducted research suggests that port authorities need to strategise beyond their traditional landlord business model by contributing to the development of such industrial ecosystems, thereby enhancing ports' environmental performance and innovation-driven international competitiveness. ■

"The creation and managing of industrial ecosystems represents a major opportunity for previously stand-alone firms to create added value..."

This article draws inspiration from the paper *Strategic levers of port authorities for industrial ecosystem development*, written by Rick M.A. Hollen, Frans A.J. Van Den Bosch & Henk W. Volberda and published in *Maritime Economics & Logistics*, vol. 17 (2015). See also F.A.J. Van Den Bosch, Rick M.A. Hollen, H.W. Volberda & M.G. Baaij (2011), *The strategic value of the Port of Rotterdam for the international competitiveness of the Netherlands: A first exploration*. Rotterdam: INSCOPE/RSM Erasmus University, ISBN 978–90–817220–2–5.

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Handling threats to the validity of online data

By ***Petra Saskia Bayerl and Babak Akhgar***

Long gone are the days of online naivety where web users openly disclosed details about themselves and paid scant attention to cookies, trackers and privacy policies. Increased internet security awareness has doubled the pressure on businesses and public bodies to re-interpret the personal data they collect.

Today's web users do not necessarily have the time or the desire to trawl through the plethora of sites offering similar services or products. That said, many appreciate the customisation and personalisation of offers. Technologies now exist that can push such targeted content by matching recent online activities using sources such as cookies, trackers or user profiles. This approach is also in the commercial interest of the sites and services whose content is being pushed, as well as creating a million dollar business for companies offering personal data of potential customers.

The possibility of recuperating data available in the public domain (using so-called "open source intelligence" or OSINT techniques) means that businesses have a powerful tool enabling them to assess consumer product perceptions and purchase behaviours, track public opinions and consumer trends or measure customer loyalty whilst, at the same time, delivering content that matches people's (presumed) browsing and buying preferences. Of course not only private companies use such techniques. Governments and law enforcement agencies, for instance, also employ them to offer better services to their citizens as well as ensure their safety.

In this way, consumers – and the internet-using public more generally – become part of a "data-veillance ecosystem" and acquire "online data doubles" of themselves with which companies and governments try to predict with increasing accuracy the intentions and behaviours of the "real self" in order to sell their products, facilitate their administration or ensure a society's security. Internet users thus enter into a trade-off between using (often free) services from search engines to mobile games in the understanding that they pay for them with their personal data.

However, since the Snowden revelations internet users have become much wiser to this approach and the potential security and privacy pitfalls these practices harbour, which raises the question whether this increased awareness also has consequences for the acceptance of users for these data collection practices and thus for the business models relying on them.

The cost of privacy

The privacy policies of platforms such as Facebook have come in for considerable criticism in recent times. This particular case, as well as the repercussions for some Twitter users of their online declarations, has confirmed that there is no such thing as total online privacy. It is also an open secret that some HR personnel perform online searches and plough through social media to see how candidates present themselves beyond their CV and cover letter.

There are various techniques internet users can adopt to protect their personal data. Not accepting cookies or changing to services that guarantee higher privacy (from search engines and email providers to proxies or Tor-like networks) is one, while behaving with more restraint when publishing content on social media by very consciously choosing what to present in the spirit of "impression management" is another. A further approach is supplying false data when setting up online accounts or interacting with companies.

Handling threats to the validity of online data *(continued)*

By ***Petra Saskia Bayerl and Babak Akhgar***

Such behaviours – including avoiding certain platforms altogether – are viable options, but they can still mar users' online experiences and even mean exclusion from an increasingly vital arena of today's life. More and more web users are faced with a difficult choice between convenience and privacy, as are the businesses and organisations relying on user data for their sites and services.

Surveillance awareness

Our research illustrates that not only are web users becoming more sophisticated in protecting their privacy, but that site and service providers must also become more skilled in interpreting the data that they collect. The study in question addressed a population of 300 experienced web users primarily from the US, India, Canada, Croatia and Romania, with a balanced gender split and, in most cases, aged 40 or less. The line of questioning sought to establish and correlate two main issues – the perception and attitude of web users to online surveillance of their activity by private businesses and state organisations, and their opinion and practice of supplying false personal information, a trend that makes the collection and accurate interpretation of online data a major headache.

Awareness impacting attitude

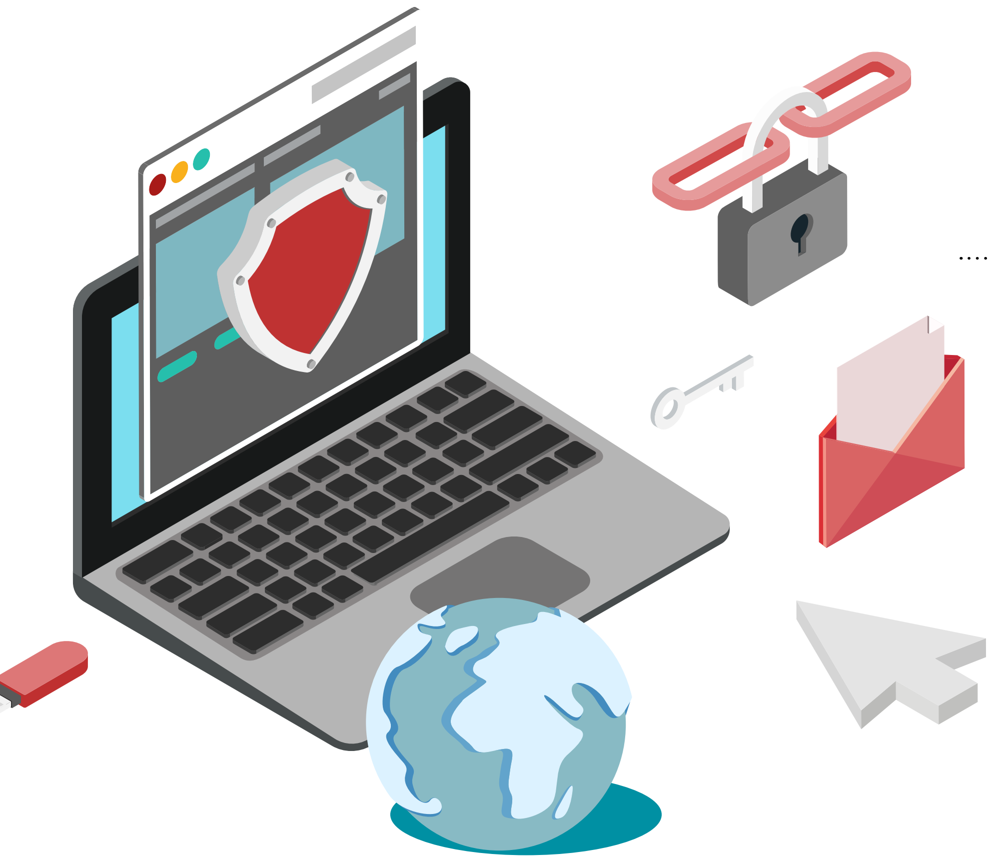
As one would expect, greater web experience generates greater sensitivity to the issue of online surveillance. The attitude to this practice varies according to who is doing the tracking and why. Stronger negative reactions emerge when the organisations in question are state agencies or governmental organisations, as opposed to private businesses. When carried out with legal objectives (ie, crime prevention) the activity is perceived more positively. In contrast, web users who feel their freedom of expression is threatened and/or the trustworthiness of their government is questionable regard the activity in a much dimmer light. At the same time, we found that for all users falsification of personal data is widespread – and widely accepted.

The key for businesses and state bodies is to understand how public perceptions translate into actual falsification of online personal data and the resultant obstacles this practice poses to accurate data interpretation. Interestingly, declaring the wrong gender and using an untruthful profile photo represent greater taboos than registering a pseudonym or bogus e-mail address, indicating that some information may pose greater challenges for verification than others.

Legitimising the act

Overall our study suggests that the key lies in whether data collection is seen as legitimised by its purpose – and thus in transparency regarding the act itself – how it is carried out, and why. No-one likes being caught out by fine print, so burying terms and conditions deep within an online policy statement will only irritate "internauts" and increases the chances of them providing false information or opting out altogether. Even worse are the instances in which problematic data collection practices are made public by third parties. Not only do they undermine the trust of the user community, but they also deter new users from joining.

Technical solutions exist for businesses that, in full awareness of the rising trend for data falsification, need to sort through the information collected with an even finer tooth comb. It has become quite common, for instance, to allow sign-up for a service only through a known account such as Facebook or to offer special benefits (discounts, gifts, etc) exclusively to users who sign in through such a known account. This exploits the possibility to map the social graph of web users across various online networks and perform classification and association mining. Further methods are trust score computational models and validity pattern mining. Yet, all these meth-



“Our research illustrates that not only are web users becoming more sophisticated in protecting their privacy, but that site and service providers must also become more skilled in interpreting the data that they collect.”

ods are costly and do not address the growing pressures of online data collection on falsification tendencies and on user behaviours more generally. They operate on the symptom, instead of preventing the illness.

Onus on businesses

Awareness of data collection has never been higher, so the onus is well and truly upon businesses and organisations to be more candid and open in the use they make of any such information in order to legitimise this activity in the first place. Privacy has become a sales argument with which new services differentiate themselves from established competitors, offering for instance “no track” guarantees, fast decaying content or communication in exclusive communities. Users are thus increasingly provided with choices between more or less intrusive services, as well as ways to protect themselves from the prying eyes of companies and the government.

Whether and to what extent they use them depends on the perceived legitimacy of data collection and whether users can self-determine what they may or may not reveal. If there is no choice, falsification is an accepted option by many. Companies therefore need to develop a higher sensitivity of how their own privacy practices may push internet users into more or less open sharing of personal information and what type of changes they may have to expect. ■

This article draws its inspiration from the paper *Surveillance and Falsification Implications for Open Source intelligence Investigations*, written by Petra Saskia Bayerl and Babak Akhgar and published in *Communications of the ACM* Vol 58, No. 8, p62-69. DOI: http://dx.doi.org/10.1145/2699410

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Enriching the customer experience with big data

By *Evelien van der Hurk*

Public transport operators have recently gained access to a wealth of information about their customers with digital records from journey-planner apps and smart travel cards piecing together a comprehensive understanding of individual and general travelling habits. New research uses this big data to create personalised travel options during train service disruption. How can other industries adopt the same idea to stay competitive in the Age of the Customer?

Imagine you must take two trains to get from Schiphol airport to Den Helder. You arrive at the connecting station of Sloterdijk and pull your collar up against the sub-zero temperature wind that is typical of a Dutch winter. A familiar announcement comes over the public address system: due to infrastructure problems your planned Intercity train has been cancelled. You need a new travel plan.

It's not enough to simply know when the next train departs. You need to know if you will be competing with other people for a seat, or even for standing room. You need to know if you are facing the very real possibility of not being able to get on the train at all.

Are there other train routes? Shuttle bus alternatives? Will there even be room for your child's pram or your folding bike? You are pressured to make this decision quickly, because while you are contemplating all these choices, time is ticking away, trains and buses on alternative routes are departing, and your delay is increasing.

Although my model focuses specifically on train service disruptions, proposing alternative routes and trains to the delayed train passenger, the underlying idea is to offer all buyers the highly targeted, customised information that they need to make decisions, improving their own experience and avoiding bottlenecks and backlogs in the purchase and consumption process.

The application of this idea extends far beyond public transport.

The age of the customer

Supply chains are increasingly shaped by individual buyers. Online reviews offer opinions from a buyer's peers about a product or service; social media is taking over from traditional helplines and customer service desks and has the added effect of bringing customer feedback into the public domain to be read or heard by others; apps and other real-time services create an expectation that information will be available to the buyer at every step of the purchase process.

In many ways public transport has lagged behind when it comes to using big data to streamline and personalise the customer experience. One of the biggest reasons for this was a simple lack of access to information. Public transport systems traditionally used paper tickets paid for in cash (and often multiple tickets for different modes of public transport) that are intrinsically anonymous.

Now that smart travel cards and travel-planning apps are a mainstay of the public transport experience, operators have the opportunity to gather data and analyse trends, at last being able to develop strategies to effectively support a travellers' journeys when disruptions occur.

Thanks to the progressive approach of Netherlands Rail (NS) and their enthusiasm for collaboration and innovation, I was able to develop a mathematical model that does exactly that. However, beyond the scope of my model are a range of possibilities for all kinds of suppliers and providers to "speak" directly to individual customers

"...beyond the scope of my model are a range of possibilities for all kinds of suppliers and providers to 'speak' directly to individual customers."

Meaningful alternatives

When a supply chain is disrupted we often assume that the customer wants to move as quickly as possible through the process. In this case, when a train is cancelled, we assume that every passenger just wants to get home even if it means standing shoulder-to-shoulder with their fellow passengers on an overcrowded train. But what if this were not the case? What if a great number of people would prefer to remain – not necessarily on the platform but somewhere nearby – delaying the next leg of their journey until the trains were less crowded?

Imagine a scenario in which an operator knows that a significant proportion of travellers at a particular time of day are parents with young children. If that operator has developed partnerships with local services and facilities, a cancelled train may be an opportunity to turn an inconvenienced customer into a loyal one. For example, if a nearby indoor playground offers a free coffee to any parent delayed by a train cancellation, how many parents would choose to be "bumped" from their intended train in the same way passengers volunteer to be bumped from their flight, freeing up space for other passengers? The win-win situation to all parties is clear as operators reduce crowding and bottlenecks, local services increase their own customer base and – most importantly – the traveller has full control over their travel decisions and a pleasant way to pass the time.

Building on the idea of partnerships (and catering to those passengers who cannot wait), a scenario in which a cancelled train triggered an automatic alert to ride-sharing networks like BlaBlaCar or to local taxi services would offer passengers an extra travel alternative, one that can be used almost immediately while still avoiding bottlenecks on other trains.

Similarly, although train service operators contract with local bus companies to provide shuttle alternatives to cancelled trains, the amount of time needed to arrange extra buses and drivers is prohibitive. Effective use of big data in this scenario could provide a passenger with a clear journey plan using already-scheduled buses, reducing or even eliminating wait times for specially arranged services.

Enriching the customer experience with big data *(continued)*

By ***Evelien van der Hurk***

Obstacles to using big data

With so much information available, effective harvesting is crucial. Although the focus of many companies is on storing lots of data, the potential applications of big data are severely diminished if data is gathered and stored inconsistently. These inconsistencies often only show up during analysis. For example, in the analysis of data from NS we found that the asynchronicity of clocks in different data sets caused many problems and we had to discard a significant amount of data. Imagine, for example, someone arriving before any train on any route arrives according to the timetable, as the check-in and out times are not synchronized with the registered train-driving times.

Synchronisation of the clocks in all data sets would significantly increase the value of the data itself – but once the system is in place, correcting this is usually far from easy. Therefore it is important that companies focus not only on storing data but also on storing it in such a way that it is consistent with other (existing) systems – and also consistent over time.

"In the future a customer can easily be the custodian of their own data while benefiting from the applications it offers."

Consumer concerns about privacy are also significant. While there is no requirement to track individuals in order to improve service (anonymous data follows patterns of behaviour, not names and addresses), big data can sometimes be akin to Big Brother in a customer's mind. To allay these concerns, it becomes even more important for companies to use data to support a customer, and not only for their own benefit.

Right now, a company collects data and we hope that they use it wisely. In the future a customer can easily be the custodian of their own data while benefiting from the applications it offers. For example, when shopping at supermarket Albert Heijn there is no need for my grocery list to be on the company's servers. I could also store this information myself locally on my phone and use an app to help me find my favourite products on sale – or maybe even propose alternatives if my preferred product is unavailable. Third parties could even develop this app. The convenient shopping experience, and possible discounts, may still attract me to shop at Albert Heijn – creating a win-win situation without having to share all my information.

Using information to streamline and personalise the customer experience will become more important as mobility and interconnectedness increases. When large services like NS are heavily investing in streamlining their customers' experiences it can only become more interesting to see where they go next. ■

This article is based on Evelien van der Hurk's PhD thesis *Passengers, Information and Disruption*, which can be downloaded at WEB http://repub.eur.nl/pub/78275

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