SMART SUSTAINABLE INNOVATION: THE GLOBAL PERSPECTIVE

SELECTION OF PAPERS AND ABSTRACTS FROM THE HU TII CONFERENCE IN UTRECHT ON 13-14 MAY 2014

Ivo Opstelten, Erlijn Eweg, Christine Robinson & Andy Wagenaar (eds.)

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Editors Ivo Opstelten, Erlijn Eweg & Andy Wagenaar (HU University of Applied Sciences), Christine Robinson (European association Technology Innovation International -TII)

Corrector Pennenstreek, Amsterdam

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Information Centre of Expertise 'Smart Sustainable Cities'
Research Group 'New Energy in the City'
Oudenoord 700, 3513 EX Utrecht (the Netherlands)
T +31 (0) 88 481 86 90
E smartsustainablecities@hu.nl
W www.smartsustainablecities.hu.nl

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INTRODUCTION

The international conference Smart Sustainable Solutions – the Global Perspective took place on 13 and 14 May 2014 in the research-rich Dutch city of Utrecht. Due to the partnership of Technology Innovation International (TII) with HU University of Applied Sciences Utrecht (HU UAS), it was possible to offer both research as practitioner-driven tracks on topics related to the conference title. The international outreach was maintained by involving colleagues from other continents. HU UAS and TII both are used to organize an annual conference: in collaboration they could bring together excellent future-minded practitioners, researchers and thought leaders from the R&I community, technology transfer and innovation management. The conference was preceded on 12 May by a session on sustainable sciences parks, hosted by Utrecht Science Park (USP) and the Utrecht Sustainability Institute (USI).

TII and HU UAS have put together both an interactive and informative programme with showcases at interactive sessions and inspiring keynote addresses and lectures, all in the areas of smart sustainable solutions, in a global perspective. The conference represented an outstanding opportunity to get an impression of the accomplishments of the state of the art until now and to share ideas and future aspirations. Thus, it formed an excellent opportunity to get connected with people coming from different professional backgrounds, from both the private and public sectors, who are sharing the same passion for innovation and technology transfer, related to sustainability issues. In addition to the excellent networking opportunities and a taste of local culture, some fascinating insights were offered into what the host city is doing to promote sustainable innovation projects.

The conference was chaired by dr. Joachim Hafkesbrink, President of Technology Innovation International and Managing Director of Innowise GmbH in Duisburg, Germany and dr. ir. Anton Franken Member of the Executive Board of HU UAS Utrecht in Utrecht.

The King's Commissioner of the Province of Utrecht Willibrord van Beek welcomed the guests in the Utrecht region. The plenary programme had a line-up of inspiring keynote speakers and eight parallel sessions, focussing on a wide range of topics and led by prominent experts:

- *Prof. Georges Haour*, professor of Technology & Innovation at the Institute of Management Development in Lausanne, Switzerland.

- *Prof. dr. Jacqueline Cramer*, director of the Utrecht Sustainability Institute (USI), professor of Sustainable Innovation at Utrecht University, the Netherlands, and former Dutch Minister of Housing, Spatial Planning and Environment.

- *Beverley Hurley CBE MSc*, CEO of YTKO Group in Cambridge, United Kingdom.
- *Prof. dr. Ivo Opstelten*, professor of New Energy in the City at HU UAS Utrecht, the Netherlands.
- *Thomas Rau*, CEO of RAU Architects and one of the Netherland's leading thinkers on sustainability.
- *Prof. dr. Kornelis Blok*, director of Science at Ecofys Group Utrecht and professor of Sustainable Energy at Utrecht University.
- *Ing. Arjan de Bruin*, director of Innovation at Consultancy Van der Meer & van Tilburg in Zeist, the Netherlands, and member of the Board of Management of the European association Technology Innovation International.
- *Prof. dr. ir. Remko van der Lugt*, professor on Co-Design at HU UAS Utrecht.
- *Koen Verhaert*, CEO of Verhaert in Kruibeke, Belgium.
- *Drs. Maurtis Groen*, CEO of MGMC and international sustainable entrepreneur.

The participants witnessed the formal opening of the Centre of Expertise 'Smart Sustainable Cities' by the Mayor of the city of Utrecht mr. Jan van Zanen, Menno de Jonge MBA, director Sustainable Business Innovation at Ballast Nedam representing the partners in the Centre of Expertise and Irene ten Dam representing the Economic Board Utrecht. They also witnessed the official launch of the TII China Chapter, celebrated at the conference, by Gordon Ollivere CBE, CEO of RTC North in Sunderland, United Kingdom and dr. Zhengping Liu, Vice President of Coway International TechTransfer Company, China.

The conference programme covered eight parallel sessions, featuring 46 presentations related to the conference topics. The eight sessions were about: Smart Sustainable Cities: The Physical Transition; Innovation across Continents (including the TII China Chapter); Social Innovation and New Forms of Entrepreneurship; Circular Economy; Smart Sustainable Cities: Policy and Regulatory Transition; Science2Business for Smart Growth; Smart Sustainable Cities: The Social Design and Open Innovation Accelerators.

To establish international co-operation in the fields of professional education is of great importance for HU University of Applied Sciences. Not only to join applied research and development but also to collaborate on pedagogical development

related to companies and international activities of other organizations. For this reason, HU UAS forms part of CARPE, the first strategic partnership of Universities of Applied Sciences in Europe. It was nice to meet with the representatives of the CARPE partners of Manchester Metropolitan University and Turku University of Applied Sciences. Working life and its interdisciplinary needs, formed the base of many presentations. HU UAS and TII aimed to realize a conference, giving exposure to the distinguishing approach of applied sciences. Projects on applied research and development, respond directly to development needs, entrepreneurship and (open) innovation dialogue, bringing practice and science together. Not only technical, but also social applied sciences. The feedback we got at the conference showed that we succeeded in those goals.

It's important to share innovations and solutions internationally, to share approaches and methods and experiences. The most urgent challenges of sustainable development are to eliminate extreme poverty, to promote sustainable consumption and production, and to manage the planet's natural resources for the benefit of us all. To find solutions for those complex questions we have to cooperate. Especially on some of the cross sectoral issues that illustrate urban sustainability. HU University of Applied Sciences, has a scope on sustainable solutions and sustainable urban regions in an international context. Why on urban regions? In the first place of course, because in Utrecht we have a lot of knowledge about this. But on the other hand, urban regions are the key challenge in realizing a sustainable earth. Urban living is growing, the future of manhood depends in an important way on the fact if and when we are able to reinforce the sustainable development of city live. The city level is nowadays the main level to implement measures. It was inspiring to exchange knowledge and expertise through the different interactive sessions, in which those challenges were exemplified.

This publication follows the structure of the conference and presents selected papers from the 8 sessions. Apart of that, we did select some interesting abstracts of presentations, illustrating the conference sphere. In the header of the article is mentioned if it concerns an abstract. I hope and expect that this publication provides inspiration and information about the state of the art of Smart Sustainable Solutions in global perspective, in a way that knowledge and experience can be used in joint projects and activities to increase the joint efforts on the grand challenges of this age.

Utrecht, June 2014

Prof. dr. Ivo Opstelten
Professor of New Energy in the City and scientific director of the HU Centre of 'Smart Sustainable Cities'

HU University of Applied Sciences Utrecht

THEME 1 SMART SUSTAINABLE CITIES: THE PHYSICAL TRANSITION

This track will focus on best practices and experiences which make living, working and mobility in the city economically and ecologically fit for present and future generations. Topics range from how to manage the transition to a sustainable city by making use of all its resources (human capital, infrastructure, building materials and energy) in a smart way to the city seen as a system of human interaction networks and their connection with the natural and built environment.

URBAN MAKEOVER, THE SLEEPING CAPITAL

[abstract]

Over the past 150 years cities have been growing enormously. They evolved from local communities that relied on nearby resources to metropolises that completely depend on global provision and distribution of resources – far outside their area of influence. This, in fact, comes down to people living in an environment they don't have any influence on. They are trapped when distribution of resources stops as a result of for instance political turmoil, climate disasters (anywhere in the world), or simply because of shortage…

There is no such thing as a fall-back scenario. Unless, as we currently see in Athens, there is an agricultural countryside where families can survive. In the Netherlands such thing does not exist anymore. Another problem is that most cities are located in industrialized, or fast industrializing countries, and have to rely on resources from other countries and cultures, mostly underdeveloped ones. This is in fact legalized plundering.

If we take the UN Millennium goals seriously, it's impossible to continue living off other people's resources. Even more so now that we know that in the next decades the global population will grow from 7 to 9 billion.

We have become addicted to ever more goods, food and entertainment. City life has changed because of this, making life more individualistic, and less and less social. Living in ever larger apartments, higher in the sky, we obtain our resources by going down the elevator, neglecting neighbors, getting in a car and separating ourselves from people around us; we go to shopping malls on the outskirts of town where we won't be recognized and can do things anonymously. If we do this at all. We might just order everything by internet, and live like a hermit. To entertain ourselves, in weekends we visit other cities, not ours, and on weekdays we amuse ourselves virtually through Internet, the new 'hangout', avoiding direct contact with other people.

However, the first two observations might be the clue to improve the third one. There is a real urgency to redevelop our urban areas in a more independent way, with more focus on local supply and local production of resources, energy, materials, water and food, in order to increase the vitality of the city and the chances of surviving in times of resource stress. As it turns out, a strong sustainability, where every option to reduce, produce and provide resources within an urban area, leads to a better social cohesion, more labor, and a better local economy as well.

These changes will come no matter what: if not willingly, it will be unwillingly when global systems fail. Only in the last case scenario the changes will be accompanied by chaos and victims.

Before the industrial revolution, the sun was the main source and promoter of all wealth: it provided us with food, materials, and energy. Actually, at some point in future, the sun will again act as our only source, adding quality to our earthly system. In the meantime we continue to deplete the supplies that have developed over millions of years, with all kinds of nasty side effects. The only real value in our world however, and sustainable for the future (in terms of 'maintainable, reliable') will be the constant flow of solar radiation and the potential production of every available m^2 earth surface. And this will be our way out: the productive use of any surface and turning it into food, energy, materials. Cities have a vast areas of unused and wasted surface. Take roofs for example: why are they built by neglecting all the potentials in energy, food and water? The Romans already collected water up there. And had they had our knowledge of solar power, they probably would have used that on their roofs as well. (They did already use passive solar energy.) But what about 2014: are we still using roof tiles….? How pedantic and snobby can one be? Après nous le déluge…

And why are we making green areas just green? Why not turn them into 'productive green'? Apples, nuts, and vegetables can be beautiful and productive at the same time. And why is every road designed for two-way traffic? It's a huge waste of land and surface, which only contributes to city life by facilitating faster and further greed for distant resource shopping.

The sleeping capital, with real value, consists of m^2s in cities! But then, even if the available surface would be put to good use, to which degree can all our needs be met in an urban environment? How can we turn a consumptive urban area into a productive urban area? In our research we found that it could be possible to make a urban area independent, but not without adaptations to our lifestyle. When it comes to resources, there will be competition for available land. As food is most important, we secured an area only big enough to enable us to live as a vegetarian. So we had to give up meat… The supply of energy by renewable resources was no problem. However, the production of the materials needed for the solar panels and wind turbines was. So we needed to get very creative in providing services in different ways. Houses would not be cooled and heated for 24 hours, and not in all rooms. We developed a strategy to compartmentalize homes: when it's very cold only the kitchen and bedroom are climatised. Which in fact takes us back to the old family life….

Half of the roads are removed for one-way traffic only, thus providing new production areas and playgrounds, at the same time saving construction resources, and cutting maintenance needs by half.

And we thought of many other interventions in the urban environment. Key to it all was our understanding that reorganization processes are needed. For instance: when everybody sticks to having his own washing machine, no matter how energy-efficient, it will be devastating for our resources. A local laundromat would be far more effective, providing labor and social contacts as a bonus. The initial target, clean laundry, would still be met. By evaluating real functional need, many more alternative solutions could be found. And in fact the current economical crisis, together with the internet, is already leading to such solutions, especially among younger people: (private) car sharing, stuff sharing in the neighborhood, we see couch surfing, shared holiday travel, home takeaways (someone in your street cooks an extra meal, for which you subscribed in the morning since you will be late from work: you pick it up at your neighbors). Currently, even repair-cafés are popping up in the Netherlands: volunteers who offer one evening a week to repair broken stuff, using a local pub as their workshop. This way everybody is happy: the hobby repairman, the owner of the broken goods, and also the barkeeper who has some extra income during an otherwise boring weeknight. Space in empty buildings could also be used as 'the city is the office' approach, whereby commuting is avoided.

A city or neighborhood that reinvents itself regarding resources-space ('planet') gets a bonus in 'People' and 'Profit' as well. Curitiba, Cuba, and Detroit showed the way, as did Gussing (Austria) by becoming independent in terms of energy, and creating lots of jobs and a lively town. In our region, the south of the Netherlands, we are now experimenting with this idea: we are developing projects to show and demonstrate the potentials. The most important outcome of these experiments is that it requires a whole new approach towards buildings and built environment developments. It's not about starting nice little projects here and there, but about long term processes towards a complete city 'makeover'. And it requires a collective effort to establish such thing.

Technology is not the problem, but far reaching reorganization of processes, of habits, and of physical distribution and production is, together with having an open mind for both physical and social reorganizations, with land/surface as a key value in the process. Elderly people can play a role as well, as 'social capital', in an urban environment. All these things may not happen just like that, maybe some small shocks here and there are needed (as was currently researched by one of my post-doctorates), but in the end they can lead to an urban area that is again social, productive, and rich: the real capital is in the streets, on the roofs and in the people.

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SMARTERCITY KARLSRUHE – AN INNOVATION SYSTEM DEDICATED TO IMPLEMENTING

The Karlsruhe Technology Region (TRK) is one of Germany's most productive locations with an economic output that outstrips the national average since many years. The TRK represents in total nearly 1.5 million inhabitants. More than 17% of this population is working in technology-intensive industries or in one of the more than 20 research institutions based in this area. Most prominent among them is the Karlsruhe Institute of Technology (KIT) - founded in 2009 by a merger of the former Forschungszentrum Karlsruhe and Universität Karlsruhe - one of Europe's largest research campus for science and technology research studies and teaching.

Energy, ICT and Mobility are the three keywords under which many research disciplines and business actors in the TRK are assembled. The 'KIT Energy Center' with its 1200 employees closely co-operates with 'KIC InnoEnergy', the Energy related 'Knowledge and Innovation Community' launched by The European Institute of Technology (EIT). These international actors are linked to local businesses through the 'Energy Region Karlsruhe', an energy efficiency network and the 'Karlsruhe Energy Forum', a cluster with more than 350 partners. On the ICT side the 'FZI - The Research Center for Information Technology', the 'FIZ - Leibniz Institute for Information Infrastructure', together with ICT related KIT Institutes and faculties form the backbone for basic and applied research. Regional start-up and software companies from sectors such as software development and architecture, social media, IT security etc. have the network 'Cyberforum' as their home. This network currently connects more than 1000 members from the ICT sector in Karlsruhe's Technology Region.

The 'Automotive Engineering Network' (AEN) is a crossborder network between the Karlsruhe Region and the western part of France, the Alsace. AEN is a communication platform for industry and institutions and focuses on research, development, education and training. In this way it supports the realisation of technology key projects.

The existence of knowledge based economies embedded in a highly developed RDI ecosystem alone – as productive and inspiring the exchange of ideas and people between the two might be at the moment – does not guarantee sustainable competitiveness, welfare and quality of life for this region on the

long run. Consequently, the TRK in 2008 established an Action group - made up of ten towns and cities, four administrative districts and a regional planning association - with the aim of further optimising cooperation between business, science, culture and the public sector.

With that the TRK followed the concept of the so-called Triple Helix that interprets the shift from the classic view of an industry-government dominated society towards the modern idea of a knowledge society which is based on the triad relationship between universities (or research institutions in general), governmental policy organisations and industry:

'The Triple Helix thesis is that the potential for innovation and economic development in a Knowledge Society lies in a more prominent role for the university and in the hybridization of elements from university, industry and government to generate new institutional and social formats for the production, transfer and application of knowledge.'[1)]

The TRK Action Group has been established to design and foster high value-adding public-private structures and processes dedicated to strengthen the quality of international competitiveness of its businesses and knowledge institutions as well as the region's competitive edge as a whole. For the 'hybridisation of elements' from research, business (in its broadest sense) and from regional policy actors the TRK institutionalized the 'Regionalkonferenz'. The overall goal of this unique platform is to initiate strategic processes which systematically and continuously strengthen the individual organisation's self-commitment to a jointly developed and continuously refined regional knowledge based economic strategy.

In the course of the past year the TRK and its 'Regionalkonferenz' went through a goal finding process that reflected ideas of efficient and sustainable cities or regions from various perspectives that include (amongst others) smart forms of housing (e.g. energy efficiency, ambient assisted living, etc.), intelligent, ecological and efficient solutions for individual mobility, public transport and energy, and also concepts for modern public services.

As a result of this process a regional development plan under the name 'Smart Movement – within and for the region' has been born. This concept draws upon the region's technological strongholds Energy, ICT and Mobility and defines the major fields of future activities. Smart movement also implies the understanding that neither physical infrastructure nor 'soft' links between organisations are mere cost positions but key assets (although neither physical infrastructure nor relationships are to be found in balance sheets of cities). Smart movement implies that a city or the whole region, including the partners of the Triple Helix, is prepared to invest in e.g. value adding/preserving measures and projects to maintain the competitiveness of its infrastructure.

The TRK and its 'Regionalkonferenz' are highly motivated to strengthen its methodologies when it comes to consider options for future actions that contribute to improved quality of life. Based on our local strengths in research and innovation we currently think about experimenting with foresight methods that can be implemented by the 'Regionalkonferenz' so it will then act as regional foresight community[2]. What we have in mind as primary goals for this foresight community is (a) the mapping of the current situation of the TRK, (b) the development of a shared understanding of the future dynamics of the TRK, (c) the conceptualisation of its desirable future and (d) the definition of a roadmap with specified measures which ensures that actions are implemented today making it more likely that the desirable future will become reality.
Before launching a foresight process for our region we need to undertake multiple learnings and welcome your comments and suggestions!

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PRESENTER
Ir. Henk Brinksma
Prof. dr. ir. Vincent Gruis

ORGANIZATION
HU UAS Utrecht,
the Netherlands

MAIL ADDRESS
henk.brinksma@hu.nl
vincent.gruis@hu.nl

RESILIENT REFURBISHMENT: AN ASSESSMENT MODEL FOR FUTURE-PROOF HOUSING

At present, the Dutch housing stock includes 7.2 million homes. The average lifespan of a home is expected to vary between 120 and 400 years[1)] and during that period, homes will be renovated several times. Three-quarters of our current housing stock was built after World War II. As such, it is so young that exact deterioration rates are not yet available. The quantity of new housing that is being produced means that changing demands in the housing market will have to be met to a large extent by modifying the existing stock of housing. The age of houses leads one to conclude that they will be renovated on several occasions during their 120 to 400-year lifespan. This means that there will be a constant stream of properties to be renovated. It therefore makes sense to look for methods of renovation that take into account the need for future modifications to those homes. Such modifications will be important both for housing stock owned or professionally managed by housing associations and for homes in private ownership. Current practices in renovation focus on renovating in line with the demands of the moment. What is more, much renovation work is highly labour-intensive and is carried out on site. This results in solutions which ensure that the house once again meets the required standards in the short term, but which doesn't take into account the changes that may take place in the future. The solutions applied may even make future work more difficult. Of course, alterations are necessary and inevitable, but how can we implement future-proof solutions that are applicable to a large portion of the housing stock?

In his introductory speech, Gruis suggests that it is time for new strategies when it comes to housing management and development.[2)] Diminishing financial resources, fewer removals and more widespread homeownership are all leading to an understanding that greater account needs to be taken of the qualities of existing housing, neighbourhoods and residents. The actors involved are seeking ways to make sure that homes and neighbourhoods can remain attractive and quality of life can be maintained without large-scale intervention. This is happening against a background of relatively high levels of uncertainty. How will the economy evolve? What rules will housing associations and their local partners have to abide by? In the future, who will have the finances necessary for investment? The stock of private housing will also need solutions that enhance

flexibility. It is rare for all homeowners, whether they are part of a homeowners' association or not, to want to undertake the same type of renovation at the same time. Renovation solutions that can deliver customized solutions for each property owner may allow owners who want to renovate more or sooner to invest earlier, after which other owners may do the same at a moment of their own choosing. This relates to research carried out by Kapteijns.[3)] He states that renovation work can only take place if both the home and the neighbourhood are ready for this. He terms this the vertical renovation cycle. This research considers the possibility of achieving a horizontal renovation cycle through innovative renovation methods, by which houses can be renovated gradually, apartment by apartment or block by block.

This means it is important to look for future-proof renovation solutions that can be implemented using an incremental and flexible approach which will not stand in the way of future renovation work, but will actually facilitate it. One answer may lie in increased flexibility and solutions that can easily be undone. It is possible to look for renovation solutions that can be changed or altered easily in the future and, additionally, that enhance the potential for alterations in the future. Examples may include flexible installations, flexible walls and components that can be installed onto or inside the dwelling.

For example, Heijmans has built a 'bathroom in a backpack' in Goes. This is a prefabricated bathroom that responds to the need to reduce the number of operations on the construction site itself, and provides a solution that is relatively easy to apply and just as easy to remove again. However, this bathroom can only be placed in a façade. Further development of this bathroom may one day mean that it can be used as an interior element too. This is a part of the home where many bathrooms are located and this installation option would provide more flexibility in using the façade and the interior space. Another example is Component Renovation (CR+) developed by the BouwhulpGroep in Eindhoven. Here, changes to the property are divided into components. Components are major parts of the building such as the roof, the kitchen, an exterior wall or an installation. By developing renovation solutions that apply to individual components, homes can be renovated in phases. When renovating one component, a client has to deal with a single party who is responsible for implementation, cost and quality. This means that renovations can take place at a time when both the owner and the occupants are ready for it. Component-based renovation can thus play a role in demand-led improvements in the social housing and private housing sectors.

To date, however, research into future-oriented and flexible construction has focused primarily on new construction. Little research has explored the opportunities that the housing stock and the construction industry can provide in terms of effective future-proof renovation with current and newly developing renovation solutions; neither has much research considered the question of how to determine whether and to what extent renovation solutions should be considered future-proof. We do not have sufficient knowledge of the possibilities that the housing stock and the construction industry can offer in terms of effective future-proof renovation with current and newly developing renovation solutions. For example, we do not know whether the existing bathroom or kitchen are easy to renovate; we are also ignorant of the opportunities created and limitations imposed by the load-bearing structure of the dwelling; and we lack knowledge of the limitations implied by the functional layout of a home. This research may reveal which possibilities (and impossibilities) are created by the characteristics of the current housing stock and the technical possibilities for future-proof renovation. It thus involves comparing the 'old' characteristics (of housing developed in the past) with the solutions that we are capable of developing today.

This research focuses primarily on homes that were built in the 1980s. The fact that these houses are now about 30 years old means that they qualify for major renovation. In this period, houses were built according to the principle of SDI (support and infill concept), which means that load-bearing walls and interior fittings are separated, a construction principle developed by the Foundation for Architects' Research (SAR).[4)] In these dwellings, a distinction is made between the load-bearing elements of the property, which consist of the basic construction and the vertical transport of people and pipes, and the interior fittings such as partition walls that create the internal layout of the house. One of the central features of SDI homes is adaptability. That is precisely why it is so interesting to see whether these homes are future-proof, and whether there are lessons to be learned from this type of residential development. Research into homes from this period may therefore result in potential renovation solutions for large numbers of homes.

In this paper, we will develop a conceptual framework with which to analyse renovation solutions and evaluate the extent to which they are future-proof. To this end, we will explore the characteristics of the product and process through a number of research activities including literature-based research into future-proof construction. SAR is a prime example of this. The product features can be divided into material properties, prefabrication, construction technique, lifespan and reversibility. The process stages are divided into the management

phase and participation by residents, the demolition phase or reuse, the design phase, the production phase and the realization phases. This enables a technical and process-based assessment of the renovation solutions and concepts that are available on the market.

Using the 'DESTEP' structure, we also identify which environmental variables affect the future stability of renovation solutions. 'DESTEP' stands for demographic, economic, social/cultural, technological, environmental and political/legal factors. These factors allow us to form a picture of the external factors that are important in determining certain future scenarios. This method will be used to explore a number of important factors that are important when assessing renovation concepts. For each factor, the current situation will be described first, and this situation will be used to test renovation concepts for their durability over time.

Both these approaches are combined and translated into an 'assessment model for resilient housing refurbishment'. Using this model, it is possible to assess – using the criteria given – whether the renovation concept being considered will make houses more future-proof, or actually make them less so. The applicability of the conceptual model has been tested on the module solution of Faay and the Active House of BAM, Velux and the BouwhulpGroep.

The table below shows it is possible to assess the prefab module of Faay and the Active House of BAM, Velux and the BouwhulpGroep.

		FAAY		Active House	
		Impeding	Improving	Impeding	Improving
product features	Material Properties	X			X
	prefabrication		X	X	
	realization technique	X		X	
	lifespan	-	-		X
	reversibility		X	X	
process characteristics					
	management phase		X	X	
	demolition phase / reuse		X	X	
	design phase		X		X
	production phase		X	X	
	realization phase		X	X	
DESTEP	demographic		X	X	
	economic	X			X
	social/cultural		X		X
	ecological	X		X	
	political / legal		X	X	

Table 1: Assessment Table for Future-proofing (Brinksma, 2014)

The results of the research into suitability led us to conclude the following.

Expansion and contraction will play an important role as the result of future demographic developments. The possibility of adapting the property will not be put to use with any great frequency; however, changes in family composition and the ageing of the population will mean that more adaptable homes will be required. Clearly, Faay's module solutions will be applicable in a range of different situations. However, the size of the property cannot be changed with these modules. This is where a conflict arises with the current modules. The 'bathroom in a backpack' (Heijmans Goes) not only renews the bathroom but also gives rise to an increase in the overall floor area. The expansion of Active House is static and it will be difficult to change this in the future. Economic developments may mean that different budgets will be available for renovation work. This affects the way in which renovation work can be carried out. When only a limited budget is available, renovation must be carried out on several occasions. This means that renovations will not be carried out in one go, but can be completed in different phases. Opportunities not only to buy but also to lease components will increase. This will enable us to adapt more quickly to changing demands and return raw materials to the manufacturer quickly. This in turn will allow us to respond quickly to new developments, such as the installation of sensors and heat recovery techniques. The development of new techniques follows a different cycle to the renovation of our housing stock. Meanwhile, the ability to use newly developed products in our homes in a simple way will make these easier to deploy. A 'plug and play' system will make it easier for a range of applications, both existing and yet to be developed, to enter our homes. Changes to insulation systems will make it possible to use existing products at different locations. Regulatory change occurs faster than our ability to adapt our homes. Any intermediate changes that occur may now be difficult to take account of, or not implemented at all. It is therefore necessary to ensure that the whole housing stock can be adapted when regulations change. This will make for a less rapid ageing of our housing stock, and smaller interventions will be needed as a consequence. We must also take climate change into account; the consequences of this are already in evidence in the form of noticeably heavier downpours. It is also possible that types of animals that we have not previously had to contend with (such as insects) will cause problems.

This leads us to conclude that the use of our assessment model could result in specific and practical recommendations for the design and re-design of renovation solutions, and could therefore contribute to renovation practices that take greater account of future developments.

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PRESENTER
W.G. Planje
M. de Reeder

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
wilko.planje@hu.nl
marcel.dereeder@hu.nl

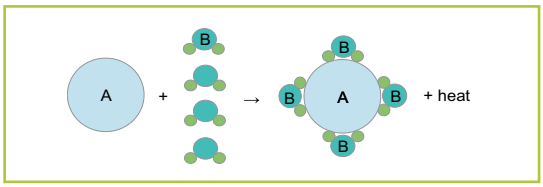
SEASONAL STORAGE OF THERMAL ENERGY IN THERMOCHEMICAL MATERIALS FOR DOMESTIC HEATING

*In this document the very first calculations are presented for the design of the reactor vessel with zeolite 13X to generate heated air with 1 kW for 1 hour. Based on the Ergun equation the reactor bed must have a flat design. The height of the bed in this specific case should not exceed the 10 cm (with a baseplate diameter of 30 cm) to prevent high pressure losses when using a standard ventilator in case of 3 mm diameter zeolite spheres. Other possible measures to prevent pressure losses are to increase the particles size or porosity. First experiments with reactions with liquid water with $CaCl_2$ * $2H_2O$ and silica gel show that the calcium chloride reacts 6 times quicker (but both to about 50 °C), but that its granular structure is not maintained during the reaction. Hydrated silica gel keeps its structure but reacts more slowly. Humid-air experiments on both CaCl2 * $2H_2O$, silica gel as well as zeolite 13X particles should be carried out to get more information as to how an optimal open reactor vessel could be designed. More information will be provided during the presentation at the conference.*

Introduction

Solid materials, like dehydrated hygroscopic salts, silicates and zeolites have the ability to adsorb water molecules thereby generating heat. Typical energy densities between the 0,6 GJ/m^3 and 1,0GJ/m^3 can be achieved[1)]. Theoretically even densities up to 2,3 GJ/m^3 are possible when for examples MgSO4 salts[2)] are used. Compared to a water boiler (0,2 GJ/m^3) the energy density is higher, without any standby losses as long as water is separated from this so called thermochemical material (TCM). The exothermic reaction for TCM in general reads:

$A(s) + B(g) \rightarrow [A{\cdot}B]\,(s) + heat$



In case the substance B is water the reaction reads: $A(s) + n{\cdot}H_2O(g) \rightarrow [A{\cdot}nH_2O]\,(s) + heat$

The last line shows the reaction with water vapor. Also liquid water can be used to generate heat but in that case the energy densities are reduced with a 0,20-0,25 GJ/m^3 due to evaporation heat of water.

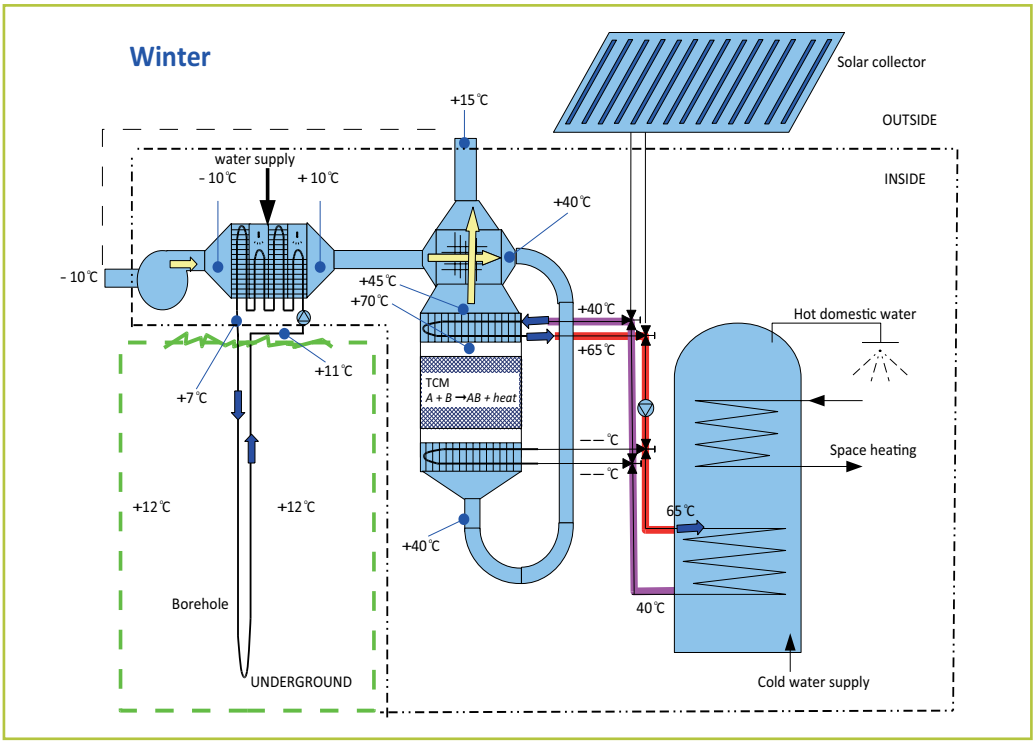


Figure 1: Schematic process of a possible open system, functioning in wintertime. Here, water vapor (carried by air of 10 °C) reacts with TCM. The solar collector is (barely) not active in the winter. The temperatures are indicative (not measured!).

Regeneration of TCM is possible by raising the temperature such that water molecules are released to their direct environment. It is the reverse of the reaction above. While this kind of adsorption processes are quite familiar in short term heat storage in e.g. adsorption cooling (silica gel) and desiccant wheels (zeolite) the long-term heat storages stirs ones imagination. Is it possible to create heat in wintertime for a building with thermochemical materials and regenerate TCM in summertime? Several national research groups (ECN, TNO-Delft, Technical University Eindhoven) are focusing on the development of such new materials exceeding the 3 GJ/m^3. A house in the future with only a 10 GJ of yearly heat demand would need a 3.5 m^3 of TCM.

With a group of students we have started to develop a very simple open reactor vessel in which humid air carries the water vapor to the TCM[3]. Thereby the air functions not only as work medium to carry water vapor but also the generated reaction heat. An example of a total system during wintertime is shown in figure 1 (see above).

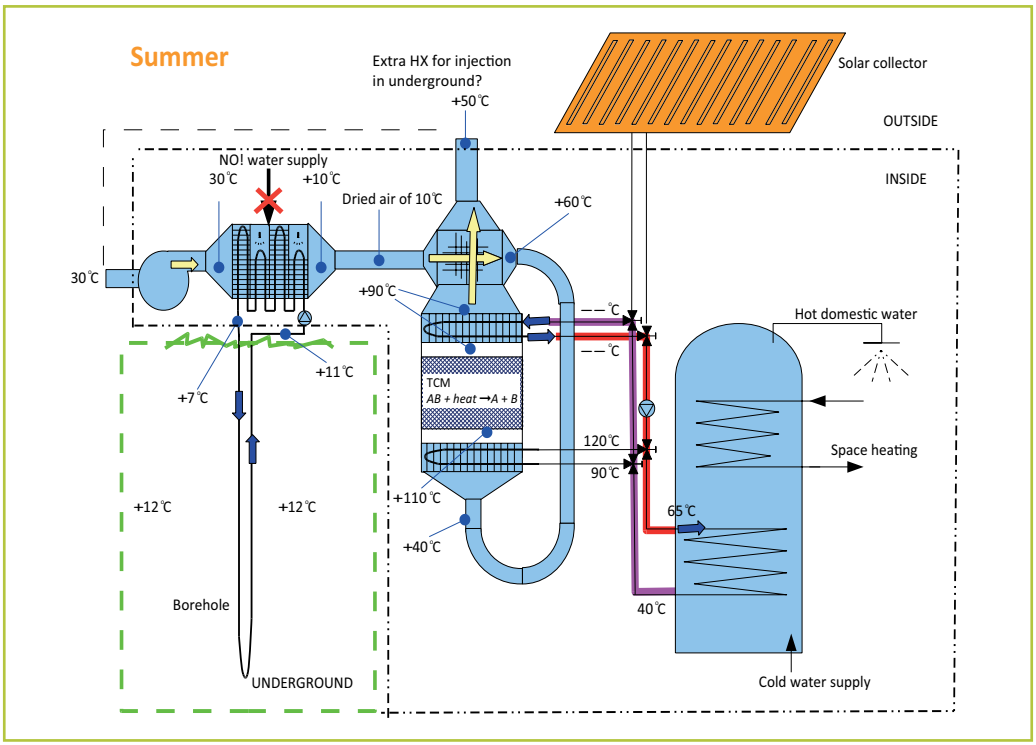


Figure 2: Regeneration of the thermochemical material in a possible open system during summertime. The solar collector creates temperatures of the air, entering the reactor vessel, up to 120 °C.

The plotted temperatures are indicative, illustrating the performance. The first step is to humidify the outer air of -10 °C via a humidifier and heat exchanger creating an air flow of 10 °C with approximately a relative humidity (RH) of 100% (x = 7,5 g water vapor per kg dry air). After preheating this air in a second heat exchanger, exchanging heat with air exiting from the reactor, the preheated humid air enters the reactor vessel and will raise further in temperature due to the hydration-reaction heat. When this 70 °C air exits the reaction vessel it can sink heat to a boiler (see red and purple lines). The rest heat in the airflow is used to preheat the air from the humidifier. In figure 2 the situation is

sketched for the regeneration of the TCM. After the air flow is dried at 10 °C it becomes reheated via the solar collector at temperatures such that the reaction is reversed and water vapor is released from the [A * n H_2O] system until it is [*A*] again. Hereby it might be possible to release remaining heat in the 50 °C outlet to the underground via an extra heat-exchanger (not shown).

Experimental challenge

The system above works only when there is sufficient knowledge about the heat exchange and cycling performance in the reactor vessel. Our first challenge will therefore to explore this part. Our first goal is that we generate heat with 1 kW for 1 hour in an open system by using one of the following TCMs: silica gel, zeolite or $CaCl_2$*$2H_2O$ (this last one can react to $CaCl_2$*$4H_2O$ or even $CaCl_2$*$6H_2O$).

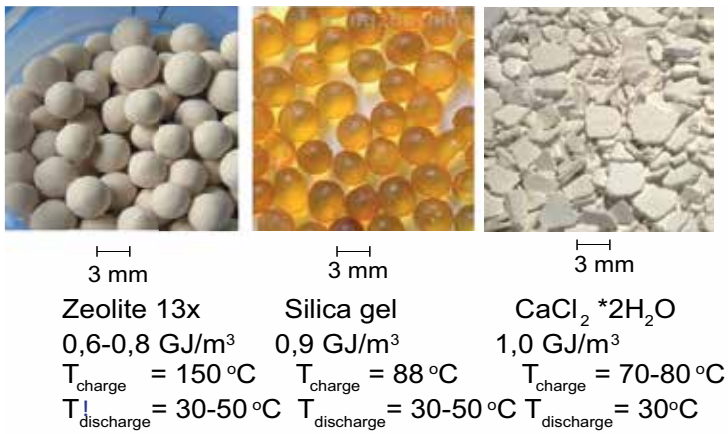


Figure 3: Possible candidates for 1 kW reactor vessel [1].

Figure 3 shows the candidate materials for the first concept, in which silica gel and zeolite are most interesting for the first tests because they are relatively inert and safe to work with. The first set-up of the vessel will be coupled with our standard air conditioning unit for measuring purposes in the energy laboratory. Typical ranges are 10 l/s - 300 l/s, between 10 °C and 40 °C with 10% - 100% RH.

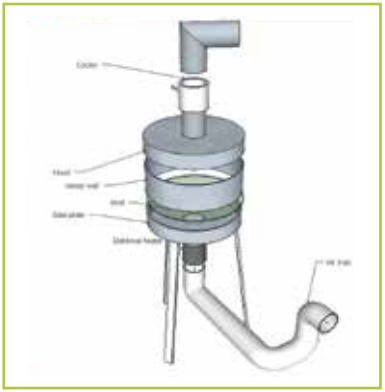


Figure 4: Sketch of reactor vessel, including an extra electrical preheater to boost the incoming air to temperature > 80 °C because of regeneration.

Figure 4 shows a sketch of the reactor vessel which will be connected to the air conditioning unit. An extra electrical heater is required to create the higher (T > 40 °C) regeneration temperatures. Several temperature sensors are included in the reactor bed and in the inlet and outlet stream. A permanent differential pressure measurement will be included to read the pressure losses over the reactor bed.

First calculations, measurements and discussion

The dimensions of the vessel are determined by the choice of the TCM, the requirement that 1 kW for 1 hour (1 kWh) has to be produced and that it can be coupled with the standard air conditioning set-up in the energy laboratory.

Our choice is to design on basis of the TCM zeolite 13X. With the measurements of Whiting et al.[4)] we can calculate that 4 kg zeolite 13X is required with an air flow from the airco-unit with 33 l/s (RH = 100% , T = 10 °C), see table 1. Besides the calculation of the mass of zeolite and the required air flow, also the pressure loss in the bed must be estimated. The ventilator of the air conditioning unit can deliver maximum a typical Pa at this flow speed. In combination with the Ergun equation, considering zeolite particles of 3 mm diameter and closed spherical packaging (porosity about $\epsilon = 0.26$) the pressure drop over the zeolite bed can be approached with the formula:

$$\Delta p_{bed} = \frac{150\mu_{air}(1-\epsilon)^2 V_S L}{\epsilon^3 D^2} + \frac{1.75(1-\epsilon)p_{air}V_S^2 L}{\epsilon^3 D}$$

with μ the kinematic viscosity, ϵ the porosity, Vs the velocity of the entering air, D the granule diameter and L the height of the bed (SI units everywhere). Table 2 shows two columns for two different porosities, the first one for close packaging of spheres, the second one in case of extra added porosity. With respect to the maximum 350 Pa pressure the ventilator can deliver, the porosity must be more than close packaging when we wish a minimum bed height of more than 10 cm at a vessel diameter of 30 cm. However, when using bigger diameter particles it is also possible to stay below the 350 Pa.

Zeolite 13X (Na-X)

Hydration heat zeolite 13X [4]	900 J/g	[4]
Mass density zeolite dehydrated	600 kg/m3	
Energy density	0.54 GJ/m3	
Increase mass due to hydration in case of full reaction	1.28	[4]
Water mass per 1 m3 zeolite for full reaction	168 kg water	
Watercontent in air @10 oC @ RH 100%	7.5 g/kg dry air	
Air density @ 10 oC @ RH 100%	1.24 kg/m3	
Air mass for 1 m3 zeolite (full reaction)	22400 kg	
Air volume for 1 m3 zeolite (full reaction)	18065 m3	
Heat capacity air	1 kJ/kg/K	
ΔT_{air}	24 K	
Required mass zeolite for 1 kWh	4.00 kg	
Required volume zeolite for 1 kWh	6.67 liter	
Required mass flow for 1 kWh	33 liter/s	

Table 1: Required zeolite (completely dehydrated) and air flow for 1 kWh heat generation. Temperature lift can be (theoretically) calculated to be 24 K in case complete water adsorption occurs during passage.

Material		Zeolite
Density zeolite	$\rho_{zeolite}$	600 kg/m3
Mass zeolite	m	4 kg
Diameter	D	3.00E-03 m
Density air	ρ_{air}	1.24 kg/m3
Dynamic viscosity	μ	1.98E-05 Ns/m2
Air flow	ϕ	3.30E-02 m3/s

			Porosity ε 0.26	Porosity ε 0.5
Heigt bed (L) m	$D_{baseplate}$ m	V_s m/s	ΔP_{bed} Pa	ΔP_{bed} Pa
0.05	0.41	0.25	221	17
0.1	0.29	0.50	1255	104
0.15	0.24	0.74	3664	313
0.2	0.21	0.99	8005	698

Table 2: Ergun equation with the laminar and turbulent term estimates the pressure drop over the zeolite bed. Closed packaging should be avoided to prevent a very flat bed design.

First results

Already two of the three materials have been delivered at the laboratory and tested with respect to temperature by just adding liquid water (15 g) to 25 g silicate gel and to 25 g $CaCl_2$ $2H_2O$. At the end of this reaction the hydrated silica gel was still granular and useful to regenerate, while the hydrated calcium chloride became partly fully solid (no particles at all) and partly a solution. However, the same experiment should be repeated with water vapor, carried by air whether the structure of the particles $CaCl_2$ * $2H_2O$ is maintained.

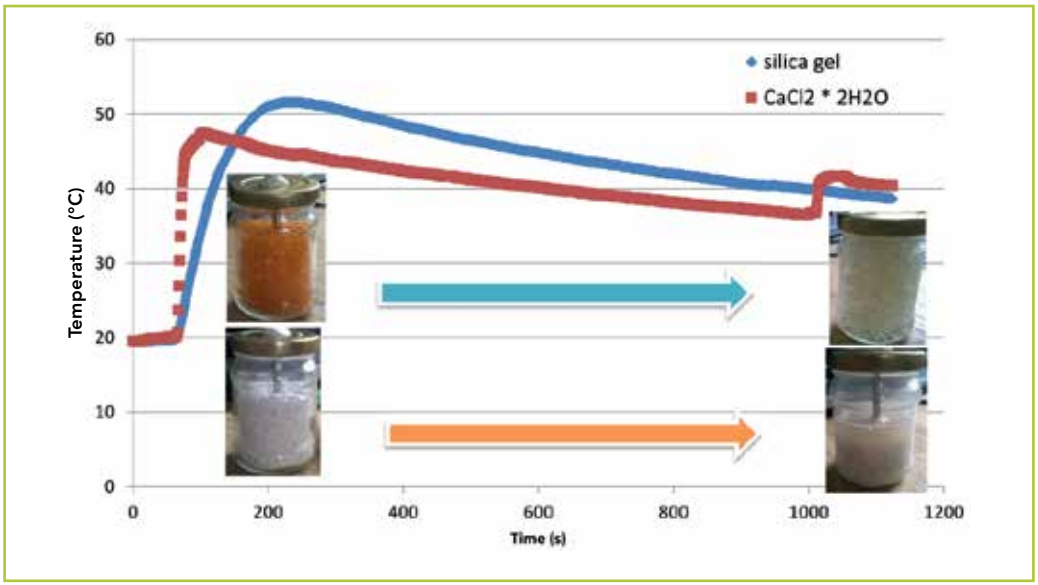


Figure 5: Reaction of silica gel (25 g) and calcium chloride (25 g) with 15 g water.

The first steps of the reactor vessel are constructed and can be used for granular zeolite and silica with 3 mm and higher as shown at the left (figure 6).

First conclusions and outlook

An open reactor has implications on the design. Ventilators in general cannot pressurize beyond the 1000 Pa so that one of the following measures must be made for an open reactor: flat design (low height reactor bed), large diameter particles or an high porosity reactor. This last measure would imply that a transport system is required to transfer (daily amount of) TCM material from a close-packaged TCM storage vessel to the reactor with its higher porosity when a high energy density storage system is pursued.

First reactions with TCM and liquid water show that the silica granules remain intact while $CaCl_2 * 2H_2O$ particles conglomerate when no intensive stirring or mixing occurs. The discharging temperatures are quite similar as found in literature. The reaction rate with $CaCl_2 * 2H_2O$ is more than 6 times faster.
The next step is to apply humid air to a flat bed of silica gel or zeolite 13x and determine the ΔT_{air} and Δp_{bed} for several bed configurations and TCMs.

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THEME 2 INNOVATION ACROSS CONTINENTS

TII's declared mission is to be the "Global Gateway to Innovation". Its experience in organizing its 2013 conference in Beijing proved that there is a genuine interest among innovation support professionals working in different areas of the world to share good practice and investigate collaboration opportunities. This track will focus on issues such as international technology transfer, internationalization, soft landing, managing IPR in a global context and will include a presentation on the newly launched activities of the TII China Chapter.

TITLE
Causes and Consequences of City Growth in China

PRESENTER
Hein Roelfsema

ORGANIZATION
Utrecht Centre of Entrepreneurship, the Netherlands

MAIL ADDRESS
h.j.roelfsema@uu.nl

[abstract]

City growth in emerging markets is one of the greatest challenges of our time. One the one hand, agglomeration may result in higher living standards due to economies of scale in production, technology transfers that enable investment in human capital, and entrepreneurship. However, on the other hand agglomeration may reduce the quality of life because of environmental degradation, rising crime rates, and to some the erosion of (assumed superior) traditional values. Most would agree that the sustainability of the rise in living standards in the developing world depends much on how well the process towards higher rates of urbanization is managed. To analyze the complex relation between the drivers of agglomeration, urbanization itself and outcomes in terms of income and qualitative measures of living standards, we present a structural equation model and bring this to Chinese city growth data for the period 1980-2011. Using a principal component analysis, we construct four factors of city growth: foreign direct investments, human capital pools, location, and market potential. We show that these factors are highly connected to city growth dynamics in terms of agglomeration, using data for 280 Chinese cities. As we use a structural equation model, we identify the direct and indirect effects of these factors on wages and living standards. The indirect effects can be interpreted as how these factors affect wages and living standards through their effects on agglomeration. Of the many interesting results three stand out. First, using the structural equation model makes sense. As agglomeration is highly positively connected to wage levels and living standards, single equation testing between for example FDI and wage levels runs the risk of estimating inflated effects of the presence of foreign firms in the region. When we decompose into direct and indirect effect, the relations are more nuanced, and to some closer to 'gut feelings'. A second result that stands out is that the direct effects of FDI are small when compared to the indirect effects. In addition the effects of FDI are much larger for wage growth than for rises in living standards. A tentative conclusion is that FDI mainly aids economic development through it is effect on agglomeration. A third finding is that human capital buildup has a large direct effect on living standards and works less through its effect on agglomeration. In addition, human capital builduphas a stronger connection with living standards than with rising wage levels. We check for robustness of the results by considering different time periods (which affect the results substantially) and different subsamples of city size. Furthermore, the paper offers some interesting descriptive statistics of city growth dynamics in China using Zipp's law and Gibrath's law.

STRENGTHENING EU-CHINESE COLLABORATION IN THE FIELD OF TECHNOLOGY TRANSFER

TII's Annual Conference in 2013 took place in Beijing and one of its main objectives was to explore opportunities for the Association to develop international services and membership in China and other parts of Asia. The conference proved very successful and one of the most popular activities was a workshop designed to analyse future possibilities for strengthening EU–Chinese collaboration. The workshop used traditional technology road mapping (TRM) methodology and was attended by approximately 50 delegates.

A large number of potential areas for collaboration were initially identified and subsequently divided into five 'groups of ideas' which were considered - by popular vote - to be the most important. The five broad topics were then analysed using a time chart to produce a draft action plan for each. The purpose of this paper is to present the results of this analysis, to look in detail at the first topic about establishing a TII chapter in China and to open up discussion on the remaining four topics in advance of the 2014 conference.

Ideas for collaboration

In the initial session, a total of 24 ideas for collaboration were identified as follows:

- Establish voluntary TT network in China (equivalent to TII)
- Foster R&D Collaboration
- Increase training and personnel exchange
- Utilise accepted tools and standards
- Exchange good practice on Smart Cities and urban environment
- Improve information flow: Eu>China>EU
- Foster improved one-to-one matchmaking
- Establish training programmes in Innovation
- Foster 'outward technology' flow from China to Europe
- Overcome cultural problems inhibiting transfer process
- Organise technology driven market events
- Stimulate more effective University collaboration

- Promote job exchange and secondment of personnel
- Develop RITS network (regional economic development strategies)
- Increase volume of contract R&D
- Expand TT networks and conformance
- Secure government support for professional collaboration
- Lobby for bi-lateral collaboration on sustainability
- Develop on-line mechanisms for technology transfer
- Establish soft landing schemes for companies and organisations
- Produce case studies jointly
- Recognise common professional standards
- Expand funded mechanisms for EU-China R&D similar to FP7
- Organise peer-to-peer visit programmes between TT organisations.

The five most important topics (groups of ideas)

1] Creation of TII Equivalent in China – non-governmental and voluntary

2] Support for R&D collaboration and joint projects e.g. Horizon 2020

3] Exchange of personnel and training in innovation subjects and information

4] Accepted standards and tools for technology transfer

5] Cooperation on environmental actions such as sustainable cities

Each of these topics was mapped on a time chart by participants. Following the conference the first of these topics was analysed in more detail in response to a proposal by Coway International that it would support the establishment of a Chinese subgroup or chapter of TII (see below).

1] Creation of TII equivalent in China

Several of the suggestions made by workshop participants pointed to the desirability of setting up a private sector network of TT organisations in China. Such a network could operate more or less independently of government sponsors. It would, therefore, be freer to engage in organisation and staff development activity outside the immediate scope of its publicly funded commitments. This freedom is one of the reasons that TII has survived for so long as a membership organisation in Europe. Members value (and are therefore prepared to pay for) peer review and professional experience exchange. Actions needed to make progress towards this goal are outlined below.

Short Term Planning (1-6 months)

A working group would be set up in the first six months to gather data, share information and make a draft action plan for TII China. The mechanism for communication would have to be on-line initially and some resources would have to be made available by members for market research and discussion. Outputs would include:

- Inventory on potential members
- Technology and needs translation
- Proposed services for TII China
- Proposed organisation structure

TII China could either be set up as a subset or 'chapter' of TII Europe or as a completely separate organisation operated on a franchise basis. Most people favoured the idea of a TII chapter but, for this to be successful, there would have to be a number of services operating in China. Chinese organisations could not be expected to attend membership events and activities in Europe. Suggestions were made in relation to training and seminar meetings delivered in China along with an annual Summer School to foster professional development of Chinese staff. Both Chinese and EU organisations would like to have a focused search capability tailored to their own needs. For example one EU participant stated, 'My interest is in agriculture. I would wish to see if their technology was suitable for our production or would improve our own technology skills. And would it be helpful to the local agro-ecological development?'.

Detailed search requirements such as this can only be satisfied if a TII China becomes a physical entity with its own resources. This raises further questions such as:

- Where will the TII premises be located in China?
- Who would provide the staffing resource and the funding?
- What would be the business model of the new organisation?

During the first six months the working group would produce a draft plan to answer these questions and to deal with practical issues of ownership, strategy, management, and recruitment. Although this process will have to take place in China, the enthusiasm and commitment of TII headquarters in Brussels is a key factor.

Medium Term Activity (7-18 months)

Twelve suggestions were submitted for what could be done in the medium term. These could be divided, approximately equally into preparatory actions and implementation actions. The essence of these suggestions is described below in a logical sequence.

(a) Preparatory Actions

As stated above, the first logical step will be to bring together a group of interested people into a working party to make a draft plan. This would happen in the first six months. Following that a workshop should be held to present the plan to a wider group of stakeholders and obtain their approval. It was suggested that approaches to Chinese government organisations should be made at this time. Perhaps representatives of EU international programmes could also be invited.

Out of this 'promotional' workshop more permanent mechanisms could be set up such as an internet platform including technology areas, training materials and best practice examples. One participant even suggested that videos should be produced to promote the benefits of a Chinese version of TII with reference to case studies generated by TII in Europe. It was felt that this was not a one way process and that in order to be successful there must be an information exchange forum between Chinese members and in the Chinese language. These actions should all lead towards a clear mission and implementation strategy.

(b) Implementation Actions

It will be important that some visible structure be established as a focal point to make sure that the collaboration actually happens. Some people felt that this would require incorporation (forming a legal entity) and a registration process. The detail of how this would happen was not discussed.

Most people supported the idea of setting up a TII expert pool or which would comprise specialists from all technology and business disciplines. Their task would be to help companies and support organisations identify partners, new technologies and new markets. It was stressed that search mechanisms would facilitate technology flow in both directions between China and the EU.

The final idea for implementation in the medium term was to establish feedback mechanisms so TII members could monitor the level of collaboration resulting from formation of TII China.

Long Term Solutions (18-36 months)

The long term objective will be to have a permanent contact point for easy communication and collaboration. Participants in the workshop were unanimous in their support for this. However it could only be achieved if organisations could be appointed in China as well as Europe to manage and take responsibility for the communication. One of the perceived benefits on the Chinese side might be to promote enterprise culture alongside technology transfer. Another idea for the longer term was to establish an Investment company or investor association which could help in the commercialisation of technologies arising from international collaboration between TII members.

Measures of Success

The first important success measure will be the completion of an Action Plan with clear objectives and milestones. In terms of quantifiable measures of success, workshop participants made a number of suggestions such as the recruitment of 40 additional paying members of TII by month 36. Early indications from the Chinese organisations at the conference were that 15 new members was realistic. Promoting this new service could potentially account for a further 15 new TII members in Europe. It might also appeal to 'subsets' within the membership of other networks (such as EEN) that have a special interest in China.

Posting suggestions on the road map chart.

Discussing specific topics in small groups.

Since Beijing in May 2013, some progress has been made but timescales have slipped and the conference in Utrecht will give TII members the opportunity to re-visit the above objectives. It is to be hoped that a more comprehensive action plan will also be developed to address the other thematic areas [2 to 4] outlined below. The ultimate mission or goal will be to create a truly international platform for technology transfer professionals.

2] Support for R&D collaboration and joint projects e.g. Horizon 2020

Joint Research and Development and collaborative projects involving both EU and Chinese partners was a second priority area. Some of the key ideas on this topic are presented below.

Short Term Planning (1-6 months)

- Discuss R&D Framework Agreement
- Establish H2020 info NET for Chinese Partners
- Website and news service for different industries
- Information about Chinese public policy trends
- Use of 3rd party events for strategic visiting

Medium Term Actions (7-18 Months)

- Develop China Group Internet Platform
- Enhance specific contract research or joint research projects
- Offer R&D Consulting / Intermediary services for R&D applications

Long Term Solutions (18-36 Months)

- Develop a permanent R&D collaboration platform & on-going program
- Promote harmonised policy making between EU / Chinese governments

Measures of Success

- Number of joint projects applied for
- Number of joint projects approved
- Sum of money (¥, €) generated

3] Exchange of personnel and training in innovation subjects and information

Knowledge transfer in its broadest sense was considered very important both in terms of personnel exchange and the sharing of best practice through training and mentoring.

Short Term Planning (1-6 months)

- Facilitate working teams to exchange information on a regular basis (weekly?)
- Create working group for formal experience exchange (3-6 months frequency)
- Develop clear training targets
- Provide information dynamics that constantly refresh (what need & what offer)
- Mapping needs and available exchange places
- Evaluation of organization

Medium Term Actions (7-18 months)

- Go outside & learn how to manage technologies together
- Create an electronic network to connect with China and Europe. Requires a software platform of needs and offerings, and human resource to deal with that information
- Deliver a 'Summer School' on Technology transfer methods (1 week course)
- Mobilise people working either in Chinese and European companies, understanding the company differences between each country as well as learning the advantages
- Development customised training curriculum including website resources
- Extend activities from national to regional level in both China and Europe

Long Term Solutions (18-36 months)

- Seek funding support from Chinese government and EU via Horizon 2020
- Promote training courses for students

Measures of Success

- 10 personnel exchanges organised annually
- Number of people trained – both students and TT employees
- Additional members of TII Europe and TII China Chapter

4] Accepted standards and tools for technology transfer

The need for recognised international standards was widely accepted. Otherwise, global technology transfer partnerships will be slow to develop and suffer from misunderstandings.

Short Term Planning (1-6 months)

- Study successful cases in each phase of the transfer process & abstract the essence of the cases and establish models in each phase
- Develop common procedures: manuals, standard forms and web based protocols
- Organise regular webinars and knowledge sharing sessions

Medium Term Actions (7-18 months)

- Make available standard documents in Wiki
- Organise sectorial EU-China TT Events
- Develop insightful case studies and learning materials

Long Term Solutions (18-36 months)

- Create an EU-China network (Web), divided by each sector; this network could be accessible under certain membership conditions
- Investigate potential for similar actions in other territories e.g., India, Indonesia

Measures of Success

- Maintain members awareness of progress through phases in the process
- Check levels of compliance to resulting international standards

5] Environmental actions such as Sustainable Cities co-operation

Considerable interest was expressed, especially from Chinese participants in environmental and energy saving technologies and especially in how they could be applied to urban areas.

Short Term Planning (1-6 months)

- Gather examples of successful application of green technologies
- Produce descriptive material about technologically oriented cities
- Disseminate list of pioneer and initiatives across TII membership

Medium Term Actions (7-18 months)

- Create EU-CHINA environmental project group, for training and capacity development; include funding providing as well as website development
- Set up match making platform related to environmental / energy knowhow
- Promote exchange visits by city planning officials
- Organise virtual events & match making webinars among members

Long Term Solutions (18-36 months)

- Facilitate the exchange of specific energy & environmental technologies
- Set up permanent matchmaking platform related to urban environment
- Foster long-term collaborations with local government, urban authorities

Measures of Success

- Contribute to specific environmental objectives - such as advances in energy saving buildings, lower noise levels generated by automobiles etc.
- Generate 10 matchmaking activities & 5 collaborative technology ventures

The EU-Chinese road-mapping workshop received some very good feedback following the conference in Beijing. Many good ideas were expressed and there was significant agreement about the potential value to be obtained from an international approach to these issues. TII will benefit as an association by focusing on the suggested programme of activities whilst - in parallel - extending its influence to China through a joint membership initiative.

THEME 3 SOCIAL INNOVATION AND NEW FORMS OF ENTREPRENEURSHIP

Social innovations are new ideas (products, services and models) that simultaneously meet social needs more effectively than alternatives and create new social relationships or collaborations. In other words, they are innovations which are both good for society and enhance society's capacity to act. Systemic change is the ultimate goal of social innovation which inevitably implies sustainability. New forms of entrepreneurship which target e.g. disfavoured groups of the population are an important form of social innovation which offer a sustainable alternative to unemployment and dependency on government benefits. This session will look at good practice and successful case studies of social innovation in action.

TITLE
Innovative business partnering models by applying social technical principles to value chains

PRESENTER
Raf Sempels

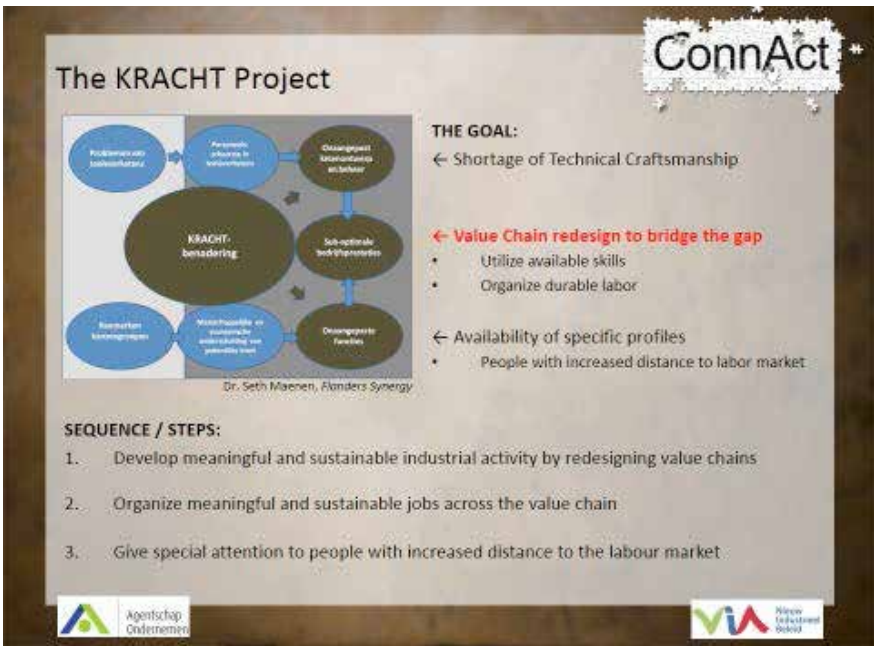
ORGANIZATION
Viisiteam, Scherpenheuve, Belgium

MAIL ADDRESS
raf@viisiteam.com

INNOVATIVE BUSINESS PARTNERING MODELS BY APPLYING SOCIAL TECHNICAL PRINCIPLES TO VALUE CHAINS

The KRACHT project

The KRACHT project was initiated in the 'Flanders in Action' policy program of the Flemish Government, as part of the 'New Industrial Entrepreneurship' Initiative. KRACHT is aiming at finding ways to create new, competitive and sustainable industrial activity for Flanders, while at the same time addressing a labour market gap: can we find ways to counter the lack of craftsmen by integrating people with specific abilities and specific limitations within the value chain?



The broader picture is that in due time we all will become 'people with limitations'.

The question needs to be asked whether all of us would agree to be kept in 'enclaves of similar individuals' (as is the current approach) or whether we would rather remain active, participating in creating real value and in providing our value in a mix of younger and older people, in a mix of new ideas and experience.

The KRACHT project is executed by Connact vzw, with the co-operation of Flanders Synergy, Viisiteam® and Value Chain Partners including Daikin Europe, Corelio Printing, De Lijn, ODTH, Oesterbank and Bombardier

SUSTAINABLE GROWTH: Translating Added Value into Business Energy

Businesses today are striving to achieve sustainable growth as a combination of profitability, workforce motivation and Corporate Social Responsibility. The key to finding success can be found in 'Added Value'.

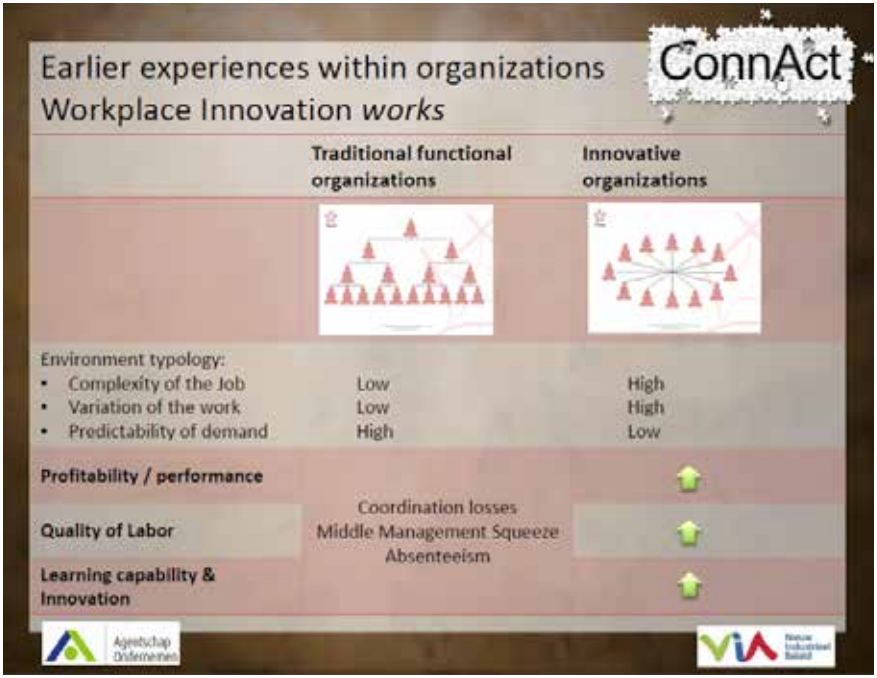
Businesses that focus on maximizing added value for their customers will be more successful in obtaining the required profitability. By eliminating anything that does not provide added value, they immediately contribute to achieving their CSR goals.

By the same token, employees who can identify how they contribute to this added value and who understand that what they are doing is meaningful, are more motivated and innovative. Organizations feel more energized and people will return more energy into their job.

Clearly defining the added value of a product/market combination and designing products, processes and organizations to maximize this focus will lead to energized businesses that thrive.

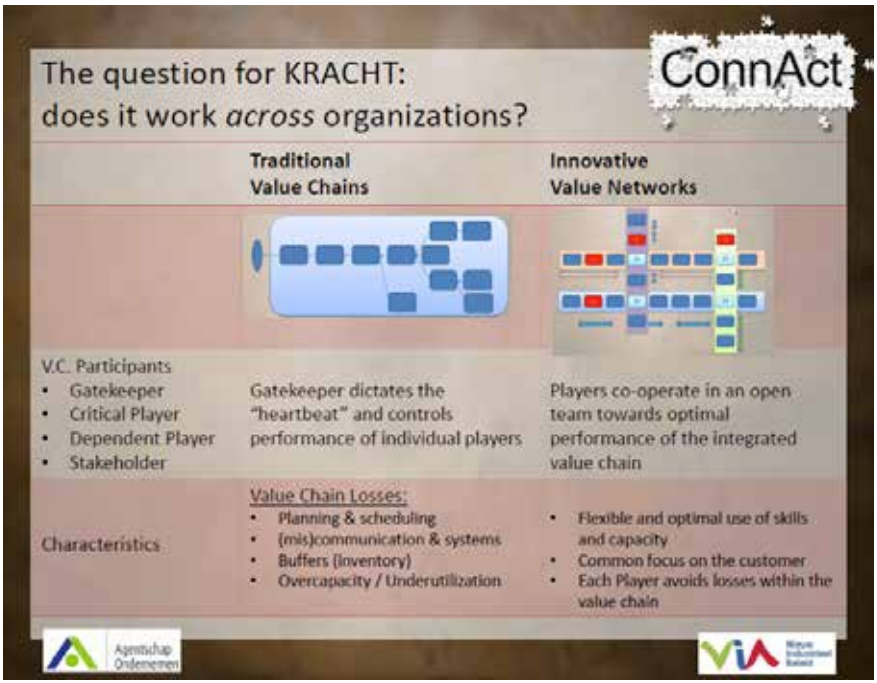
LOCAL AUTONOMOUS NETWORKS:
principles of workplace innovation extended across organizations

The introduction of workplace innovation and the application of socio technical principles into organizations have meanwhile proven to add to business success.



The focus on customer oriented processes in combination with the division of tasks and responsibilities within autonomous teams have shown to boost productivity by double digit factors, to improve employee motivation and contribution, and have also proven to increase the rate of innovation in organizations by generating more ideas and bringing more ideas into realization. These organizations are clearly more adapted to new challenges and changing market demands.

Yet, the limitation of Workplace Innovation and Socio Technical Design is that it focuses on the design of one business or one organization. As if an organization would hold all knowledge, skills and resources to address market needs in the most optimum way. We all realize that we are merely a part of a much larger value chain.

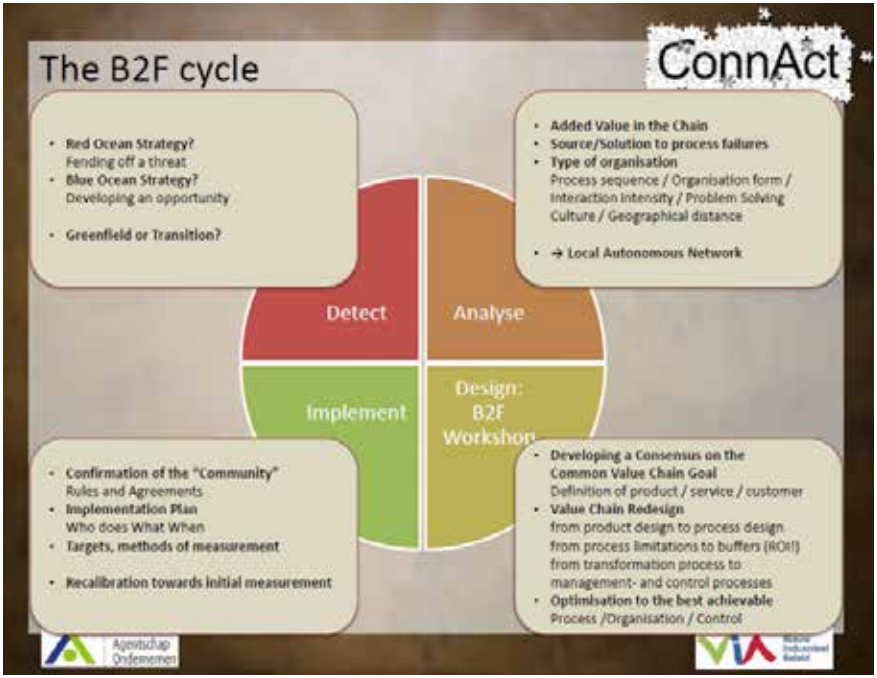


New innovative models have now translated the principles of workplace innovation and socio technics into partnership models across organizations, by developing so called Local Autonomous Networks.

These partnering models have allowed business in Western Europe to successfully withstand the competition of global sourcing and to regain/retain industrial activity.

BUSINESS MODEL PROTOTYPING:
integrated product, process and organization design made tangible

By combining existing models and methodologies, Local Autonomous Networks were forged out of traditional Value Chains, and traditional Customer / Supplier relationships were transformed into partnership communities that were able to address market demands in a mix of productivity gain, simplification of processes and innovative ideas that would not have occurred with the traditional way of working.



The KRACHT project developed an approach, the B2F or 'Business to Flanders' cycle to initiate, manage and control such a business model prototyping process. This new approach of redesigning traditional Customer/Supplier Relationships into Value Oriented Partnerships is supported by a methodology that allows to simulate and assess physical, co-ordination and management processes, as well as the impact of organizational choices, in order to establish the feasibility and leverage of the Business Model.

As there is an almost infinite combination of scenarios and parameters, the project till now primarily focused on 'red ocean strategies' within 'closed communities'. This means that the value chain players all perceive a threat to the current business model, and a selected group of players are invited to join the redesign process.

This allows the 'new community' to quickly establish itself and quickly define a common goal, as everyone involved is in a known environment. The project is now starting to multiply the number of cases, and to expand to 'blue ocean strategies' and 'open communities'. This means new opportunities and businesses will be created. Once the detection of possible candidate value

has taken place, the analysis phase allows to detect areas for improvement and critical value chain players. Only if a well scoped product/market combination can be defined that holds enough opportunity, and only if the required players are available and can be committed to the process, continuation will be worth while. If organizations are unwilling or unable to make the required choices and to commit to new ways of co-operation, there is no basis for success.
The design phase is both critical and rewarding. Once boundaries are set, standard methods and design rules of Lean Management (Value Engineering and Process Design) and Workplace Innovation (Organization Design) can be used to create a simulation model for the business value, for the physical and management processes, and for organization interfaces. It all starts with a common goal that respects individual goals, and yet creates unexpected value to all participants. It is no longer about dividing the cake, it is about baking a new cake.

The design and implementation phase may iterate a number of times, as participants need confirmation of their role in the community, and need reassurance that working within the community is safe. Once practical and concrete arrangements need to be planned and executed, questions will be asked such as 'do we really want to go forward' and 'are we really committed' and 'is this exactly what we want'. We observed that not only business boundaries, but also institutional, legal and infrastructural roadblocks may hamper progress.

Part of the KRACHT project is therefore about advising the Flemish Government as to how to address these issues and to facilitate industrial growth through legislation and policy.

Although first results show that this approach can be successful, we must not close our eyes to the fact that so far, not every initiative could be concluded with a business success. Failures however have contributed to insights as to the critical success factors for such an approach.

The main conclusion is that traditional thinking in terms of customer/supplier relationships is killing for added value, efficiency and innovation.

TITLE
Foresight Innovation Communities – The Social Design of Innovation

PRESENTER
Prof. dr. Peter Heydebreck

ORGANIZATION
Inno Group, Karlsruhe, Germany

MAIL ADDRESS
p.heydebreck@inno-group.com

FORESIGHT INNOVATION COMMUNITIES – THE SOCIAL DESIGN OF INNOVATION

The determinants of innovation processes are manifold. Most empirical studies have identified market-related factors, technology-related factors, organisation-related factors (partly including financial issues) and strategy-related factors as key success determinants of innovation processes. As the renowned scholar of innovation management, Jürgen Hauschildt, pointed out, these findings are so plausible that the implementation of their implications could be left to consultants without any risk[1]. What he meant is that in the world outside of academia, innovation occurs in complex systems or actor-networks, in which human elements influence each other and interact with their environment. Technological innovations are not driven solely by world-class researchers or engineers, nor are commercial innovations solely propelled by smart business people, or social innovations driven by good citizens alone. Innovation is a holistic task and innovation success demands a multidimensional approach. The components included in this approach reflect society in all of its complexity and richness. These include the views and ideas of the scientific community, the balancing of interest in politics, business professionals' risk awareness, and citizens' hopes in light of an unknown future. All of these elements take part in the process of innovation that can ultimately lead to innovation success.

The authors argue that Europe fails to fully grasp this approach and thus realizes below satisfactory levels of innovation. It is against this background that the authors explain the 'European paradox' described by the EC 1995 Green Paper on Innovation; that substantial financial support of R&D does not in and of itself lead to satisfactory market success. To quote the Green Paper on Innovation:

'One of Europe's major weaknesses lies in its inferiority in terms of transforming the results of technological research and skills into innovations and competitive advantages'[2].

This is in accordance with a very basic idea. Namely that innovation starts with research and discovery, followed by technology transfer or adaption, and ends with market implementation. This is the so-called linear model of innovation that has existed since the 1940s when industrialists and economists expounded the theory[3,4]. Since that time, the linear model of innovation has dominated

governmental science policies, applied research funding programmes and has been institutionalized through the many offices and departments for technology-transfer established by universities and research organizations. Even though current research and management theory have pronounced it outdated and provided alternatives, in practice the linear model of innovation is alive and well today.

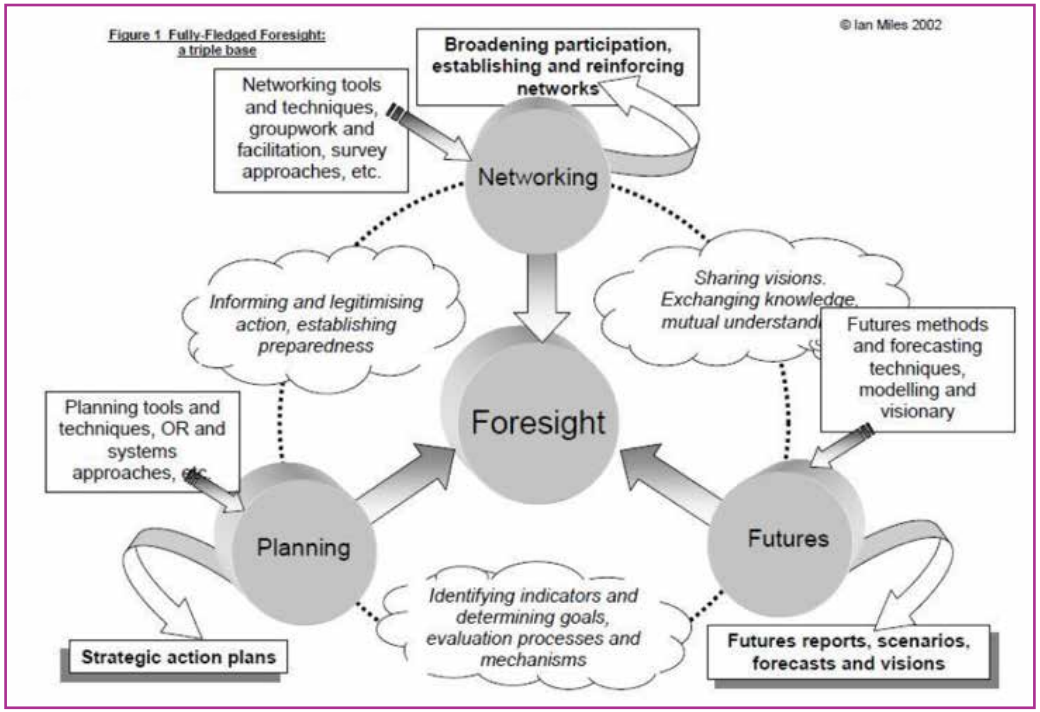
The authors argue that the failure to integrate societal concerns early on, dooms many innovation to market attempts to fall short before implementation. On a superficial level, the efforts fail due to legal/regulative restrictions. However, very often they fail because they do not adequately address stakeholder concerns.

Thus, the action of citizens' advocacy groups to oppose projects, e.g.:

- big physical infrastructure projects (e.g. airports, stations, power lines, windmill parks…),
- innovation in food (e.g. genetically modified crops…), and
- the re-prioritization of public support from 'classic' industries to new industries.

At the same time, it is not sufficient to just communicate societal needs and to hope that someone will take care of them. For example, asking investors to behave as good corporate citizens to employ more people, or become more environmentally sustainable will not lead to major changes in business behavior. Motivating incentives such as goal-oriented tax schemes, support schemes or legal sanctions can however lead to socially desirable behavior.

There is no single answer to address the challenges above. The authors however strongly believe that the implementation of Foresight methods in individual innovation processes can contribute to overcome the so-called 'paradox'. Foresight is defined as an independent, participatory, interactive and systematic process, developed with collective and cross-disciplinary methods. Foresight is used to highlight the questions of the present and of the future by on the one hand considering them in their holistic, systemic and complex framework, and, on the other hand, in inserting them in temporality[5]. In short, Foresight means thinking about the future in order to shape the future today.



Fully-Fledged Foresight according to Miles 2002[6].

Foresight is thus substantially different from forecasting which is about estimating the future, often based upon a sector approach. This difference makes foresight an adequate tool for embedding the various perspectives of all key players and stakeholder groups in innovation processes.
The authors are convinced that there is no European "paradox", but that there is a fragmented system which needs to become interwoven much more effectively. The authors advocate for multi-disciplinary foresight innovation communities that include individuals, companies, NGOs, universities etc. in order to realize what might be called the "social design of innovation". In practice this process is comprised of several stages.

These are:

- mapping the current situation of technical systems
- the development of a shared understanding of the future dynamics of the technical systems
- the conceptualisation of a desirable future
- defining a roadmap that ensures that innovative actions are implemented today

Can Foresight Innovation Communities create marketable products? This question will be decided by practical application. Thanks to the Federal Ministry of Education and Technology (BMBF) - Germany's leading governmental agency for economic exploitation of research results by implementing 'Innovative Measures' - the authors are optimistic that Foresight and economic exploitation innovation will be linked more closely in the near future.

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TITLE
Student Driven Business Incubation, the Innovation Hub

PRESENTER
Prof. Han van der Meer

ORGANIZATION
Saxion University of Applied Sciences, the Netherlands

MAIL ADDRESS
meer@innovation.nl

STUDENT DRIVEN BUSINESS INCUBATION, THE INNOVATION HUB

Business Incubators (BI) are being considered spatial clusters in which entrepreneurship and innovation is stimulated. However, research has shown that most BI's do not meet expectations. A new BI sub-type was identified called the 'Student Driven Business Incubator' (SDBI), which is mainly managed and driven for and by students. It was shown that the SDBI is a fit alternative to (costly) top down managed BIs. The strengths and possible challenges of the SDBI for existing SMEs will be discussed resulting in a concept called the Innovation Hub. The first Innovation Hub was established 2 years ago and now it is already an active network of 7 Innovation Hubs.

Introduction

The impact of entrepreneurship on national economic growth is a widely recognized. Economic growth and job creation activity is no longer characterized by reliance on large firms but has shifted to S(mall- and) M(edium) E(nterprise)s and start-up firms .

Entrepreneurial activity is one of the major drivers of economic growth. SMEs and in particular growth oriented SMEs are an important source for job creation (Valliere, 2006). In western economies SMEs represent more than 90% of all firms.

To stimulate start-up formation and within existing SMEs to stimulate innovation often so-called spatial clusters are formed (Pont and Van der Meer, 2012). At the initiation of a spatial cluster, various benefits are expected concerning regional and economic development and stimulation of entrepreneurship in the form of synergy between participating entrepreneurs.

At the same time, the availability of space at low costs is found to be the primary reason for creative entrepreneurs to settle in a certain area (Heebels and van Aalst, 2010). Resources spent by participating entrepreneurs on collaborative actions are limited and might not always yield the expected outcome in terms of synergy within the cluster.

Therefore, management and participants involved in spatial clusters are interested in co-ordinated processes or planned activities that have a positive impact on synergy within the cluster. It can be argued that successful policy towards synergy in spatial clusters is based on reciprocity between management and participants. At the same time, the relation between management and participants varies in each cluster.

Incubators for start-ups

A well-known form of spatial clusters is the B(usiness) I(ncubator). Grimaldi and Grandi (2005) distinguish four different kinds of BI's; Business Innovation Centers, University Business Incubators, Independent Private Incubators and Corporate Private Incubators. In this paper we focus on University Business Incubators (UBI) and Business Innovation Centers.

University Business Incubators are, as their name implies, directly connected to an university. Since1990, more and more universities engage in developing these kind of BIs. However, the results of these incubators are disappointing as most University Business Incubation programs do not meet the expectations (Wright et al., 2003). In fact, some UBI services even obstruct spin-out companies in their business goals, growth and/or survival. As we suggested (Claase et al.) these problems arise due to the top down management approach most UBIs employ. Therefore, we proposed a new management approach to overcome the before mentioned issues of UBIs. We define this approach as Student Driven Business Incubator (SDBI). As the name implies, the SDBI specifically focuses on student entrepreneurs and academic entrepreneurship. The incubation process is bottom up driven and managed by this target group. This type of SBDI can work remarkably effective and efficient for stimulating start-ups as has been shown in examples like StartX in Paolo Alto, but will this bottom-up student driven approach also work for Business Innovation Centers for existing SMEs?

Student Driven Business Innovation Centers for SMEs

Organizing knowledge flows for innovation in SMEs is mainly a matter of organizing manpower. This phenomenon is also known as 'knowledge on the hoof'. A dominant and proven concept for organizing these kind of systems of Open Innovation systems (Chesbrough, 2003) between SMEs and (scientific) knowledge institutes like universities is the use of interns and graduation students (Van der Meer, 2007). This concept shows rather evident advantages as well as disadvantages. A successful approach to overcome the disadvantages

and to strengthen the advantages was found in the Innovation Centre of Rotor (Eibergen, Holland).

In this student driven Innovation Centre we found the following 4 basic characteristics:

1) A group of students (6 to 8) from different disciplines and universities work individually (and sometimes in small teams) on a portfolio of several innovation projects.

2) The portfolio consists partly of subjects given by the company and partly suggested by the students themselves. Each student gets 4 weeks to translate his own project in the portfolio into a project plan. In this way the ownership of the project is transferred to the student.

3) The group works in their own studio. In this studio there is a climate of hard work, exchange of ideas and co-operation towards a common goal.

4) The Innovation Center is managed by a management trainee of the Fast Forward program. This program gives recently graduated students during 24 months 3 management trainee positions as well as a training (0,5 day each week) in management skills. The manager of the Innovation Center provides for the making of the studio, the recruiting and selection of the student researchers, the basic portfolio of innovation projects, daily supervision of the students, reporting and communication of the results of the projects as they progress (for instant via Social Media and computer systems like SharePoint) and all affairs with the Universities.

Based on an in-depth analyses of the Rotor case and the concept of this Student Driven Incubator a formula was designed for a broader concept which later was called 'the Innovation Hub'. The seven 'Habits of a successful Innovation Hub' are postulated as:

1) Co-ordination over temporariness

2) Anchoring within the company goals

3) Shared ownership of a project

4) Focus on implementation

5) Combining young energy and deep experience

6) Strength in diversity

7) Save heaven on the shop floor

Core in the Innovation Hub is the responsibility of students to drive the unit by themselves.

The concept was spread out over companies in a rural region in Holland named the Achterhoek. This region has no universities and a rather bad reputation with academic students. Since the yearly budget for an Innovation Hub is about 60.000 and for good operation it needs a critical mass of at least 6 students and a portfolio of 10 attractive innovation projects, starting a Hub is quite an endeavor for a single SME. The concept was thus first picked up by group of three companies Contour, van Raam en Waterkracht.

After a careful preparation of 8 months under the guidance of University Saxion the Hub Innovar took off in the beginning of 2012. It turned out to be rather successful.

Figure 1: Logo of Innovar, the first formal Innovation Hub.

On the wings of the positive experience of both Rotor and Innovar over the past two years a network of seven Innovation Hubs was established in the rural region of the Achterhoek ranging from a classical '1 company 1 Hub' model to a daring '12 companies 1 Theme' oriented Hub. All these Hubs are completely privately funded. Only the research and a light network organization binding the 7 hubs and exchanging practice is partly funded by government. The goal of further research is to develop a systematic Good Practice approach for new Hubs. The goal of the network is to eventually form a 'not at all Virtual yet not Formal University of Innovation' in the region. A region with no easy access to academic students and no chance at all to build their own formal university.

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TITLE
Centers of Sustainable Co-Created Products bij BoP

PRESENTER
Maria-Laura Franco-Garcia
Juan M. Jauregui Becker
Aard Groen

ORGANIZATION
University of Twente, Enschede, the Netherlands

MAIL ADDRESS
m.l.francogarcia@utwente.nl
j.m.jaureguibecker@utwente.nl
a.j.groen@utwente.nl

Jaap van Tilburg

NIKAS + University of Twente, Enschede, the Netherlands

jj@vantilburginnovation.nl

CENTERS OF SUSTAINABLE CO-CREATED PRODUCTS BIJ BOP

[abstract]

Product Co-creation Centers, or PC3, is a multidisciplinary project at the University of Twente in the Netherlands researching the development of an economically sustainable and scalable model to boost development of the Base of the Pyramid (BoP) by systematically providing entrepreneurial and creative people at the BoP with the right competences to start up their own businesses. This initiative is framed within the values of BoP protocol 3.0, as and such, the goal is developing a scalable instrument to support the people at the BoP to successfully transfer from informal markets to formal markets through the expansion of new entrepreneurships. More concretely, the PC3 project aims to find means and ways for stimulating BoP to undergo the processes of opportunity recognition and conceptual product development, both, guided by business development methodologies for start-ups.

Co-creation is used here as an instrument to empower the people at the BoP level to co-create sustainable enterprises. In our vision, the co-creation process is lead simultaneously by a BoP entrepreneur that owns the value generating idea and a non-BoP function developer responsible for organizing the product and business development process. As a result of such a process, the new ventures from BoP's are expected to have impacts at the BoP's wealth which could be measured through aspects such as (1) income, (2) access to basic needs and (3) local improvements on the BoP's impacts (environmental and socially), among others.

In the short-term, the PC3 can be seen as a concrete and scalable method that can be applied to different contexts. In the long-term, our ambition is to build a network of PC3's in BoP's settings, therefore the use of the 'social innovation systems' term.

PRESENTER
Maria-Laura Franco-Garcia
Juan M. Jauregui Becker
Aard Groen

Jaap van Tilburg

ORGANIZATION
University of Twente, Enschede, the Netherlands

NIKAS + University of Twente, Enschede, the Netherlands

MAIL ADDRESS
m.l.francogarcia@utwente.nl
j.m.jaureguibecker@utwente.nl
a.j.groen@utwente.nl

jj@vantilburginnovation.nl

As a matter of fact, 'innovation' is foreseen during PC3 implementation from different dimensions:

1) the technological and functional one as indicated by Pralahad, here cited as 'breakthrough innovations' which relies on different use of materials and production lines to offer more ad hoc products and services to satisfy the BoP's market.

2) the 'eco-innovations' due to PC3 methodology's emphasis put on environmental criteria and positive impacts all along the supply chain of the BoP's business ideas.

3) the 'social innovation' which according to Mumford, 'it is reflected through the generation and implementation of new ideas about how people should organize social interactions, to meet one or more common goals'.

PC3 project involves the co-creation of new processes and procedures for structuring collaborative work, i.e. the development of new business practices and the introduction of new social practices in a group. Hence, PC3 represents a social innovation, per se. At present, we are developing cases in Mexico, Brazil and South-Africa. We are looking for more partners willing to innovate with meaningful purposes. The project website is: **http://www.utwente.nl/ctw/pc3/**

TITLE
The role of social innovation in UK criminal justice reform and its implications for theorising social innovation

PRESENTER
Prof. Chris Fox
Robert Grimm

ORGANIZATION
Manchester Metropolitan University, United Kingdom

MAIL ADDRESS
c.fox@mmu.ac.uk
r.grimm@mmu.ac.uk

THE ROLE OF SOCIAL INNOVATION IN UK CRIMINAL JUSTICE REFORM AND ITS IMPLICATIONS FOR THEORISING SOCIAL INNOVATION

The UK government has called for a rehabilitation revolution in England and Wales and put its faith in market testing. It hopes this will lead to greater innovation, resulting in reductions in reoffending while also driving down costs.

It is the government's intention to create a:

'rehabilitation revolution' that will pay independent providers to reduce reoffending, paid for by the savings this new approach will generate within the criminal justice system. (HM Government, 2010: 23)

Proponents of market testing, particularly where Payment by Results is part of the equation argue that 'freeing' up providers to deliver services in different ways will encourage greater innovation. This 'revolution' will need to be achieved in the context of reducing budgets. To achieve greater savings real innovation that can deliver game changing solutions will be needed. It is our contention that many of the potentially game changing reforms in criminal justice have been, in one way or another social innovations.

Social innovation has been described as 'the generation and implementation of new ideas about how people should organise interpersonal activities or social interactions to meet one or more common goals' (Mumford, 2002). Defined in this way, social innovation implies new sets of social relations to deliver products and services. These may include new partnerships across sectors, flattening of hierarchies, coproduction and personalisation. Social innovation may also refer to new products and services that address social needs. The Young Foundation for example understands social innovation as those 'new ideas that work in meeting social goals' (Young Foundation, 2007).

Many of the most innovative developments in criminal justice over recent decades have come through social innovation. The foundations of the Criminal Justice System in England and Wales are built on the input of the citizenry and

the voluntary sector. Restorative Justice for instance is a co-produced approach to delivering justice (Weaver, 2011) and the Justice Reinvestment movement is an example of social innovation that illustrates the use of new telecommunication technology.

Social innovation is essentially a co-creative practice. Modern approaches to community policing are reliant on individuals and communities engaging with the police in reporting crime, joining residents meetings, forming neighbourhood watch groups, etc.. Part of the mission for social innovation in the criminal justice system should therefore be the maintenance and renewal of legitimacy and while the precise role of citizens volunteering in the system might change over time, their continued involvement is crucial.

Social innovation as a contested concept

Some supporters of social innovation argue that markets provide the most efficient mechanisms to allocate scarce resources and to achieve highest levels of social impact.

The World Economic Forum (2013) for instance defines social innovation entirely within a market approach:

'Social innovation refers to the application of innovative, practical, sustainable, market-based approaches that achieve transformative social and/or environmental change, with an emphasis on under-served populations.'

Others would disagree. As Albertson and Fox (forthcoming) note, what is now called neoliberalism comprises only a selective reading of economic theory Jones (2012) but that version has come under sustained criticism including philosophical challenges that have perhaps been most eloquently described by Hollis (1987), economic challenges from economists who are concerned the narrow view of humanity neo-liberalism offers does not reflect the full human experience (Stiglitz, 2009 and Sen, 1977) and empirical challenges from behavioural economists who demonstrate that people are not as rational as we like to believe (see Thaler and Mullainathan, 2008 and references therein).

However, if we reject neoliberalism as the theoretical basis of social innovation it is not clear what should take its place. To date, neither position has been clearly theorized leaving social innovation open to the risk that it is 'all things to all people'.

The private sector has traditionally been driven by financial returns, innovative products that perform well in the market attract additional investment. A similar market based model can be tested for social innovation investments and social impact returns. If we treat social innovation as an extension of market ideology into the social then, from the perspective of an economist in the neoliberal tradition the key challenge will be to provide free market conditions in which social innovation can flourish. Important macro level policy instruments to achieve this might include the marketization of public services, deregulation and fiscal measures such as tax incentives.

If we doubt that social innovation is best theorised as an extension of neoliberalism and suggest different theoretical underpinnings then different policy instruments will be required. Social services and markets are often seen as opposites on a value scale. Markets are generally perceived as profit driven while social services have altruistic and moral motives. Social innovation suggests a re-evaluation of the way in which 'return' is measured. Social investors are market participants who also look to maximize their return on investment. Return here is not necessarily monetizeable. The current UK government seems to appear the 'rehabilitation revolution' from both angles: social outcomes through top-down marketization and deregulation.

Critical reflections' social innovation in the criminal justice reform

The Ministry of Justice has signalled its desire to see providers of rehabilitation services 'tackling offenders' broader life management issues' (Ministry of Justice, 2013b: 17). It also recognises the need for offenders to be able to access a range of public services provided by other Government departments and agencies in order to tackle the multiple issues that offenders often have. Again, this might provide opportunities for social innovators to re-model criminal justice services as part of a broader social justice offer – a model that might fit well with personalisation, given that personalisation is likely to encourage an understanding of offender need that is more holistic rather than limited to managing criminogenic needs.

The latest criminal justice reforms favour a mixed economy of criminal justice provision, which might provide a range of opportunities from social innovation either from within existing organisations involved in the criminal justice system or from new organisations. If this is to happen then the ability of Ministry of Justice, as commissioners, to widen the supplier base and create a genuinely mixed economy in which the advantages of public, private and not-for-profit organisations can all play a part will be key.

On paper this approach fits well with the promotion of social innovation. However, in reality, the 'rehabilitation revolution' has generally favoured new market entrants that, whether drawn from the private or not-for-profit sectors, are large, commercially driven organisations. In part, this is the result of the payment by results model that has been implemented. Only large organisations with substantial capital reserves, or access to substantial flows of credit can take on the risk of payments for reductions in 12 month re-offending rates that will take longer still to be proven (Fox and Albertson, 2011). The intention to use a national commissioning model for rehabilitation services divided into 21 geographic contract areas (Ministry of Justice, 2013b) might further hamper social innovation.

As innovation is fraught with uncertainty, the innovation process requires experimentation and a tolerance within institutions for both risk-taking and failure. Before up-scaling new ideas, these need to be prototyped. Risk taking in criminal justice is never straightforward. Looking at current criminal justice policy in England and Wales it is not clear that using PbR as a financial instrument will promote risk taking. PbRs will drive private providers to offer services to those people that are most likely to meet the outcome with the least effort. More difficult cases that carry a high risk of failure will be left to deal with in the public sector. To regulate risk, private providers participating in criminal justice PbR schemes are likely to apply a 'skim' and 'park' strategy (see also Fox and Albertson, 2011).

Conclusion

Despite substantial effort to improve rehabilitation, reoffending rates remain high in the United Kingdom. To make criminal justice more effective the government suggested innovative strategies that include a combination of market testing, a diversification of the supplier base (mixed economy) and a focus on outcome oriented commissioning strategies (payment by results). This 'rehabilitation revolution' is consistent with a wider public reform agenda.

In recent years, social innovation has been brought forward as a response to societal challenges. If social innovation is to flourish in the criminal justice sector there will clearly be an important role for lead contractors in the forthcoming competition for rehabilitation services to demonstrate a real commitment to creating an environment in which social innovation is promoted. This will be challenging when they are also being asked to reduce costs while managing offenders' risk. On the other side of the commissioning table the Ministry of

Justice will need to think carefully about the facilitators of social innovation and ensure that these are part of its assessment strategy when letting rehabilitation services.

A criminal justice strategy for social innovation would combine a mixture of top-down strategies that facilitate greater social innovation with scope for bottom-up development. Based on our analysis of current criminal justice policy we argue that while some of the top-down, macro conditions are being put in place that could facilitate social innovation, the government has, to date, assumed that the market will create the community-level or bottom-up conditions. However, the social innovation literature suggests that this is a naïve position to take.

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THEME 4 THE CIRCULAR ECONOMY

It is clear that the linear approach to our economy has its limitations and that apart from the energy crisis, the resources problem is an even greater concern. This session intends to investigate the transition to a sustainable (global) circular economy with tangible examples of successful business models. We will look at ways to overcome internal barriers in existing organizations so that they can implement solutions to unsustainable (linear) production methods. Moreover, we will investigate new business opportunities and external barriers.

TITLE
Producing high-quality fertilizer using rock dust waste of crusher plants. Addis Ababa, Ethiopia

PRESENTER
Ir. Martin van Beusekom

Ruben Borge Robles

ORGANIZATION
MetaMeta Circular Economy, 's-Hertogenbosch, the Netherlands

Rockin Soils, Almere, the Netherlands

MAIL ADDRESS
mvanbeusekom@metameta.nl

rborge@metameta.nl

[abstract]

F*arming in Ethiopia is hard: for the smallholder farmer, as well as for the international horticulture companies. Insecure water and nutrient supply are always a threat to reduce the harvest (reducing food security for smallholder farmers) or reduce the quality of the export crops (reducing profit for the horticultural companies). Since late 2012 MetaMeta Circular Economy produces mineral fertilizers in Ethiopia using waste products as input. Used waste products are: Rock dust (from crusher sites of the infrastructure sector), Cow dung (waste product from cattle farms), Charcoal and Ash (rest product of cook stoves in homes and restaurants), Crop rests (left over from teff and sorghum harvest).*

We assist our clients so we can (help them):

(i) identify the local available waste streams (within 20km)

(ii) bring them in contact with the valuable waste producers

(iii) design a pilot scale mineral fertilizer production location

(iv) train farmer or staff of the company to produce the mineral fertilizers

(v) design a full-scale production location for the mineral fertilizers

The mineral fertilizers produced from local waster steams are solid and liquid Bocashi, ash fertilizer and fusarium control agents.

In 2013 we ran three projects:

1) *Smallholder farmer project (2013-2016) in Ethiopia where we trained ± 500 farmers last year. Farmers cultivate mainly teff, sorghum, maiza and faba-ben for home consumption. The project is funded by Impulsis (ICCO) and MetaMeta Research BV.* ***http://www.impulsis.nl/projecten/alle- projecten/project/2706/remineralization-of-agriculture-ethiopia***

2) *Waste re-use for on-farm mineral rich fertilizer production for Marginpar BV. Flowers produced at this farm are Thissel, Hypericum and Hortensia.*

PRESENTER
Ir. Martin van Beusekom

Ruben Borge Robles

ORGANIZATION
MetaMeta Circular Economy, 's-Hertogenbosch, the Netherlands

Rockin Soils, Almere, the Netherlands

MAIL ADDRESS
mvanbeusekom@metameta.nl

rborge@metameta.nl

3) *Waste re-use for on-location mineral fertilizer production for coffee farmers in the Kilimanjaro region, Northern Tanzania.*

Our services offer horticultural companies high quality and cheaper fertilizers compared to chemical fertilizer. Also it reduces the greenhouse gas emissions — related to chemical fertilizer production and import — of our clients. Also the circular economy approach creates employment on a regional scale, stimulating local entrepreneurship.

TITLE
Circular rail system – Transition from a linear rail system to a circular resource smart system

PRESENTER
Thijs Cloosterman

Hermen Jan van Ree

ORGANIZATION
Prorail, Utrecht, the Netherlands

Royal Haskoning DHV, Utrecht, the Netherlands

MAIL ADDRESS
thijs.cloosterman@prorail.nl

herman.jan.van.ree@rhdhv.com

[abstract]

The Dutch rail system depends heavily on energy and raw materials. About 1000 kton of carbon is emitted annually by the rail sector. 75% is related to energy use of trains. 15% is related to the use of materials such as steel and concrete. The Dutch Railway company NS has the ambition to generate all its energy (around 1,4 GWh) with wind power putting carbon emissions by material use in the spotlight.

ProRail is mainly responsible for the use of materials in the rail system. Its tracks, stations, safety systems are made of high class materials such as premium steel, aluminium, copper and high strength concrete. The use of these materials creates a great dependency with serious risks: mounting prices and price volatility. Also, copper , concrete and steel have a significant impact on carbon emissions and water use. Reducing our environmental impact and dependency of expensive virgin materials is thus an important strategy of ProRail and its industry partners.

Circulair Spoor
Collaboration is key in the rail industry. ProRail is a management organization and outsources all its work to engineering consultants (e.g. RHDHV), construction companies (e.g. BAM) maintain companies (AssetRail) and logistical partners (e.g. RailPro). Starting a research about the possibilities of the circular economy in the rail industry as a joint effort is essential and therefore five parties (mentioned above) started a collaboration to redesign the rail infrastructure: Circulair Spoor.

Barriers
The research is now taking place. We are identifying the most important systems which have a great impact on the footprint of the sector (planet and profit wise) and we will soon start to indicate barriers and opportunities to redesign our rail system. Four main barriers are identified: technological, financial, organizational and legal. By May13th we expect to have substantial knowledge about these barriers.

The goal of Circulair Spoor is to prove that 'circularity' is possible in the rail sector. A business case (true value) of a small railroad will show the

potential of circularity and also identifies future challenges. Collaboration is key. Trust, vision, and energy are vital to transform a traditional industry into an enabler of a future sustainable society.

Main Partners: *ProRail, RailPro, BAM, RHDHV, AssetRail.*

Knowledge Partners: *TNO, Kirkman Company, EY.*

TITLE
Agents in Products: Using agents' technology to extend the product life and support reuse of subparts

PRESENTER
Drs. Leo van Moergestel
Daniël Telgen MSc
Ing. Erik Puik
Prof. dr. John-Jules Meyer

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
leo.vanmoergestel@hu.nl
daniel.telgen@hu.nl
erik.puik@hu.nl
j.j.c.meyer@uu.nl

[abstract]

A software agent is an entity that can run autonomously, play certain roles and interact with its environment. In this paper a so-called product agent will be introduced. This is a software agent that is closely related or tied to a certain product. Depending on the nature of the product, the product agent could even be embedded in the product itself. In the model presented here the agent will be at the basis of the creation of a product, however scenarios where an agent is added in a later stadium are also possible.

The product agent will log the events that are related to the product, such as usage, errors, repair and maintenance. This way a kind of product diary is developed by the product agent. The information in this diary will be used when the product comes to the end of its life and can be used to estimate the profit of reuse of subparts in the device.

In the model described here a market model is presented where agents of broken products negotiate about reusing each other's parts to extend the life of a product. Another use of the product agent will be the description of the product itself that will help to discover places where rare material is used that should be recovered for future use.

TITLE
Future Friendly Learning Lab, Contribute to the acceleration of the transition towards a Future Friendly Living environment by increasing the impact of (pilot) projects

PRESENTER
Cyrille Gijbels-Janssen
Prof. dr. ir. Remko van der Lugt

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
cyrille.gijbels-janssen@hu.nl
remko.vanderlugt@hu.nl

FUTURE FRIENDLY LEARNING LAB, CONTRIBUTE TO THE ACCELERATION OF THE TRANSITION TOWARDS A FUTURE FRIENDLY LIVING ENVIRONMENT BY INCREASING THE IMPACT OF (PILOT) PROJECTS

The mismatch between what we demand of the earth and what she can offer us is ever more increasing. According to MIT professor John Ehrenfeld, sustainability is an emergent property of a complex system (Ehrenfeld, 2008). In western tradition, we tend to deal with things that we cannot comprehend by dividing them in smaller pieces and trying to define measurable performance indicators. However, such optimisation of separate aspects does not lead towards an optimal state of the overall system.

Government, companies, and organisations recognize this and put more and more attention on 'systems thinking' - focusing on the whole system - as they develop visions and strategies towards a sustainable society. For realizing those high ambitions they need co-operation with other stakeholders. Such co-operation needs flexibility from every stakeholder because such co-operation is not part of daily work practice. The take-off of such a project is highly determined by the energy and/or initiative of stakeholders, be it on the topic of mobility, health, energy, et cetera. Through pilots, these stakeholders try to make the move from vision to practice. Such small-scale pilots are often successful. However, after the pilot it is 'business as usual' instead of structurally incorporating its outcome in the organisation.

Transition is necessary for the realisation of high sustainability ambition, however this transition towards a Future Friendly Living environment is difficult to achieve. For the transition of a complex system it is necessary to change the structure, the culture as well as the procedures. This means the conversion of thinking, acting, and organising which usually takes one or two generations. The

core of transition control, or in other words, transition management concerns targeted interventions leading towards the preferred situation. Transitions are quirky, complex and have an uncertain outcome. That is why they cannot be led in the traditional way. Fortunately, the pace and direction can be influenced. Because of the complexity and uncertainty of transitions, different experiments and solutions on a small scale are needed before one can make a choice for solutions which are useful on a larger scale. By transition control it is all about searching, learning and experimenting (Rotmans, 2012).

Our goal is to support the transition towards a Future Friendly Living environment by increasing the impact of pilot projects, through organising and facilitating a Future Friendly Learning Lab. So, our principal research question is 'How can the output of pilot projects get incorporated in daily work practice and thereby contribute to the transition towards a Future Friendly Living environment?'

Future Friendly Living environment

According to Ehrenfeld, it is important to underline eco-effectivity, doing 'good', instead of the focus on eco-efficiency, doing 'less bad'. Ehrenfeld uses the term 'sustainability as flourishing', meaning we have to look for the source of the sustainability problems: extreme consumerism and individualism. Ehrenfeld is searching for fundamental solutions in going back to what really satisfies us: taking care for ourselves, each other, and our environment.

In recent years, organisations developed visions about a sustainable future perspective. For realizing those high ambitions, co-operation with other stakeholders is necessary. Sustainability in itself is difficult to operationalise. It is about fulfilling the needs and wishes of people in a sustainable way.

Regimes like governments and housing corporations are used to make decisions without involving people who work or live in the area. These days, stakeholders determine together what is needed and increasingly, residents take initiative themselves. Nevertheless this transition process of changing structures is difficult, both for the individuals and the organisations involved.

Future Friendly Learning Lab (FFLL)

The Future Friendly Learning Lab is composed of a group of individuals covering various organisations and pilot initiatives, who are intrinsically motivated to learn and move forward together on the subject of sustainable and healthy living environments. The FFLL is given structure by the Sustainable System Innovation

approach (Van der Lugt, 2013) which combines the systems thinking mindset with co-design tools and techniques. This approach is all about switching between tuning and adaptation of the long term vision and orchestrating short term actions which stimulates the acceleration towards a Future Friendly Living environment.

Sustainability is a result of movement within the total ecosystem and can therefore not been seen separate from issues as health care, social welfare, labour, et cetera. These issues can form a starting point for a project towards a Future Friendly Living environment. The eco-acupuncture approach matches this vision: focusing on the disruptions of energy in the system and design interventions to repair these disruptions. The Australian architecture professor Chris Ryan is achieving good results with this approach: the proverbial pinprick which creates movement in the energy in the living environment.

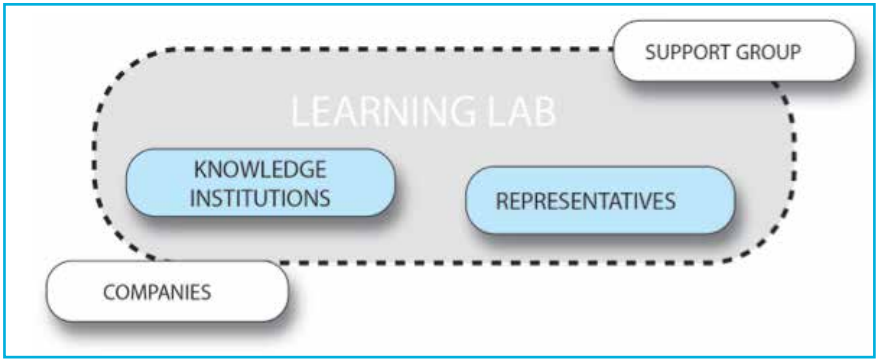

Figure 1: Structure co-operation FFLL.

Structure co-operation

In Figure 1, the structure of the co-operation is shown. To learn from pilot projects it is important to share information. Therefore:

- The organisation has formulated a vision with high sustainability ambitions
- Organisations with commercial intentions cannot participate
- The representative of the organisation is actively involved in projects meeting the high sustainability ambitions of the organisation
- The organisation is committed to the FFLL to fulfil the trajectory
- Maximum of 20 participants

- Different sectors are represented
- A meeting once a month
- The Support group has merely a guiding function and is therefore not involved in the Learning Lab on a monthly basis but on a quarterly basis — or more often when needed

Representatives
Representatives are actively involved in projects towards a Future Friendly Living Environment.

Knowledge Institutions
Three knowledge institutions (HU University of Applied Sciences Utrecht, HAN University of Applied Sciences and the Dutch Research Institute for Transitions at the Erasmus University Rotterdam), combine their expertise to support increasing the impact of the (pilot) projects to stimulate acceleration of the transition towards a Future Friendly Living environment.

Support Group
These organisations are able to facilitate the project and through their engagement and network they can contribute to making the pilots manifest and deliver quantitative data. The kind of organisations that meet this profile are organisations such as NGO's (Urgenda), branch organisations (Aedes, VNG), banks, cadastre, governmental and juridical organisations.

Companies
Companies are not mentioned as key partners within the Future Friendly Learning Lab. The people and organisations which do take part in the Future Friendly Learning Lab are actively working on realising the high sustainability ambitions. Within the Future Friendly Learning Lab it is important to create a confidential environment to share the difficulties the participants are facing. Consultancies or other commercial companies would interfere with these important conditions, although those companies should really learn about the projects. Therefore, the knowledge will be shared indirectly with them. All three knowledge institutions have tuition of professionals within their focus area of the Centre of Expertise or the Transition Academy.

Structure trajectory

The trajectory of the Future Friendly Learning Lab is subdivided in different phases, as shown in Figure 2, which gives structure to the process. Each phase implies that its own questions be discussed as mentioned below.

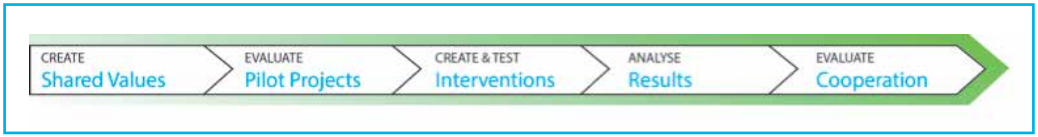

Figure 2: Structure trajectory FFLL.

Shared Values

Create shared values by discussion.

- What is a Future Friendly Living environment?
- What are the sustainability ambitions of the organisation?
- Why is sustainability important for the (organisation of the) participant?
- Sense of urgency?
- What are the discrepancies between the current situation and the preferred situation?

Pilot Projects

Evaluate the results of pilot projects.

- What are the differences between the pilot project(s) and 'business as usual'?
- How does the pilot meet the sustainability ambitions of the (organization of the) stakeholder?
- Which lessons have been learned? Which are useful in general and can therefore be implemented in other projects?
- What can be done better in a follow-up project?
- Does the project stimulate consciousness among the stakeholders?
- Is the project visible?
- What role of the different stakeholders is needed? Is this different from when they do 'business as usual'?

Interventions
Set up interventions to create ***structural changes*** within the 'business as usual' of the participants according to the evaluation of the pilot project.

- Is it possible to increase the *impact* of the project?
  - Improving the visibility of the project
  - Connect with other projects
  - Upgrade the project
  - Start new projects
- How to increase the *consciousness* of stakeholders and the *sense of urgency*?
- What *role* – different than the stakeholder is used to – can be experimented with?

Results
Analyse the results of the interventions and their impact.

- What is the impact of the intervention?

Co-operation
Evaluate the impact of the FFLL.

- Does the FFLL has a positive effect on the transition towards a Future Friendly Living environment?
- How did you experience the FFLL?
  - Did you feel free to speak about your projects?
  - Did you learn something because of the other participants?
  - Strengths and weaknesses of the structure of the trajectory?
  - Strengths and weaknesses of the structure of the co-operation?

Conclusion / Discussion
Which kind of innovations could be successfully implemented strongly depends on the context and motivation of the people involved. An integral vision composed from the (often latent) needs of the stakeholders is needed along with the continuing engagement of the various stakeholders (government, housing, care, residents, etc.) throughout the process.

More can be learned of (pilot) projects by focusing on another important aspect: what is needed within the (organisation of the) stakeholder to make a structural change towards a sustainable 'business as usual'. The Future Friendly Learning Lab wants to offer the opportunity to strengthen the (organizations of the) stakeholders in their search towards creating a future friendly living environment.

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TITLE
A practice based approach to further high level reuse in equipment manufacturing, offering business opportunities in a circular economy

PRESENTER
Prof. Jan Venselaar

ORGANIZATION
Avans
University of Applied Sciences,
the Netherlands

MAIL ADDRESS
j.venselaar@avans.nl

A PRACTICE BASED APPROACH IN EQUIPMENT MANUFACTURING, OFFERING BUSINESS OPPORTUNITIES IN A CIRCULAR ECONOMY

[abstract]

An effective option for companies to implement circular economy concepts is reuse and remanufacturing, an already long-time proven approach. It concerns the (re)use of modules and parts of used and discarded equipment in 'as new' equipment or 'first class' remanufactured equipment. It contrasts with recycling in which only the materials are being recovered and as basic resource are brought back to the first step of a total production chain. For some materials and parts there is no alternative, but in many cases much of discarded products is still in such condition that it can function again in 'as new equipment'.

This has proven to be quite attractive not only because of its sustainability by closing the loop of the material flow and reducing the energy consumption due to a much shorter production chain. It is also very cost-effective in many cases and creates jobs regionally, providing that the design of the equipment and the reuse and remanufacturing processes are organized well. It is a good mix of people, planet and value.

We have developed a method, called WARM[1)], to assist in particular small and medium sized enterprises determining whether and how reuse might be a workable option. The development was done together with companies looking for remanufacturing opportunities and other research institutes, and participation of engineering and business students. It has been used in projects with companies and equipment manufacturing industry organisations that want to promote sustainability and better use of resources. It involved studies for instance regarding electronic equipment[2)], workshops and business plan proposals. It has also proved to be a successful framework for education, in particular for business engineering students[3)].

The approach covers the essential steps in the technical and business issues that have to be addressed when closing the production chain on equipment and parts level. Crucial aspects are product design and redesign, assembling and disassembling, marketing, sales method, services and maintenance, logistics and reverse logistics and remanufacturing operations (cleaning, inspection, repair, refurbishment, upgrading). The approach is used for existing products with or without redesign and also for products which are still under development.

Because smaller enterprises in particular cannot spend too much time and money on initial studies which might only show that the options are limited, a stepwise set-up will be made. The first step is a quick scan of a specific device to be remanufactured. A basic set of issues is reviewed on being positive or negative for cost-effective reuse. When the overall outcome is positive, in the second step all parts and modules are being assessed on financial return when reused against costs involved. If that leads to a sufficient attractive business case, also involving other non-financial aspects, in the third step the new production set-up and business model will be developed. It will include equipment redesign, changed customer approach and relations and necessary involvement of and co-operation with other parties to form this new closed chain.

Using this approach many observations will be made which show the factors that stimulate and those that hinder companies to introduce more cost-effective ways to reduce resource use. The approach is being adapted to handle just that. It will also offer better insights in the practical aspects when circular economy approaches and concepts are implemented in companies in general.

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1) WARM is a Dutch acronym 'Winstgevend Afdank en Retour Management' (Profitable Waste And Recovery Management).

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TITLE
Towards
a Green Economy
in Utrecht

PRESENTER
Dr. André van Amstel

ORGANIZATION
Wageningen University
and Research Centre,
the Netherlands

MAIL ADDRESS
andre.vanamstel@wur.nl

Drs. Hylda van Amstel-Kuiper
Drs. Sven Willemsen
Dr. Gerrita van der Veen

HU UAS
Utrecht,
the Netherlands

hylda.vanamstel-kuiper@hu.nl

[abstract]

How can the Utrechtse Heuvelrug region make big steps towards sustainability and a green economy without jeopardizing the natural resources, beautiful nature and national parks in the area? Which investments are needed and what is the (social) return on investment of company innovations? In this paper some examples will be given of successful innovations by SMEs. The social return on investment of these innovations will be estimated.

A project by a consortium of Utrecht University of Applied Sciences, Wageningen University and Research and Amsterdam Business School had as a goal to support small and medium enterprises (SMEs) with developing innovations towards a green economy. This project on regional sustainable development was initiated by the Business Council of the Utrechtse Heuvelrug in the Netherlands. Results are described from the Sector point of view of innovating businesses (with an emphasis on the return on investments) and from the Society point of view (on the social return on investments) where these innovations had to strengthen the human health and the ecological and cultural values of the Utrechtse Heuvelrug. First the methodology and the themes will be introduced. Then the (social) return on investments will be estimated and described. Examples will be given of initiatives for a green economy in themes like Green Mobility, Green e-platform, Green agricultural products, Sustainable building, Green Hospitality, Green Recreation, Green Local Energy. The environmental improvements are described for natural resources use, water, soils, energy, waste, global warming, acidification, ecological footprint, cultural history, landscape, employment, human health, noise, well-being and happiness. Banks are invited to invest in sustainable ideas to make it happen.

A green label is developed for the best companies and innovations: 'Utrechtse Heuvelrug Duurzaam Doen!'

THEME 5 SUSTAINABLE CITIES: POLICY AND REGULATORY TRANSITION

Many cities have the ambition to become climate neutral in the coming decades. Enormous effort will be required from (local) governments, the private sector and society to reduce energy use and CO2 emission within cities and beyond. This track seeks contributions that 1) will explore new modes of governance, policy and management to promote climate neutral cities; 2) assess the impact of existing polices and measures for energy efficiency improvement and CO2 emission reduction in the built environment and 3) evaluate the successes and failures of public, private or bottom-up initiatives to makes cities less energy and carbon intensive. Topics include: promoting energy efficient buildings, green procurement strategies, policies and measures to promote renewable energy, sustainability reporting, certification and indicators for smart sustainable cities; local or regional energy efficiency initiatives; reducing CO2 emissions from transport.

TITLE
A user perspective on the gap between science and decision making. Local administrators' views on expert knowledge in urban planning

PRESENTER
Rien van Stigt MSc

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
rien.vanstigt@hu.nl

[abstract]

The role of expert knowledge of the environment in decision making on urban development has been intensively debated. Most contributions to this debate have studied the use of knowledge in the decision-making process from the knowledge providers' point of view. In this paper, we reverse the perspective and try to understand how local decision-makers use scientific knowledge in decision-making on an urban plan and how they perceive the world of the scientific experts providing this knowledge. We approached municipal administrators, responsible for local urban development, with conceptions regarding the use of knowledge that were derived from literature on this issue. By reversing the perspective on the science – decision-making gap, we find that local administrators have a different view on this gap than scientists. Administrators appear to have a more balanced or even completely opposite perception of the different epistemic backgrounds of scientists and decision makers, the inherent uncertainty of scientific knowledge and the rationality of decision making in urban planning. It's our conclusion that local administrators make use of expert knowledge primarily to obtain their main goal, which is balancing all interests to arrive at a decision that can count on political and public support. Rather than perceiving a problematic gap between decision makers and experts, they nourish this gap in order to provide as much room for manoeuvre as possible for striking the intended balance of interests. There is a lesson here for environmental experts: rather than supplying decision makers with more or better knowledge as to how a plan affects environmental values, they should focus on providing better decision frameworks, by trying to enhance the weight attached to these values.

TITLE
Revisiting the 60ies: Transforming existing urban areas from the 60ies and 70ies into sustainable and attractive living quarters

PRESENTER
Esther Roth

ORGANIZATION
W/E Advisors Utrecht, the Netherlands

MAIL ADDRESS
roth@w-e.nl

[abstract]

Important challenges exist to transform residential neigbourhoods from the 60ies and 70ies into attractive areas where people want to live and can afford to live. At the same time these renovations should contribute to the policy challenge of transforming the city into a zero-carbon area.

These transformations do not only require building technological innovations such as 'zero-on-the meter' house renovation concepts, but they also require a well-considered process approach involving local authorities, social housing associations, commercial real estate companies and private owners.

The challenges and approaches will be elaborated based on practical experiences from the cities of Arnhem and Nijmegen. Those experiences were gained in a series of dedicated workshops which were organized as part of the European collaboration project SUSREG, a project focusing on sustainable urban planning.

We will also demonstrate the use of GPR Urban Planning, a software tool to assess the sustainable quality of urban plans. This tool can be used to discuss and communicate sustainability ambitions within urban planning processes.

TITLE
Evaluating the contributions of the CO2 Performance Ladder to improved corporate energy management in the construction industry sector

PRESENTER
Martijn Rietbergen

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
martijn.rietbergen@hu.nl

[abstract]

The CO2 Performance Ladder is a certifiable scheme for energy management and carbon reporting that is used by several Dutch public authorities as a tool for green public procurement. Achieving certification gives companies a competitive advantage in awarding contracts in the construction industry sector. For the various stakeholders, including the scheme owner, the commissioning parties and the participating companies, a wider adoption of the scheme is only legitimate if the CO2 Performance Ladder is really contributing to improved energy management practices in firms, the reduction of energy efficiency barriers and the increased level of uptake of cost-effective energy efficiency options. This ex-post research will build upon earlier ex-ante research about the potential impact of the CO2 Performance Ladder on reducing CO2 emissions in the Netherlands.

This paper therefor aims at evaluating the effectiveness of implementing the CO2 Performance Ladder as a management system for improving energy efficiency and CO2 emission reduction in the construction industry sector which is the main target group of the scheme. The implementation of the CO2 Performance ladder will be evaluated by using methods for evaluating policy theory, programme process evaluation and impact assessment. Data will be collected mainly through document research (e.g. energy management plans, monitoring reports and CO2 footprints) and interviews with various representatives of firms and other stakeholders.

The preliminary research results show that the CO2 Performance Ladder contributes significantly in improving energy management practices in small and medium sized enterprises. However, for larger companies the CO2 Performance Ladder is not an added value yet, but merely a must to receive a competitive advantage in contract awarding. During the implementation of the scheme additional energy efficiency measures were taken. As a results, the large majority of the involved firms reduced their absolute CO2 emissions or reduced CO2 emission intensity substantially in the last 3-4 years. However, these reductions were mainly achieved by relatively easy measures such as switching from grey to green electricity, behavioural changes and attractive supporting fiscal policies for leasing energy efficient cars.

Based on these results we may conclude that at least in the short term the CO2 performance Ladder is an effective tool for tapping the energy efficiency potential in especially small and medium sized enterprises by awarding green practises when procuring contracts in the construction industry sector. This research implies that the wider adoption of the CO2 Performance Ladder in other economic sectors could be considered.

PRESENTER
W.G. Planje
L. Looijen

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
wilko.planje@hu.nl
liza.looijen@hu.nl

CAN ENERGY NEUTRALITY OF DEEP RETROFITTED RESIDENCES BE GUARANTEED?

In the document below the very first simulation results are presented for an essential part in the energy balance of a deeply retrofitted terrace houses, namely the yearly demand for space heating. This is achieved by using the TRNSYS/TRNBUILD simulation tool. There is a business case for retrofitting houses when the investment can be paid back with the avoided energy costs within 20 years in case of loan arrangements. However, behavior of inhabitants on ventilation (disturbing it via venting by opening windows, blocking vents), above average usage for household electrical appliances and suboptimal functioning of the PV roof can have a significant impact on the yearly energy balance. For example, due to disturbed ventilation the extra heating demand can be up to 15 GJ resulting in €270 extra costs to drive e.g. an electric heat pump. With the TRNSYS simulation tool typical margins can be discovered from which specific business cases can be investigated. More variables on the energy balance will be extensively discussed during the Annual TII conference.

Introduction

The ambition of the Netherlands is a reduction of 20% in CO2 emissions for 2020 (compared with 1990), 14% renewable energy (a percentage of the overall energy requirement) and 20% energy saving. In that respect new buildings have to be built in such a way that during their lifetime they are energy-neutral (see [1)] for a definition). However, by that time, a huge part of the existing Dutch building stock, which was built before 1980, can still be energy consuming when nothing is done. Therefore specific initiatives with subsidy programs have been launched. The typical energy consumption is displayed in Figure 1 for the different type of buildings. Several big construction contractors (e.g. Volker Wessels, Ballast Nedam, BAM, Dura Vermeer) are stepping in these new fields of retrofitting for housing companies and are trying to reduce the yearly energy demand to zero. The first pilots have been carried out, examples are shown in Figure 3.

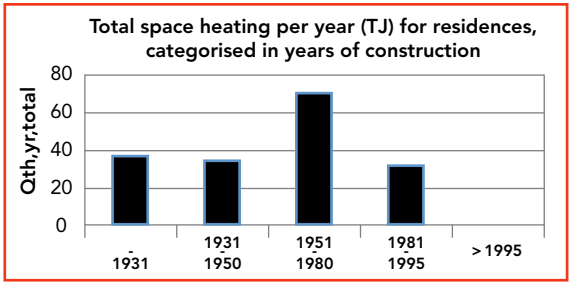

Figure 1: Table with the amount of residences in 2010 with a specific yearly demand for space heating per residence (Qth,yr), categorized in freestanding houses, semi-detached houses, terrace houses and apartments[2)].

2010	Detached		Semi-detached		Terrace house		Appartment	
Construction year	Amount $Q_{th,yr}$		Amount $Q_{th,yr}$		Amount $Q_{th,yr}$		Amount $Q_{th,yr}$	
	x 1.000	GJ_{th}	x 1.000	GJ_{th}	x 1.000	GJ_{th}	x 1.000	GJ_{th}
- 1930	233	54	226	40	204	37	221	35
1931 - 1950	156	47	355	37	236	32	269	30
1951 - 1980	252	54	694	380	682	35	274	30
1981 - 1995	164	33	467	25	404	25	335	24
> 1995	343		206		237		326	

Figure 2: Total heat demand in TJ in the Netherlands in 2010, categorized per construction year period.

Figure 3: Several deep retrofit examples in the Netherlands (Heerhugowaard, Kerkrade).

There are also (new) construction companies that want to implement retrofitting measures in the market of privately owned houses. Herein, the main challenge is to reduce the barrier of the house owner to switch over to a sustainable residence. Complete rebuilding is not a realistic option due to the financial crises

and current housing market. A deep retrofit by stripping and replacing the facade, roof and rear is a more viable business case as long as the maximum investment does not exceed €40,000. In that case a financial construction might be arranged whereby the avoided energy costs will be used to pay off the investment.

	Required	External energy	Costs
Electricity	3000 kWh	3000 kWh	€ 690
Space heating (gas boil. 90%)	38.25 GJ	1700 m^3	€ 1,071
Hot tapwater (gas boil. 60%)	5.5 GJ	260 m^3	€ 164
Cooking	1.4 GJ	40 m^3	€ 25
Total per year			€ 1,950

	Required	External energy	Costs
Electricity	2500 kWh	2500 kWh	€ 575
Space heating (COP 3,5)	7.65 GJ	607 kWh	€ 140
Hot tapwater via colector	3.96 GJ	0 kWh	€ -
Hot tapwater via heatpump (COP 2,2/preheat)	1.5 GJ	189 kWh	€ 44
Cooking (electric)	1.4 GJ	389 kWh	€ 89
PV production		-3685 kWh	€ 848-
Total per year			€ 0

Table 1: Due to 80% reduction in required space heating by insulation and using electricity generating PV roof the net energy consumption is about zero (green box). The orange box is the original situation.

When, for example, a terrace house from 1971 is insulated by filling the cavities of the side walls and the facade, rear, roof and floor are replaced with insulated versions (22 cm mineral wool), combined with heat pump technology, completely covered PV roof and solar collector, a first simple calculation shows that the yearly energy costs can be zero (see Table 1). This is mainly due to the strongly reduced heat demand by insulation and the electricity generating roof (connection to the electricity grid is required). The important themes in this type of business models are that the costs of (pre)fabrication and time of mounting are minimized, that financial and contractual arrangements are optimized, that law and legislation barriers are reduced and that the energy bills are avoided. In this research we focus on the last part. What kind of variables have consequences

for the total energy consumption of such a deeply retrofitted residence? And how can these variables effect the way financial contracts are being drafted in case of loan arrangements?

Simulation methodology

We decided to use the simulation TRNSYS tool[3)], in which dynamic energy simulations of a building can be carried out in a the subsoftware tool TRNBUILD. With this tool it is possible to determine the effect of construction components, installation systems, control strategy and inhabitant behavior on the energy consumption and climate parameters. TRNSYS has quite an extended approach to calculate the temperature, humidity and energy requirements for heating and cooling in multizone buildings. The transformation of buildings in TRNBUILD are facilitated by Google Sketchup plug-ins, which make the input process quite easy. After the construction is loaded, TRNBUILD has a an interface to apply specific systems for heating, ventilation, infiltration, heat gain, window shading and time scheduling.

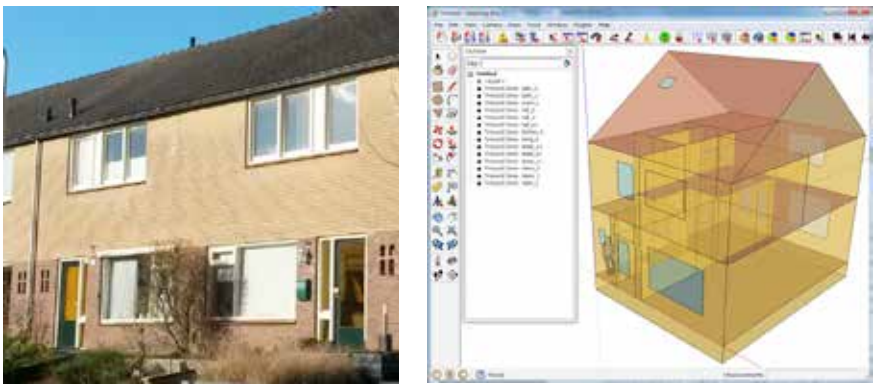

Figure 4: Typical terrace houses as constructed in the 70's. At the right the implementation into TRNBUILD via plug-ins in Google SketchUp. The different thermal zones, the windows and doors (also inner doors) are applied. The construction of the walls, floor and roof can be determined in TRNBUILD itself.

To test the performance of TNRNSYS we first simulate an existing terrace house (built in 1971) as shown in figure 5 on which deep retrofit actions might be performed. The original building, with a typical foot print of 50 m^2, standard cavity walls, concrete roof tiles and standard double glass uses on the average (n = 20) 2000 m^3 of natural gas for space heating per year including hot water and cooking. Typically a 300 m^3 is used for hot tap water and cooking (see also Table 1).

Considering an high efficient gas boiler (90% on space heating) this implies a yearly heating demand of 38 GJ. After the transition into TRNSYS we can make sensible choices for the temperature set points and ventilation rates and check whether the simulated heating demand comes close to the realistic values.

When sufficient consensus has been achieved between simulation and real energy consumption, the effects of replacing facades, rear, roof and floor with 22 cm mineral wool insulation components can be investigated by means of changing parameters for new simulations. Variation of settings of heating, ventilation and electricity consumption, and external and internal shading are possible to analyze the effects and trends on energy consumption and comfort. To illustrate the usage of the simulation tool the effects of retrofitting in relation to ventilation are shown below.

First results and discussion

Table 2 shows the different settings at which the original building has been simulated. The same goes for the retrofitted situation. Three types of ventilation rates are indicated per situation, divided by slashes. These rates are specified for certain groups of thermal zones. E.g. kitchen and bath have the highest ventilation rates, the attic and halls the lowest. The infiltrations are included in these (constant) ventilation rates.

When the original building is simulated the calculated heat demand (35 GJ) corresponds quite nicely with the real demand (38 GJ) when no ventilation and infiltration are included in the calculation (calculation A). However, this is a non-realistic, lower limit calculation. Ventilation rates in the range of 0.2 up to 0.7 h^{-1} should be applied for the different zones to approach a more realistic situation. The result of the simulation with these rates are shown in B, increasing the yearly heat demand to 46 GJ, which is still not too bad when compared with the real situation. When constant ventilation (normally 2 – 3 h^{-1}) would be applied more than 64 GJ can be expected (situation C). This is an upper limit (permanent presence of people).

The effect of replacing and modifying the external walls and roof and insulating the floor, including filling the cavities of the side walls with polyurethane are indicated in simulation D in case no ventilation and infiltration are present (lower limit calculation). Only 8 GJ is required for space heating in this unventilated situation. Therefore, the insulation results in a 77% reduction of transmission and radiation losses with respect to the original building. However, realistic and health ventilation rates must be pursued. Calculation F reflects a situation in which permanent ventilation is present without any heat recuperation of the rejected

		Original situation	Retrofitted situation
Facade		11 cm brick/6 cm air/11 cm brick	2cm plaster/22cm mineral wool/6cm board/1cm brick
Rear		11cm brick/6 cm air/11 cm brick	2cm plaster/22cm mineral wool/6cm board/1cm brick
Roof		2 cm board/10 cm air/ 3 cm board/3 cm concrete files	2 cm board/22 cm mineral wool/ 3 cm board/3 cm tiles
Floor		20 cm concret slab/5 cm insulation	20 cm concret slab/22 cm insulation
Ceilings		20 cm concrete slab	20 cm concrete slab
Windows		Double glazing 3 mm/13 mm/3 mm 3,2 W/m^{2}K	Triple glazing 4/8/4/8/4 Krypton 0,68 W/ m^{2}K
Inner doors		4 cm board sandwich	4 cm board sandwich
Outer doors		5 cm massive plywood	5 cm massive plywood
Infiltration		included in ventilation	included in ventilation
T_{set} living room/kitchen	°C	20/18	20/18
T_{set} floor 1	°C	18	18
T_{set} attic	°C	18	18
Curtain regulation		off	off
External shading		off	off
A Ventialtion_rates	1/h	0/0/0	
$Q_{th,year}$ (simulated)	GJ	35	
B Ventialtion_rates	1/h	0.2/0.4/0.7	
$Q_{th,year}$ (simulated)	GJ	46	
C Ventialtion_rates	1/h	1.0/1.0/1.0	
$Q_{th,year}$ (simulated)	GJ	64	
D Ventialtion_rates	1/h		0/0/0
$Q_{th,year}$ (simulated)	GJ		8
E Ventialtion_rates	1/h		0.2/0.4/0.7
$Q_{th,year}$ (simulated)	GJ		18
F Ventialtion_rates	1/h		1.0/1.0/1.0
$Q_{th,year}$ (simulated)	GJ		35
G Ventialtion_rates	1/h		0.2/0.2/0.2
$Q_{th,year}$ (simulated)	GJ		13

Table 2: Simulations to determine the demand for space heating in TRNSYS for the original and future situation, calculated for several ventilation rates. The infiltration (in particular for the original situation) is considered to be included in the ventilation rate. All rates are constant (no time scheduling). The orientation of the facade is to the South.

outgoing air stream. When a 90% efficiency heat recuperator is used in a balanced ventilation system a 13 GJ is needed (simulation G). From the figures above follows that ventilation has a serious impact on the energy balance (as expected). Opening windows permanently during the day may result in ventilation rates exceeding these in situation F. Every 10 GJ extra space heating demand is yearly an extra €180 electric costs for the heat pump. These figures can have effects on a retrofitting business case.

Another advantage of the time simulations in TRNSYS is that also potential discomfort situations can be predicted. It will be interesting to see how insulation and glazing configurations have their effect on overheating. An illustration what the influence is when we go from situation B to situation G on the temperatures in the living room and bedrooms during a warm summer period is given in figure 5. Due to the relatively high thermal mass inside the building (concrete floors, brick walls at the sides) no dramatic overheating is observed (1,5 K extra). Some delay in cooling down after the warm period can be recognized in the retrofitted situation.

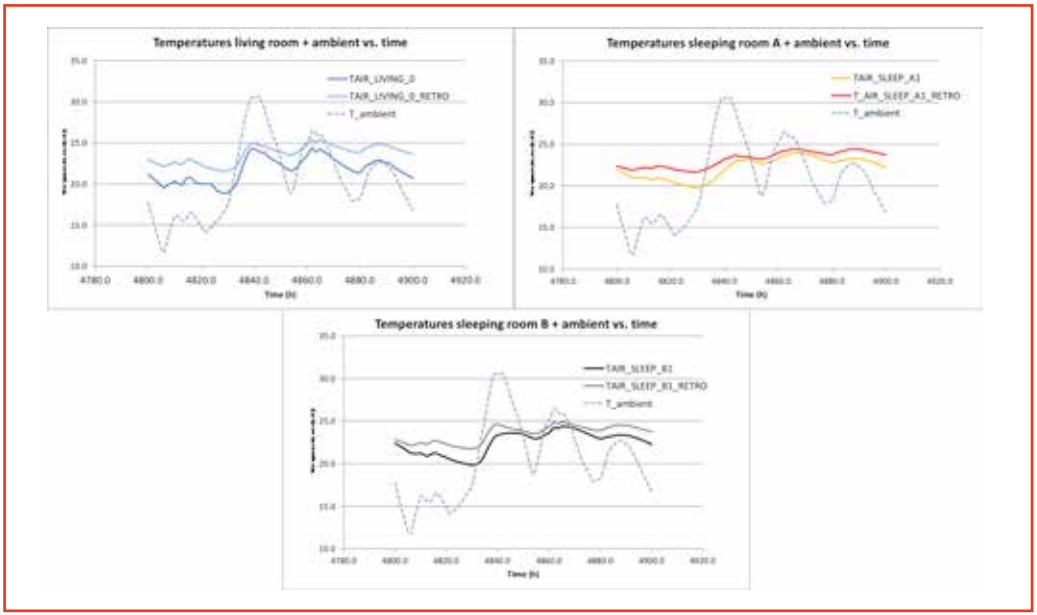

Figure 5: Simulation of temperature levels (°C) in the original and retrofitted residence for a few warm days in the summer. Y-axis temperature in °C, X-axis time in the year in hours. Red line: living room. Orange line: big bedroom at the back (North) Green: big bedroom at the front (South). Blue line: the ambient temperature.

First conclusions and recommendations

Based on the outcomes of the simulations of the original situation for heat demand (46 GJ) with respect to the realistic heat demand (38 GJ), TRNSYS seems to be a useful tool to predict trends on energy demand and comfort when variations in e.g. ventilation, infiltration, construction components, shading etc. are made. There is some overestimation in TRNSYS, possibly due to ventilation rates which are too high (indicating very poor ventilation in the current situation), but another reason might be that the effect of closed curtains during the nights has not been included yet.

The variation in ventilation rates shows direct effect on the energy requirements, as expected.

In addition, comfort and discomfort can be analyzed on an hourly basis when new construction elements and installation systems are applied.

More issues will be discussed at the conference, margins with respect to the business case will be further detailed.

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THEME 6 SCIENCE2BUSINESS FOR SMART GROWTH

The motto of the new Horizon 2020 Framework Programme of the European Union is to put more emphasis on developing market applications from the results of research projects. A pre-requisite is therefore to tackle commercialization issues at an early stage and to update the exploitation plan as the project advances. This session will focus on methods and approaches to research exploitation issues as well as models and tools for bringing good scientific discoveries to market.

PRESENTER
Ing. Arjan de Bruin

ORGANIZATION
Van der Meer & van Tilburg, Zeist, the Netherlands

MAIL ADDRESS
debruin@innovation.nl

CAPITALISATION INTERREGIONAL PROJECTS AND THE ROLE OF INNOVATION AND ENTREPRENEURSHIP

INTERREG IVC projects show that an integrated, long-term regional entrepreneurship policy is a prerequisite for entrepreneurs to be a driving force for economic growth, jobs and social cohesion.

The Europe 2020 Strategy offers an inspiring and ambitious objective: achieving economic growth in a way that is good for the environment, for society and for the competitiveness of Europe. Regional managing authorities only have a small set of levers that they can pull to steer businesses and citizens in the right direction. This is especially true since the crisis has had its effect on public sector budgets. 'Affordable and effective' is the current policymaker's motto - but how can we make this work?

Time and time again, entrepreneurs prove to be a driving force for economic growth and job creation. And lately the notion has arisen that entrepreneurial spirit is also good for solving all kinds of societal issues, with the idea of the Social Economy. Rural areas that are lagging behind, urban districts with empty buildings, preventing brain drain, regional environmental concerns, young people with no prospects for a job: entrepreneurs are a catalyst for all kinds of economic, environmental and societal change.

So it makes sense to support entrepreneurs as one of the ways to help a region to recover from the crisis in a smart, sustainable and inclusive way. A regional managing authority can offer the necessary support in order for an entrepreneur **to create added value for his own business and for the region.** The support offered depends on the barriers that the region's entrepreneurs face in the areas of education, finance, regulation, infrastructure and coaching needs.

Entrepreneurs are not just a driving force for economic growth and job creation; they can also contribute to solving social issues, such as a low employment rate or the exclusion of certain groups.

Every region is different in the types of entrepreneurs that it hosts, the barriers these entrepreneurs face and the regional issues that they can help resolve. That is why tackling issues at a regional level has its advantages. For instance, in a region with a high number of unemployed citizens, regional authorities might prioritise measures that stimulate self-employment amongst this group. Likewise, in rural areas entrepreneurs can play a key role in creating jobs for educated young people to prevent brain drain. This publication sets out how regional managing authorities can employ entrepreneurship support to achieve their regional objectives in five comprehensive recommendations. These are supported by successful examples from various INTERREG IVC projects that deal with entrepreneurship support. The entrepreneurship support policy toolbox is the result of the INTERREG IVC Capitalisation exercise on the topic of entrepreneurship. It provides policy makers with an operationalization of the recommendations, illustrated by a database of good practices from INTERREG IVC.

1] Good entrepreneurship support starts with good policy, not just good tools

Successful entrepreneurship support is not just a matter of offering some stand-alone support tools, but of a long term, comprehensive entrepreneurship policy. The capitalisation study showed that it can be tempting to create affordable, easily implemented, simple, stand-alone support tools, such as business competitions for young people or a coaching trajectory for entrepreneurs. However, it is crucial for entrepreneurs to be able to rely on a recognisable, long-term and accessible support infrastructure. This is achieved through developing a comprehensive strategy that answers questions such as: What do you want to achieve by supporting entrepreneurs? And by what means? After all, supporting entrepreneurs is not just a goal on its own, it is also a way to achieve regional objectives, such as economic growth, regional competitiveness, increased employment rates or inclusion of certain groups.

Successful entrepreneurship support is not just a matter of offering some stand-alone support tools, but of a long term, comprehensive entrepreneurship policy.

The study shows that successful examples of entrepreneurship support have a **long-term strategy** at heart. By defining the objectives and the direction in one strategy, you ensure that available resources are aligned and measures taken do not counter-act. It functions as a shared vision among policy makers and external stakeholders who align their actions towards the same end. A long-term, shared strategy functions as a compass for making and justifying decisions when it comes to choosing what types of entrepreneurs to support and what kinds of tools to implement, especially in case of limited resources.

A successful example of a long term support tool is the Munich Business Plan Competition, an example from the INTERREG IVC-project IMAGEEN. The competition has three stages (business concept, market strategy, full business plan) that finally lead to a selection of 3 winners. One of the key success factors in this model is that the access to finance elements forms part of a much wider support package. The competition started as early as 1997 and takes place each year. The yearly reoccurrence and the high level of media attention create a so-called '**multiplier effect**'. This shows how not only the choice of support tool, but also a consistent and smart execution, can contribute significantly to the Return on Investment of the public money spent.

Another important aspect of objective-based entrepreneurship policy is making sure that the **objectives are feasible and measurable**. By monitoring the effect of entrepreneurship policy, one can not only justify the budget spent, but also make adjustments to implemented tools in order to increase their effectiveness. However, it can be a challenge to choose the right quantitative indicators that give actual insight in the effect of an entrepreneurship support tool. The policy toolbox that results from the capitalisation study, gives resources on how to successfully employ monitoring in policy development.

2] Create a comprehensive support infrastructure that meet the barriers of different kinds of entrepreneurs in your region

Every region has its own context, own objectives and own target groups for entrepreneurship support. In addition, each group of entrepreneurs experiences its own kind of barriers. That is why it is important to carefully research what barriers the targeted entrepreneurs experience in their quest for commercial success. When choosing and designing a support tool (or adopting a successful example from another region), it deserves close consideration how these barriers are tackled. As soon as the needs of different entrepreneurs vary significantly, it can be helpful to segment them in order to tailor-make the support tools to

match their different needs. Segments might be start-ups, social entrepreneurs, local family-owned businesses, etc. The analysis of entrepreneurship support within INTERREG IVC uncovered that there are five areas in which entrepreneurs generally experience barriers, namely education, finance, regulations, infrastructure (such as housing) and need for coaching.

In order for support tools to really help entrepreneurs tackle their own barriers, it might be necessary to develop tailor-made support tools for separate segments of entrepreneurs.

Furthermore, in order for a region to create a hospitable environment for entrepreneurs, it is necessary to create a comprehensive support package for businesses in every stage of their life cycle. For instance, a region might need to invest in short, intensive entrepreneurship experiences at schools to evoke the entrepreneurial spirit among the regions' young people. This was for example successfully executed in the Danish InnoCamp initiative from the INTERREG IVC project ENSPIRE EU. But also SMEs that have existed for a few years might need help finding investors. The policy toolbox gives levers and good practices for support tools for entrepreneurs in all stages of their life cycle.

However, there is a limitation to a regional managing authority's influence on a hospitable environment for entrepreneurs. A support infrastructure can be built, but an **entrepreneurial ecosystem** emerges from all kinds of characteristics that go beyond a regional policy maker's control, such as an atmosphere where likeminded entrepreneurs are inclined to help and to inspire each other. However, there are ways for policymakers to positively influence the emergence of an entrepreneurial ecosystem. An example from INTERREG IVC is the Gothenburg Brewhouse, part of the IMAGEEN project, which is a shared space where creative industry entrepreneurs benefit from cross-fertilisation of ideas.

Noteworthy is that the most successful support infrastructures in INTERREG IVC generally consist of **different tools that strengthen each other**. For instance, in the Munich Business Plan Competition coaching and access to finance are offered simultaneous. Investors use their knowledge and experience to coach and select 'gazelles' (high-growth companies). This process is mutually beneficial for both investors and start-ups: investors reduce the risk of their investments; start-ups are helped along through high quality coaching.

3] Support social entrepreneurs and tackle regional problems in one go!

Social entrepreneurship and the social economy: these are relative new terms for an economy in which not only profit, but also people and planet are at the heart of business. In this capacity, social entrepreneurs can help managing authorities to strive for their region's objectives in regard to Sustainable and Inclusive Growth. Therefore, a region might consider a distinctive policy for social entrepreneurship. Different definitions of the social economy are circulating, but in the context of entrepreneurship the most operable definition is the one of the Social Business Initiative of the European Commission: 'Social enterprises apply business strategies to tackle goals such as bettering society or protecting the environment. They have close ties to their communities, promote social cohesion and help reduce economic and social disparities between EU regions and countries.'

Supporting social entrepreneurship is a way for regional managing authorities to empower certain groups, such as the unemployed, disadvantaged or minorities, to fight social exclusion. When implementing a special policy for social entrepreneurship, it is important to consider the needs that social entrepreneurs have extra in comparison to regular entrepreneurs. Tailor-made education and coaching trajectories are often chosen to give social entrepreneurs not only practical business skills, but also the self-esteem, self-confidence and autonomy of action they need to run a business. Another form of social enterprise is setting up businesses that employ and support certain social groups. For instance the region of Hanover, where the fairKauf business initiative (part of the INTERREG IVC project MESSE) helps unemployed citizens towards a better future:

'The crisis has had a major impact on the number of long-term unemployed citizens in our region. About 20% of the citizens of Hanover fall below the poverty line. Of course we could have just stuck to paying them welfare. But instead we help them to run a business where they can develop valuable expertise for their career and receive extra education to get fit for the job. It does not only make financial sense, the people get their sense of self-worth and enthusiasm back too.'

One of the main functions of social enterprises is that they can empower certain groups, such as the unemployed, disadvantaged or minorities, to reach social inclusion.

4] Enable 'smart' entrepreneurs to contribute to the region's competitive advantage

Of course supporting social entrepreneurs is not the only way for a regional authority to build on a better region. Many regions possess unique endogenous – from the inside – **knowledge and skills that regions can capitalise on to build competitive advantage**. To do so, the European Commission has developed a legal base for national and regional managing authorities to develop so-called Smart Specialisation Strategies. These are strategic innovation policy frameworks that are defined as follows:

'Smart specialisation strategy means the national or regional innovation strategies which set priorities in order to build competitive advantage by developing and matching research and innovation own strengths to business needs in order to address emerging opportunities and market developments in a coherent manner, while avoiding duplication and fragmentation of efforts.'

In light of Smart Specialisation Strategies, regional authorities can support entrepreneurs to exploit a region's unique knowledge & skills, thereby creating competitive advantage for the region

Start-up companies often play a significant role in bringing new technology from universities and other knowledge institutions to the market. By supporting high-tech entrepreneurs to achieve commercial success, regional authorities can positively influence the regional economy and job market. Start-up entrepreneurs have their specific set of challenges in the process of commercialising new technology and building profitable, sustainable businesses. They can be considered 'smart' entrepreneurs in the sense that they play a key role in the Smart Specialisation strategies of some regions. For instance, investors often consider start-up companies too high-risk to invest in. Regional authorities can play a role in making private funds accessible for start-ups. An example is the Veneto region that participated in the INTERREG IVC project MINI EUROPE. This region has established a guarantee system, which makes investment in innovative companies more attractive for investors.

5] Interregional co-operation: Exploit the opportunities for mutual learning in the area of policy development

One of the unique features of INTERREG IVC is that it facilitates mutual learning between regional managing authorities in the area of policy development.

Various INTERREG IVC project partners expressed the value of experiencing another region's operationalization up close, which shows that interregional co-operation is important and necessary in order to increase the territorial cohesion between European regions. By participating in INTERREG projects, regional policy makers open their windows and **open up for learning from peers with unique experiences**.

The capitalisation study showed that it is easier to transfer a single, separate policy support tool in comparison to an integrated entrepreneurship policy from one region to the next. However, although the results of mutual learning on a higher policy level are less visible on the short-term, the impact of seeing an integrated policy in working might be much larger. Working with peers from other regions proves to be a motivation to improve one's own policy as well.

The interregional exchange of policy solutions is never a 'copy and paste' process.

A final lesson is that transferred tools in INTERREG IVC projects often comprise of small pilot projects. The challenge that regional managing authorities face is to let these projects **lead to real, long term change** in policy. It is crucial to start any project with the involvement and open-mindedness of high level policy makers with actual influence on regional or even national policy development. Furthermore, transfer is not a simple 'copy-paste' process; it is a process of learning and adaptation to a region's unique circumstances. Finally, transfer processes clearly benefit from a person who develops a sense of ownership of the solution during the transfer process, an 'intrapreneur' who actively promotes the project's message, strives for successful implementation and motivates policy makers on a high level for actual change.

In conclusion: supporting entrepreneurs requires commitment

Any entrepreneur can tell you that starting a business is risky and requires the willingness to take the time before commercial results are actually achieved. Policy makers who want to make a difference in their region by supporting entrepreneurs, should ignite the same entrepreneurial spirit among themselves. The effect of entrepreneurship support is only truly worth the effort in case policy makers employ a long term, focused strategy that reaches beyond electoral periods, yearly budgets and terms of office. Only an integrated support infrastructure, in which all separate tools are aligned, can make a real difference for a region's smart, sustainable and inclusive growth.

TITLE
Achieving Impact — Social Sciences and Humanities as Innovation Boosters

PRESENTER
Dr. Christoph Köller

ORGANIZATION
Köller & Görgen, Hürth, Germany

MAIL ADDRESS
c.koeller@gk-bb.de

ACHIEVING IMPACT — SOCIAL SCIENCES AND HUMANITIES AS INNOVATION BOOSTERS

Innovations represent one of the most important factors for economic growth and social prosperity of a country. As they frequently have their source in science, the contributions of research institutions to the innovation ecosystem are essential. Natural sciences and the branches of engineering have been supporting the development of new products for many years in the form of technology transfer.
The process has been made possible by the establishment of structures — technology licensing offices, for instance — that pave the way for the transfer of scientific findings from research to business. However, the focus of these activities is on technologies and technological innovations.

But what is the situation in the research areas which are not technologically oriented such as the humanities and social sciences? Do they not have any contributions to make to innovations and competitiveness? Or is there unexploited potential here which is crying out to be explored?

Studies have revealed that there truly are valuable findings in these fields which could be turned to good account in politics, by society and in business as well. Steve Jobs, the founder of Apple, made the following statement during his presentation of the iPad 2: 'It's in Apple's DNA that technology alone is not enough — it's technology married with liberal arts, married with the humanities, that yields us the result that makes our heart sing.' The IT giant Google draws on the creativity of students of the humanities as well and recruits many of its associates from these fields of study, and for good reason. The benefits of technology frequently do not come to full fruition until it is joined with the humanities and social sciences because the latter focus on people, their perceptions and their behaviours. Innovations cannot be successfully realised without the critical input of both sides.

As early as at the end of the 1990s, for instance, citizens founded initiatives opposing wireless services because of their fear of electrosmog, although science and technology were unable to find any evidence that there were

actually any health risks involved. It was not until the underlying motivation of these actions was understood from a sociological perspective that measures to generate acceptance became possible.

But these disciplines can do more than contribute the results of research in the humanities and social sciences to business; they also have the potential to solve problems of today's society. Humanities and social sciences have an especially significant contribution to make when it comes to social innovations. Important broad subjects in this respect include the health care sector or changes in lifestyle, both closely related to human behaviours, but there are others as well. Carsharing systems, just as one example, have become viable and successful only because there has been a change in attitudes and behaviour regarding aspects of mobility and the environment. The study of these areas is at the heart of social sciences in particular. So it will come as no surprise to hear that the new European framework programme for research and innovation, Horizon 2020, explicitly encompasses the humanities and social sciences under the heading of 'embedding SSH' and calls upon syndicates to incorporate expertise from these fields.

Then why has there been so little exploitation of the potential inherent in the humanities and social sciences?

Participating in a project funded by the German Federal Ministry of Education and Research (BMBF), three German research institutes explored this question and considered possible ways for the humanities and social sciences to exercise greater influence on business, politics and society. Under the leadership of the Institute for the German Language (IDS), GESIS Leibniz Institute for the Social Sciences and the German Maritime Museum (DSM) jointly examined the issue of what potential the humanities and social sciences offer for realisation as concrete value and how it can be mined. They were supported in their research by the SME Görgen & Köller GmbH (G&K), which aided the project partners during the development of their concept and market-related questions.

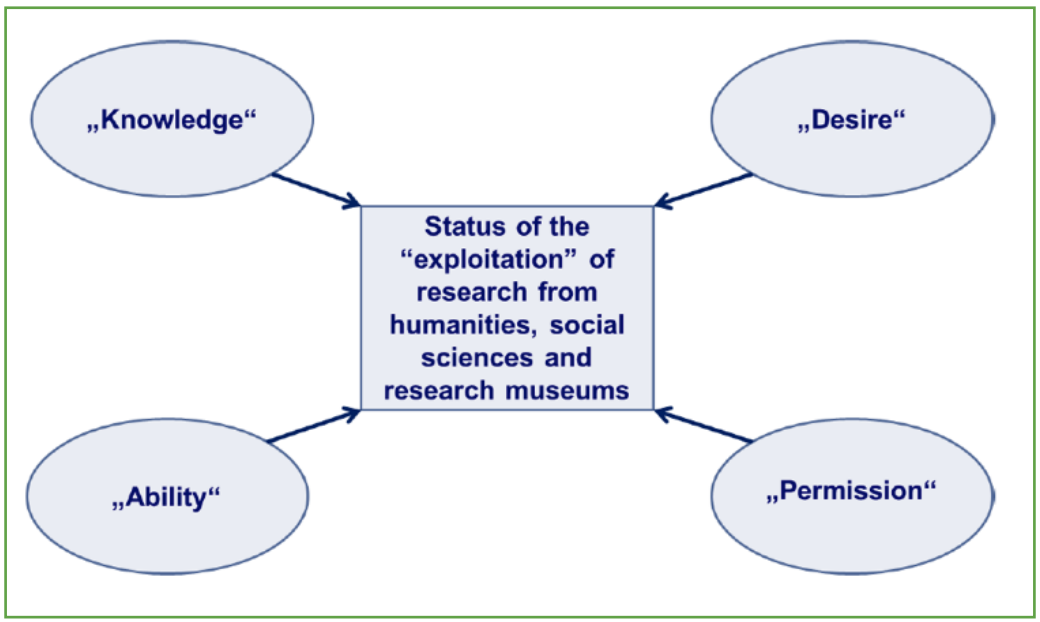
The first stage of the project was to determine the form in which research results in the humanities and social sciences were available and how they could be systematically compiled. At the same time, the current state of realisation as concrete value in institutes for the humanities and social sciences was analysed.

Generally speaking, institutes for the humanities and social sciences displayed great interest in the subject matter of the project. Institutes for the humanities

and social sciences can also point to previous realisation of their work as a concrete value. Examples include the results of linguistic research, which are used for the development of voice-operated devices. Results regarding communication in difficult situations (e.g. physician–patient) based on empirical data are valuable when utilised in training and advanced training programmes.

In contrast to STEM fields, however, these findings from SSH are not systematically identified and realised as concrete value. Why is that?

During the course of the project, the researchers determined a number of barriers to the systematic realisation in concrete terms of research results from the humanities and social sciences. They can be summarised in the categories 'knowledge', 'ability', 'desire' and 'permission'.



The barrier of 'knowledge' refers to the frequent lack of awareness on the part of institutes and researchers that the research results they produce can even be turned to good account. Mark well: realisation as concrete value is not limited here to 'marketing', but also in the sense of 'impact' encompasses the utilisation of research results to benefit society without necessarily producing any monetary benefits. This is closely related to the problem of 'ability' because the majority of the institutes lack the knowledge and experience required to

identify exploitable research results and to pursue actively their realisation as concrete value. Moreover, in most cases there is a lack of resources — financial and manpower — for any such activities. The barrier of 'desire' is especially relevant for researchers who do not want to make their work available for (commercial) purposes outside of the institute and who are concerned about 'freedom of research'. Finally, the barrier of 'permission' ultimately includes the question of whether (commercial) exploitation is even reconcilable with the principle of public benefit and the bylaws of the institutes as well as with the principles of data protection.

If research results from the humanities and social sciences are to be utilised more extensively and systematically in the innovation ecosystem, these barriers will have to be overcome.

But what can be done now to enhance the impact of the humanities and social sciences for society and business?

One fundamental step in overcoming the barriers described above is the development of suitable and viable structures. Unless the required structures are created, the systematic exploitation of research results will remain impossible. The establishment of a 'transfer agency' could offer researchers in the humanities and social sciences as well as potential customers a common point of contact for all of the issues related to exploitation. The creation of such a transfer agency and the testing of the concept are being examined in a follow-up project on the 'Exploitation of Social Sciences and Humanities' (Verwertung Geist) which began in October of last year.

A first step toward exploiting the innovation potential of SSH.

The project presented here, 'Exploitation of Social Sciences and Humanities', represents the first step toward enhancing the impact of the humanities and social sciences. It has become clear that the exploitation process is usually haphazard and guided by coincidence and that awareness for the sustained utilisation of the potential for exploitation must be created in many areas, whether in institutes for the humanities and social sciences or in politics and business. These issues have been recognised, and work in the coming years will focus on finding solutions. These solutions will be prerequisites, that the SSH will be able to make their contribution to increasing prosperity in our society and to strengthen its competitiveness. Additionally, society will be able to benefit from the outstanding research and expertise found in these fields.

TITLE
Venture capitalist planning is irrelevant to successful university technology transfer professionals

PRESENTER
Jason Ormstein

ORGANIZATION
JMOrnstein,
London, United Kingdom

MAIL ADDRESS
cjm@jmornstein.com

VENTURE CAPITALIST PLANNING IS IRRELEVANT TO SUCCESSFUL UNIVERSITY TECHNOLOGY TRANSFER PROFESSIONALS

Introduction

Too often, Technology Transfer Officers (TTOs) at major universities dress up raw science with unrealistic business plans based on the venture capitalist motivated J Curve. Unlike VCs, TTOs supporting publically funded technology should not set expectations for 'blockbusters' with unrealistic revenue expectations. This only lowers the probability of transfer success. Many great university sciences can reach the market through entrepreneurism if TTOs match market realities with cost management in business planning.

The J-Curve & VC Market Realities

The J-Curve in sociology traces its origins to the early ninetieth century when economists sought to explain why devaluation of currency would first lead to current account deficit, and then would subsequently swing positive[1,2,3]. The curve can be defined as the condition where the sum of elasticities for imports and exports with respect to the exchange rate is greater than one.

(e + e* >1)

This effect, later known as the J-Curve based on its shape, can be visualized in figure 1:

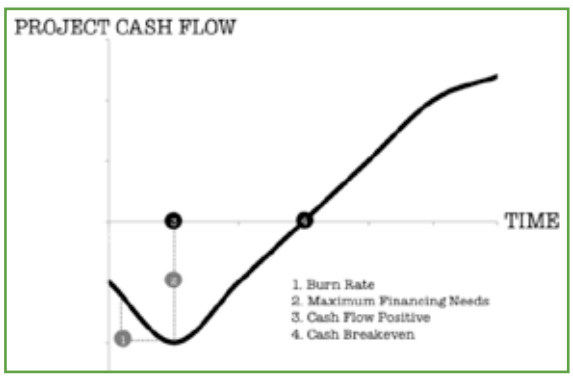


Figure 1: The Private Investment J-Curve (Courtesy of author).

In venture capital (and private equity), the J-Curve X-axis represents time and the Y-axis represents the net of negative capital outflows and positive capital inflows. As the venture capitalist makes investments into one or more start-ups, the curve will be negative. This is not uncommon with start-ups regardless of sectors, but the relationship between loss and gain will be more pronounced in new technology. In consideration of a one firm investment, the net of negative capital outflows will be offset by earnings, with the point of inflection representing the maximum financial needs of the investment. This is when the firm is cash flow positive and the burn rate, the rate observed over a specified time, becomes less relevant to the venture capitalist. These venture capital attributes are associated to the J-Curve in figure 1.

Venture capital funds typically have a term of ten years, with all returns, liquid or ill-liquid, returned at the end of this legal period for final accounting.[4)] Typically, within the first four years all funds committed by limited partners are drawn, with huge penalties imposed if the limited partner reneges.[5)] This puts pressure on the venture capitalist to invest the money, otherwise committed capital sits with low return and time exacerbates poor performance. Usually by year five, the venture capitalist would want to have all funds committed so that there will be at least five years to grow investments. Little has been innovated into this structure and each investment's J-Curve reality will dictate a funds overall return.

With this understanding, the J-Curve reveals that a successful venture capitalist will seek start-ups where:

1) the date of cash flow break even is within five or six years

2) the burn rate is low

3) the maximum financing needs are lower when compared to like investments

4) where negative capital outflows are offset by aggressive earnings

Unfortunately, different industries have diverse financing needs, and different earnings potential over like time horizons. To encourage venture investments and/or limited partners, some firms may mislead the design of their J-Curve.

Since 2012 when the groundbreaking WE HAVE MET THE ENEMY … AND HE IS US was published by the Erwin Marion Kauffman Foundation, an investor in venture capital funds, the realities of lower than expected returns from the venture capital industry were exposed.[6)] This report raised doubt as to why the industry was generally considered to offer outsized returns in the media. Clearly huge successes in the Dotcom bubble associated with Netscape, Google and EBay, and in the Web 2.0 period associated with Facebook, Groupon and Twitter, impacted media and encouraged the high risk, high return nature of early technology investing.

The average venture capitalist is perceived as a risk-taker, on par with the entrepreneur, but who's deep experience and training will lead to advice on how to succeed.[7)] Unfortunately, over the last measured twenty years of VC returns, 62% of venture capital funds failed to return to limited partners, their investors, returns higher than public markets.[8)] Yet Technology Transfer Officers (TTOs) at universities look to these firms as the holy

Market Realities & Cost Management

Returning to the limited time that the venture capitalist has to demonstrate return, one can identify that there is a motivation to inflate revenue expectation or deflate financing need expectations through unreasonable cost projections. This motivation can come from the entrepreneur, TTO, venture capitalist, or become an unintended consequence of their co-operation. Ten years from start-up to a liquidity event is very short for most university technologies, and most investments will not have the full ten years of the fund's vintage. In the US, where the usual university technology should take about 7 years[9)] to arrive at sales, there is an explicit time horizon issue with VCs Sales frameworks taught in business classes which are based on strategies employed by mature firms. These firms don't have to develop product credibility and overcome customer-switching costs. This leads to an inevitable circumstance where the entrepreneur will lower price as an incentive, eroding sales forecasts from year's prior. This is supported by a legitimacy curve[10)], which pushes the J-Curve to the right on the X-axis, when the technology has a higher degree of adoption risk.

In venture capital, the legitimacy curve can be overcome through innovation leading to rapid desirability and substitution. This process was first described by Bryce Ryan and Neal Gross in 1943[11)], and then more precisely by Everett Rogers in Diffusion of Innovations in 1962.[12)] Rogers went as far as to numerically pinpoint market penetration over successive sets of consumers. What allowed venture capital to integrate this into their J-Curve revenue expectation horizons

was the impact of network computing on adaptation models. Network computing decreased the time to expose innovation to markets, but more importantly, allowed for transparent "contagion through direct network ties".[13)]

By the late 1990s, the Dotcom sector was self-fulfilling this contagion and many thought all technology sectors could shift the J-Curve to the left. But the reality is that a decade later, the clusters of internet, software, mobile/telecom and electronics were the capital concentration of venture capital.[14)] The reality is that social networks could only overcome 1960s technology diffusion rates where perceived 'trialiability' and complexity[15)] were not obstacles; which they are in university science. Many TTOs in revenue forecasting for means of royalty calculation don't measure new technology adoption, rather integrate it into market share. Rogers' 1960s era technology diffusion curve and other rational carve-outs will give the TTO a real tool to evaluate the worth of a license opportunity.

The lean start-up movement is gaining popularity; with failing fast as the ultimate solution to cash burn.[16)] Here, entrepreneurs are encouraged by venture capitalists to move closer to the consumer with the 'minimal viable product', thereby reducing the high cost of planning. Many researchers are being pushed in this direction by governmental funding requirements for tie-up with industry or support letters.[17)] This lean start-up process supports the venture capitalist's desire to shift the J-Curve up and to the left. But the TTO needs to be cautious of the designs under the lean start-up movement as they are intended to counter issues that challenge the J-Curve for internet and software start-ups. For example, 'agile development' encouraged in the lean start-up movement is derived from software development[18)], where product life cycle is far shorter than most university science.

Conclusions

The moral hazard of venture capitalists is that the financial risk of their investment is often shifted to their limited partners and entrepreneurs through deal structuring. Venture capital funds are known to "bury their dead very quietly"[19)], but it has been revealed that their results differ from the media perception of extraordinary investment success. "Many TTOs (technology transfer offices) focus their limited time and resources on technologies that appear to promise the biggest and fastest returns"[20)], much in line with a venture capitalist. TTOs should avoid the perverse incentive of adjusting market realities and cost management to meet the false standards set by venture capitalist 'blockbusters'.

The 2003 AUTM (Association of University Technology Managers) survey found that just 1.4% of all licenses generating revenue for US universities and other research institutions yielded more than US$1m in income in fiscal year 2003… [At Yale University] One percent (10 of 850) of total disclosures led to 70% of US$20.4m received, and 4% (33 of 850) of disclosures accounted for 90% of the total licensing income… Only eight or so patents that Stanford has managed to license over the years have generated more than US$5m.[21)]

Generically, the TTO mantra accepts the existence of challenges unique to university science, but through the business planning process, there is a natural motivator to focus on plans that purport to yield higher revenue for the university. License fees should be expected to max out at $50,000 (though they can reach $250,000) with a royalty band of 2% to 5% (reaching 10% in extreme cases).[22)] The business plan then justifies the imposition of the higher bands of fees, often crippling the entrepreneur who has now already devoted considerable resource to due diligence. In consideration of the fact that the average commercialisation time from bench to industry is over four years[23)], with considerable amount of time from industry to product, fee structures and minimum guarantees in the near term only lower the probability of success.

By taking the inverse of venture capital J-Curve planning, the TTO should focus on accurate diffusion rates and understand the real upfront costs burdens on the entrepreneur. Technology transfer from universities should be planned with slow expectation, where infrastructure like incubators are known to improve success rates[24)] and where the TTO can encourage the researchers continued long term involvement through non-financial motivations such as prestige. Other cultural barriers that a TTO can confront is the stigma associated with failure, less of an issue in the US.

Better linkage to willing entrepreneurs who may not be versed in the TTO process is needed and is the TTO's responsibility. The challenges of 'lack of skills' and 'lack of seed financing' can be solved through one entrepreneur's social circles. Such an entrepreneur can provide a business model canvas,[25)] probably a better document for planning a lean start-up, when matched with realistic TTO revenue expectation. Often VCs are given special viewings of technology by TTOs, even when they have never demonstrated the skills to take such technology to market; the TTO would be better served by identifying individual entrepreneurs from the business community.

One good example of a lean start up would be virtual biotechnology companies, which surfaced in the 1990s to counter the costs of bringing new medicines to market. These companies often surfaced with university licenses representing their core asset value. Many technology diffusion issues are shared between university science and 'virtual pharmas': "These companies consist of as few as one full-time employee who oversees a drug from preclinical development to tests in patients, all in the hands of outside contractors."[26] Virtual management and other rational cost management techniques will give the TTO's new licensor entrepreneur a real tool to evaluate 'trialiability', shifting that burden from TTO to market TTOs are accurately accused of unreasonable expectations. TTO's should expend more resources on fewer 'blockbusters' and create value through techniques which allow the market to inexpensively trial raw technology. Realistically, revenues from technology transfer at university are small, and will continue to be small. The TTO should be most concerned with moving public funded technology from bench to market. Unreasonable revenue expectations by the TTO can result in reduced sponsored research and lower brand equity for the university. But more importantly, it is argued that these expectations result in a significant amount of disclosed and packaged technology remaining 'on the shelf' at the TTO's department.

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[abstract]

The present work tells the story of the commercialization efforts of a University of Porto green technology. The story telling applies the methodology ANT – Actor Network Theory.
ANT narrative follows technology transfer officers in their attempt to construct a network of actors engaged in the transfer of a green technology into industry.
Commercialization efforts are not being successful. Why is the net not working? Is someone missing in the network?
The story telling exposes the hurdles of this green technology transfer path. It is also an invitation to look for ways of making the process effective.

INNOVATION POLICIES FUNDING SCHEMES: THE BLACK HOLE FOR SMEs - INNOVATION POLICY FUNDING PROGRAMMES' NON-INVOLVEMENT ON THE SME SIDE – A CHANCE IN H2020

[abstract]

The problem described tackles the lack of funding opportunities for SMEs in certain development stages within EU and other innovation policy programmes' subsequent funding schemes, both national and transnational.

This is based on the feedback from participants at a previous session which clearly showed the missing support in that area and also good regional intakes as well as from the preliminary survey amongst Portuguese academic spin-off companies where the main factor for failure was identified by a lack of corresponding funding streams for proof of concept stage. The technological background or business side was less of a concern as was the proof of concept funding level, not seed but later stage.

The many factors that affect such company successes - and the lack thereof - may be divided into three levels:

- Entrepreneurial level; such as motivation, skills, competencies, education.
- Organization level; such as strategy, flexibility, structure, location, operations, human resources.
- Environment level; such as economic, legal, stakeholders and institutional factors.

TITLE
Innovation Policies Funding Schemes: The black hole for SMEs - Innovation policy funding programmes' non-involvement on the SME side – a chance in H2020

PRESENTER
Bruno Woeran

ORGANIZATION
Lappeenranta University of Technology, Finland

MAIL ADDRESS
bruno.woeran@lut.fi

What specific innovation management problem does this tackle?

The aim of Innovation policies on a national/EU and global scale is to generate growth, support entrepreneurial spirit, and new dimensions at societal level. They are usually implemented and aligned to funding programmes on those topics. This coincides for national and transnational programmes as well.

However, the actual outcome for SMEs - which are by definition the stronghold and creators for innovation, incremental and disruptive - more often than not ends in a non-performance for financial support on their side when it comes to funding.

Among these outcomes, financial factors such as access to early stage investment, credit and debt conditions, proof-of-concept and scale up funds seem particularly relevant for knowledge-intensive academic spin-offs. To validate such an idea, interviews were carried out with entrepreneurs from University of Minho, PT, one of the most dynamic universities in Portugal, recognised in 2012 by COTEC, the national association of innovative companies under the patronage of the President of the Republic, with the award for Excellence in Entrepreneurship.

The next step is to validate existing systems as the likes of Singapore, Malaysia, Queensland, Australia and possibly the new SME stream of Horizon2020. As there is hardly information available about reasons for the failure of new start-ups compared to the wide availability of studies and reports about success factors, it was decided to focus on cases of start-ups that failed and to learn from their experience and perception of factors that led to such failure. However, qualitative interviews with entrepreneurs, investors and innovation support specialists who went through that experience allow learning some lessons from such cases. The follow-up on those findings will lead to a more thorough research on the new funding and policy schemes as mentioned under H2020 as well as some global initiatives.

Description: How does this presentation tackle the problem?

The idea for this presentation on the outcomes of the original Portuguese survey as well as findings from the newly found innovation policy and funding schemes are to receive input and ideas for a more scientific approach to research the lack of funding opportunities from innovation policy funding schemes on a national/EU/trans-national level.

The sample of

- 9 entrepreneurs who experienced failure (and were in many cases able to overcome it and currently manage a successful company after all),
- 10 investors (business angels, venture capitalists, both public and private) and
- 10 innovation support specialists (technology transfer offices, incubators, innovation managers) that were interviewed will be extended by
- expert interviews from cases in Singapore, Australia and EU.

Preliminary results clearly identify barriers in financing as key factors perceived by stakeholders.

While factors as diverse as motivation, management and marketing skills, product insufficiency and lack of market interest are identified, financial aspects such as lack of seed capital, lack of proof of concept funds, heavy taxes and fiscal obligations, barriers to credit and debt conditions are highlighted as major factors.

The intended future research study on innovation policy funding schemes outcomes for SMEs from AT, FI and PT on EU level as well as SIN, AUS, NZ in the form of a qualitative survey and interviews is intended to tackle the problem of (none-) performance of innovation policy funding schemes for the needs and application for SMEs proof of concept levels.

Originality: What are you saying that is new and has never been said before?
There is little to none research done to this moment on the direct impact of national/EU and global innovation funding policies and the output for SMEs. The Portuguese survey outcome presented on the findings of lack of funding opportunities on a proof of concept level is a first step to compare innovation policies and impact of funding schemes on a qualitative study. The future study will be set up between Finland, Austria and Portugal from the EU-zone and a comparison with similar data samples from Australia, Singapore and New Zealand SME community as ideal comparison by size and layout as well as innovation policy aims.

TITLE
Innovation Policies Funding Schemes: The black hole for SMEs - Innovation policy funding programmes' non-involvement on the SME side – a chance in H2020

PRESENTER
Bruno Woeran

ORGANIZATION
Lappeenranta University of Technology, Finland

MAIL ADDRESS
bruno.woeran@lut.fi

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Interesting for the audience?

Increasing continuous innovation output needed from SMEs (Chesbrough 2011 et al) is a vital factor for growth and economic development. As shown in the crisis period 2008-2010 only those economies continued a certain quicker turnaround and growth level that were taking the need of industry into account and provided measures for employment, alternative financing or funding schemes (i.e. tax-incentive reduction to short-time working hours as in AT). The effect on EU-level remains still to be seen.

Hence, to discuss in a further EU survey how innovation policies and their subsequent funding schemes can be stronger focused on the needs of SMEs' strive for innovation, as offered by H2020, will be beneficial for both decision makers and policy advisors and innovation experts for implementation thereof.

This presentation will thus highlight how a better alignment between funding policies and the funding programmes of such innovative and potentially high-growth SMEs might be the indicator for a successful support scheme.

THEME 7 SMART SUSTAINABLE CITIES: THE SOCIAL DESIGN

Technocracy dominates the current thinking about sustainable innovation, both in innovative products, processes and governance. This track intends to shed light on the human side of sustainable innovations, which means that people are seen as part of, or even the drive of innovations which create a sustainable living environment. How can we integrate human smartness and technology to achieve a flourishing city environment? What is the relationship between physical sustainability (energy, materials, etc.) and social sustainability (e.g. caring for each other)? To what extent can and will we allow technology to dictate our lives? Alternative views on the interplay between people and technology related to their living environment are welcome.

PRESENTER
Prof. dr. ir. Remko van der Lugt

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
remko.vanderlugt@hu.nl

A COLLABORATIVE CO-EVOLUTION APPROACH TO SMART SUSTAINABLE CITIES

[abstract]

Introduction

The debate concerning the development of smart sustainable cities is largely dominated by technocratic approaches: 'How can we build the sustainable city of the future?' This is the case with developing new policies, as well as with technology development. The problem is reduced to a marketing question: 'How can we make people adapt & accept these technologies?' This misses the point of a smart city entirely. Cities can be best regarded as growing organisms, rather than as mere products. Cities grow, and the people in the smart sustainable city are not passive consumers, they are integral part of the city's smartness.

Moving towards the smart sustainable city therefore requires both a collaborative or Co-X effort (co-design, co-creation, co-production) and a systemic approach: regarding the city (or neighborhood, region) as an integrated and complex dynamic system, in which sustainability is an emergent property, rather than a simple measurable factor (e.g. CO2 reduction).

In this workshop we describe some practical explorations of such a collaborative approach towards sustainable system innovation.

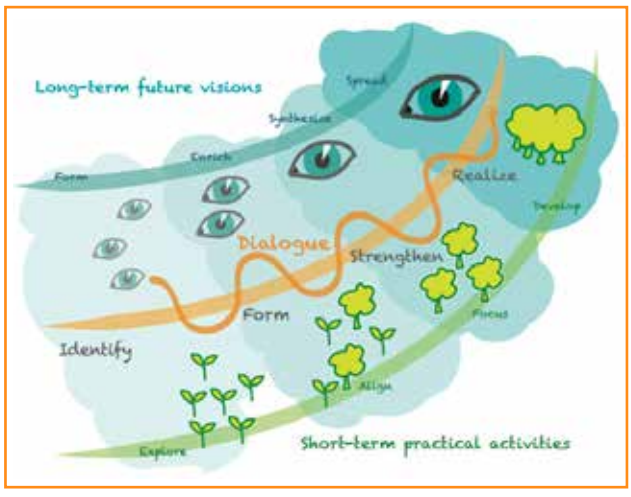

Figure 1: A visual description of the collaborative co-evolution approach.

Our approach draws on two methodological frameworks:

1] Participatory design methodology
Engaging stakeholders by taking them along the innovation journey as experts of their own experiences, using carefully designed materials in order to create a level playing field. Such an approach enables people to participate fully by a) allowing people to reflect on their own experiences, thus becoming more aware of their tacit knowledge, and b) utilizing designer tools: collage making, sketching, modeling, etc… as a collective means of building scaffolds (Van Dijk & Van der Lugt, 2013). This is relevant to the innovation process as it helps getting more people engaged that are part of the system and allows them to fully participate.

2] Transition management methodology (Loorbach, & Rotmans, 2009)
Orchestrating the journey as a co-evolution process in which both a long-term vision crystallizes as well as concrete ideas for new products and ser-vices are developed. As an adjustment to the transition management cycle, we emphasize the co-evolution process of developing a long-term vision, whilst simultaneously experimenting in the 'real world'. The central carrier of collective sensemaking is the continuous alignment of the vision and the directing of concrete activities to embody that vision.

In this workshop we will explain the basic dynamics of such a co-design co-evolution approach to sustainable innovation. We will describe case example in which we applied this approach. Finally, we will discuss some insights.

In general, our approach follows the following four phases:

1) Explore

2) Enrich

3) Fortify

4) Realize (see figure 1).

In each phase, there are activities in the long-term directed, vision-world and the short-term directed practical world. Between phases there are alignment sessions in which the portfolio of tangible activities and the future vision are

compared, adjustments are made to vision, activities or both; thus ensuring a continuous dialogue between developing a vision regarding societal issues at hand and the concrete initiatives in practice.

Cases

We have applied this approach to three cases, varying from, looking for cross-institutional services to enhance sustainability to sustainable branding of a region.

- GreenGreenerGreenest: Sustainable innovations of the internal organization of a medium-sized ICT organization, internal transition of a small organization (about 100 employees)
- Clean Care: Sustainable system innovation in regional long-term care institutions. Moving sustainability in these institutions from technical fixes to more structural
- Green Ridge: Entrepreneurs in Utrecht rural ridge area looking for a stronger sustainable reputation by working towards a regional brand and sustainable pilot innovations

Green ridge in more detail

The Green Ridge initiative was fuelled by seven local associations of entrepreneurs who felt that 'green thinking and doing' was part of their core mode of being, but they also felt that they could use this as a means to obtain a stronger position in the market. So the goal was to develop a 'green region brand'. For this, Utrecht University of Applied Sciences (HU) developed a project proposal in which a marketing agency, two research university and HU collaborated to help the entrepreneurs develop a region branding, consisting of a brand (or strategic vision), and a number of pilot projects to support and ground that vision. At the onset, about 8 clusters of entrepreneurs developed these concrete initiatives, supported by researchers from HU, who functioned as 'cluster secretaries'. The strategic part consisted of developing an view of the existing external and internal identity, leading to a series of 'gold nuggets', qualities of the Utrecht Ridge, that could be the ingredients of a region brand.
These in turn, led to three guiding principles: Pure working and living, Pure well-being, and Vitalizing green.

We had a series of meetings in which the entrepreneurs developed a better understanding of the identity and vision of the brand, as well as positioning the projects in relation to this identity. For instance, one of the initial projects

concerned the development of a 'Water Path', to signify the purity of the drinking water. Bottled water from the ridge is sold as premium water, but is the same water that is used for flushing the toilets. The Water Path is intended to communicate this. It fits well with the pure well-being concept. Another project concerned the development of a bio-gas plant. As this hardly fits the guiding principles, at some point the decision was made to abandon this initiative as part of the region brand.

The final brand is called 'Duurzaam Doen!' (Sustainable doing!), a rather generic name, but loaded with the projects and principles it provides a lively common attractor. At the end of the project, the fostering of this brand is continued by a foundation, carried by all the associations of entrepreneurs. Both the projects and the brand are still very much alive.

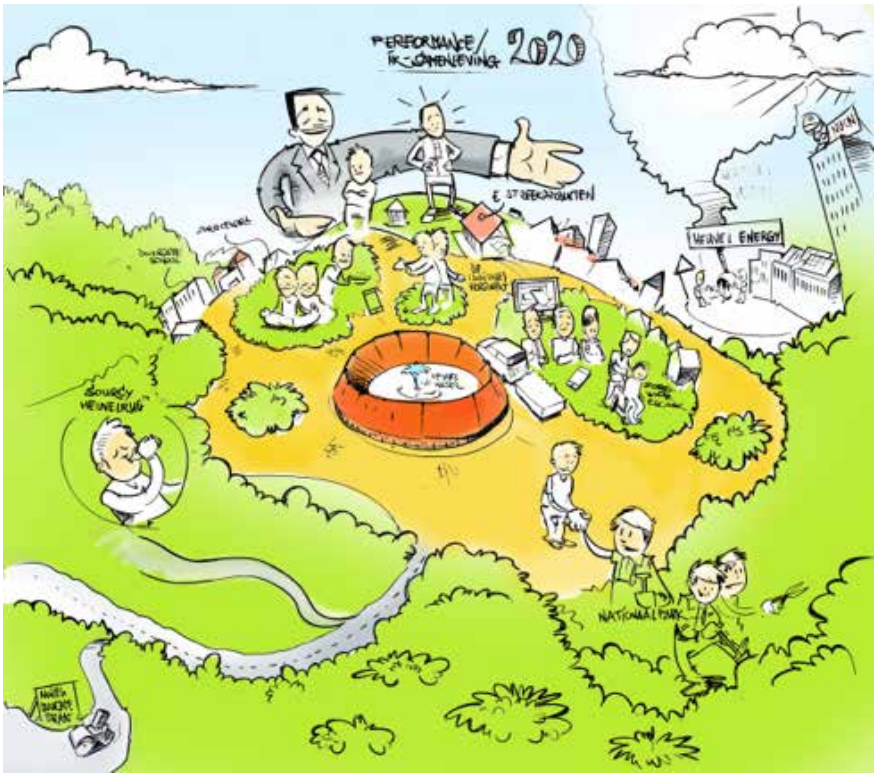

Figure 2: Future vision of the Ridge, in which all the cluster project are represented.

Findings

In general, we find that the aligning dialogue between the long-term goals related vision and the short-term objective related activities made for a clear focus of activities, or at least for explicit attention to the areas that the team does not agree with. We noticed that the transition process itself was a major vehicle for shifting mindset towards sustainability, by putting it on the agenda, and by requiring people to think beyond short-term targets and results. However, we did find that participants had difficulties with the open-ended character of the process.

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TITLE
Strategic Collaboration for Sustainability: The Natural Step Framework

PRESENTER
Freek van der Pluijm

ORGANIZATION
The Natural Step, the Netherlands

MAIL ADDRESS
freek@samenheid.com

[abstract]

The results of unsustainable human development are evidently worldwide - climate change, species extinction, pollution, poverty, and inequality are deteriorating our capacity to sustain our ways of life. Our society needs more effective ways of using our skills and resources to create positive change. A 'whole-system', trans-disciplinary approach is needed to deal with the sustainability challenge of meeting our society's needs of today and the future.

A fast growing community of sustainability practitioners trying to achieve exactly this kind of collaboration has organized itself around a unifying Framework for Strategic Sustainable Development, commonly referred to as The Natural Step. In 2008 the Institute for Science and Innovation in Society at Radboud University Nijmegen started using this the approach and in 2010 The Natural Step Netherlands was founded. Since then the approach has cultivated roots in its local, regional and national communities through work by government, knowledge institutions and businesses weaving sustainability into the heart of a hundreds of initiatives, from changes in corporate strategy of multinationals and sustainability awards for local businesses to community planning, youth engagement and housing.

The founder of The Natural Step – by some considered one of the 100 Visionaries of the 20th Century - Karl-Henrik Robèrt, once said that 'the question of reaching sustainability is not about if we will have enough energy, enough food, or other tangible resources - those we have. The question is: will there be enough leaders in time?' This case study explores how exactly this kind of leadership is now being developed all through the Netherlands.

TITLE
How to encourage employees to travel by bike? A quantitative field study about sustainable travel behaviour

PRESENTER
Anita van Essen
Prof. Reint-Jan Renes

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
anita.vanessen@hu.nl
reintjan.renes@hu.nl

[abstract]

In this session we present a quantitative field study conducted for the University of Applied Sciences Utrecht (HU) about sustainable travel behaviour amongst employees. The HU is situated on the Uithof (industrial area nearby Utrecht) together with large institutions as the University Medical Centre and the University of Utrecht. As the Uithof is expanding, mobility issues such as parking problems and traffic jams arise. This study had as a goal to explore the different factors that influence the current travelling behaviour of the HU employees and the potential for policymakers to stimulate cycle use amongst car drivers. In scientific research the concern for sustainable travel has resulted in a focus on the underlying psychological principles of individual travel behaviour. For instance, recent research shows that not only instrumental motives (travel time, travel costs) but also affective motives (pleasure to drive) and symbolic motives (self-presentation) play a role in understanding car use. Moreover, travel behaviour is strong habitual behaviour. Therefore, it can be difficult to change this (unconscious) behaviour towards sustainable travelling habits. By analogy, our research focused on exploring the different (implicit and explicit) motives behind driving instead of cycling to work. This topic was investigated by means of an online questionnaire in which employees (n=1933) of the HU were asked about their motives for car use and cycle use. The selfreported data were enriched with the work-travel distance per individual in order to investigate relations with (the perception of) travel time and distance. The results show that different (psychological) factors relating to travelling distance, time, weather circumstances, perception of freedom and autonomy play a role in travel mode choice. The outcome provides an indication for stimulating cycle use as an alternative to car use. Our discussion focuses on how policymakers can use the insights from this study for developing policy measures that stimulate sustainable travel behaviour.

THEME 8 OPEN INNOVATION ACCELERATORS

Open innovation is on everyone's lips, but how do you manage such a complex process inside and outside the firm? What are the skills and tools that can be adopted to make open innovation happen in reality? What are some of the pitfalls and challenges and how have they been overcome by those who are facilitating or even better accelerating open innovation? This session will look at tools, good practice and case studies of open innovation at work.

PRESENTER
Ir. Sil Bruijsten
Prof. ir. Tim Zaal

ORGANIZATION
HU UAS Utrecht, the Netherlands

MAIL ADDRESS
sil.bruijsten@hu.nl
tim.zaal@hu.nl

MASTERS OF MAINTENANCE & ASSET MANAGEMENT AS A CATALYST FOR INNOVATION AND IMPROVEMENT IN INDUSTRY

Masters educated in Maintenance & Asset Management work in various sectors of industry including the building sector, where they are often active in international development and maintenance projects. From their Integrated Design (ID) approach, they contribute in a multidisciplinary context to products that deliver added value to all stakeholders: not only end customers (customer satisfaction), vendors (optimum capital utilization) and shareholders (optimal return), but also society as a whole (sustainability and versatility engineers).

In this paper we show that the results of using the ID approach for organizational issues lead to organizational improvements and innovations.

After a short introduction, we first define the research method used. Then we give a description of ID and its key elements, and how ID and the above mentioned master courses are connected. We finally discuss a selection of master theses, showing practical examples of using ID in a real (here maintenance) environment.

Introduction

The Master of Engineering[1)] is a (part-time) master's degree for professionals at the HU University of Applied Sciences Utrecht, NL. Students of this master course are involved in designing, developing, managing, maintaining and sometimes renewing or disposing of physical assets, such as buildings, ships, machines, installations or trains. The companies they work for are the owners and /or users of these assets. The goal of the master course is that students improve their knowledge and skills to a master's level (Engineering, 2012) using Integrated Design as a conceptual framework.

In order to show that the students have mastered the competences of a module, they have to fulfill an assignment. These assignments are small research projects

coming from the student's company. The fundamental goal is to apply the basic concept of the master course i.e. ID. The results of the students' research projects constitute an empirical data base that is available and accessible for research (Bruijsten, 2010)[2].

From their ID approach, the students contribute in an interdisciplinary context to products that deliver added value to all stakeholders: not only end customers (customer satisfaction), vendors (optimum capital utilization) and shareholders (optimal return), but society as a whole (sustainability and versatility engineers). This added value is primarily due to a process of thinking and acting in all phases off the life cycle of a product and, additionally, driven by an optimum use of the available IT resources and continuous improvements (Hobeon, 2010)[3].

This paper is part of a study[4] that aims at validating the assumption that the ID Approach leads to organizational improvements, and innovation in Industry. The available literature, however, provides only limited insight in the validity of this assumption and in which parts of the concept are more important than others. Although there some studies dealing with the value of the ID approach, a study that scientifically establishes this assumption is still missing. Drawing up a secondary analysis of the results of a number of master theses, we will provide evidence for the assumption that using the ID concept leads to improvement of the performance of physical assets and is at the same time a booster for the achievements of the organization.

Research method

As a first step in our study we need to select a method that enables us to comparatively analyze the above mentioned master theses. The method we opt for is an adapted version of the procedure described by Noblit and Hare (Noblit and Hare, 1988)[5] as Meta-Ethnography. According to Noblit and Hare (1988) this method enables a rigorous procedure to put together multiple cases for interpretation and to compare these studies in order to draw cross-case conclusions (part I).

Using this method will enable us to analyze the theses in a systematic, orderly and controlled manner in order to arrive at synthesizing conclusions regarding the consequences of using the ID approach. The comparative analysis of the master theses consist of four steps. The first step in the analysis deals with the possibilities of applying ID principles in general. The second step deals with the degree of 'real' improvement, innovation and value creation that can take place in a thesis report, which is of course only limited in its scope and impact. The third step deals with an assessment of the degree to which ID principles have been applied in the theses. The fourth step, finally, deals with an assessment to what degree progress has been made in organizational improvement, innovation

and value-creation by using ID principles on the basis of the measurement of innovation and value-creation.

In the following chapter we will start with a description of Integrated Design and its key elements. After that the key elements will be explained in what way they can contribute in terms of improvement, innovation and value creation in organizations in general. The results of this will be validated on the basis of three exemplary master studies. (See 'Effective applicability of the model'.)

Integrated Design

The definition of Integrated Design consists of two qualifying notions, i.e. is Integrated and Design. Let's start with the notion 'design'. A common definition of Design is to give a good solution to satisfy a need with the means that are available and with consideration to the social standards. Van den Kroonenberg (1972) already used a definition of this kind. A big advantage of this definition is that it includes not only new designs but also improvements in an existing design process. It's also not limited to the building sector or industry, as it can be used in every domain.

Integrated means 'everything included'. The word is mostly used in combination with another word like for example in this case 'design'. The combination 'Integrated Design' then refers to everything included in the design process, i.e. time, disciplines, people, IT, money. It is a way of working and thinking. ID is an attitude and it is, as we will see, very important in the design process.

There are several scholarly definitions of Integrated Design (ID). According to Delhoofen (Delhoofen, 2003)[6] it is about three perspectives that simultaneously have to be taken in an design process. Also Zaal (Zaal, 2000)[7] has written in the same way about ID in his inaugural lecture in 2000 but in 2010 (Zaal, 2010)[8] he extended the model with a fourth perspective or dimension. According to his model there are four strategies which are used simultaneously. Figure 1, used by Zaal and Delhoofen, contains three visible axes: Integration of abstractions, Integration of the Life Cycle and Integration of Disciplines. The relative importance of the axes, their length and hierarchy, are subject of another part of our study and will not be commented upon here.

Two other dimensions, Social Behavioral components and Stakeholder analysis, are conditions for ID to be successful.

Co-operating in multidisciplinary teams requires a certain willingness to work together with all stakeholders and to develop the specific competences that are needed. To determine the people involved it is often necessary to conduct a stakeholder analysis (Quin,2009)[9]. On the basis of that analysis a team is put together and its members have to express confidence in each other. Confidence,

communication skills and adaptability of change are basic principles of team work. As an aside I want to stipulate that these are at the same time, important principles of social innovation, a modern approach to improve the performance of an organization.

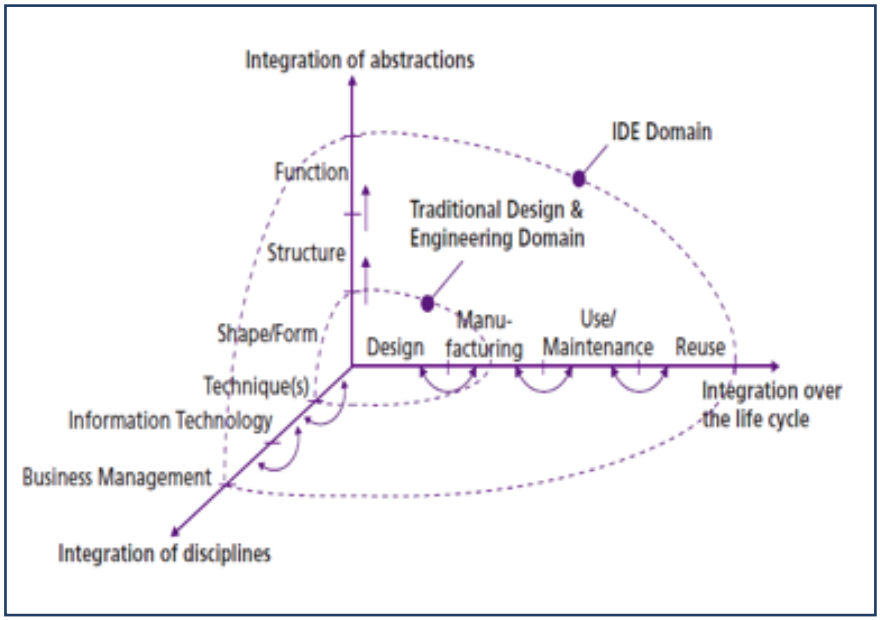

Figure 1: Five dimensions of ID (Bruijsten, 2012) adapted from Zaal, (2010).

The meaning of the axes in Figure 1 is discussed in several publications by Zaal, Delhoofen, and others.
The vertical axis represents the abstraction of thinking in functions which is related to System Engineering[10]. It shows that attention must be paid to the shape, structure and functions of a design. Functions are best described by using verbs. For example if you want to go from A to B the verb is to 'displace', if this is completed with some specifications you can design a model. Zaal (2000) used the 'Hamburger Model' (Figure 2) which is a Function-Product Model to present functions, functional specifications and solutions. Delhoofen (2003) is speaking about the system axis on which he places different function levels the same way Zaal did. Different from Zaal, Delhoofen shows the highest level on this axis that is reserved for the mission and vision and the company strategy.

The horizontal axis is the 'process axis'. It represents the integration of all phases and aspects of the life cycle. It is a time axis and it shows the phases of the design process during the life cycle from the start, the idea, until the phase of recycling. In the traditional way the people involved have no overview over the whole process and every step happens independently. The specialists work in their respective specialties somewhat isolated from each other. The 'integrated' design approach asks all the members of the design process, to look at the project's objectives, systems, and assemblies from all different perspectives. (Don Prowler, 2012)[11)]

The third axis is the 'multidisciplinary axis'. It shows the integration of the disciplines during the ID process, such as technical disciplines, IT and business (sales and organization) (Zaal, 2000). The contribution of IT technology in this process is still in a developing state (Hazeveld, 2005). IT technology makes it possible to share knowledge between disciplines and to do so in time. It enables concurrent and collaborative co-operation within and between organisations. Under influence of 'Het nieuwe Werken'[12)]. IT is one of the causes leading to levelling of traditional boundaries in a hierarchical structure. It has changed the organization of labor and its development is still ongoing.

Integrated design is not only a way of working but also a way of thinking. It is a continuous process of improving and designing. Companies will be involved more and more with each other all over the world. The IT technique has made it possible.

Key Elements of ID

The vertical axis of the figure represents thinking in functions. The ID figure shows that besides the form of a product, attention also must be paid to the structure and functions on which the design of this product is based.Tim Zaal (Zaal, 2011)[13)] used for his functional decomposition the Hamburger Model. Students of the master often use this model in their thesis study and other assignments to structure their study. Figure 2 is an example of Kuijt.

This model of functional decomposition is very useful to analyze and to zoom in the system and to locate the weak spots in the design or model.
The Hamburger Model enables to visualize the structure, functions and functional specifications and solutions. It is also helpful to store data in a structured, modelled way. The combination of weak spots and solutions makes the model very strong and the possibility of reusing data makes it feasible to Social Corporate Responsible.

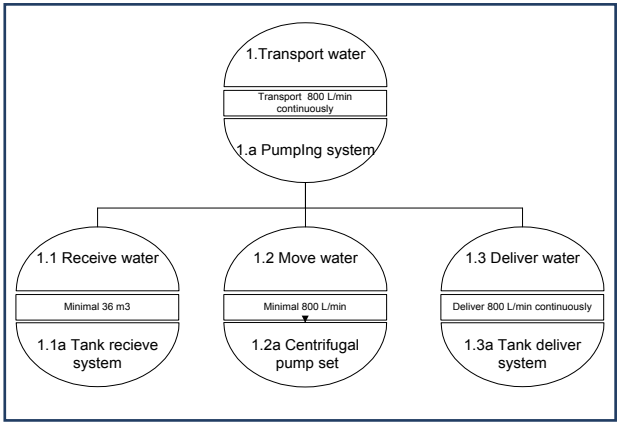

Figure 2: Hamburger Model (Kuijt, 2012)[14].

The horizontal axis shows all phases of the life cycle and different aspects like design, production, maintenance and possible reuse are considered including the Life Cycle Costs. These can be derived and analyzed in order to make a benchmark on the Total Costs of Ownership. A present value calculation could be useful in environmental decision making and enables a contribution to Social Corporate Responsibility.

The third axis shows the integration of the disciplines in the IDE process. It is indispensable to integrate technical and business disciplines. It is a tool to structure the database in a way that, often inaccessible knowledge, can be shared in time and between stakeholders. It also can be reused in the design process. It creates new services, new forms of co-operation within and between organisations. The possibilities of IT are still not recognized.

Figure 3 gives an overview of how the ID space and the modules in the curriculum Master of Engineering are connected. On the main co-ordinates we find the modules every student is obliged to follow. These are the ID modules.

The mode of operation of ID requires working in multidisciplinary teams. Skills are trained in obligatory skills days. The other modules are part of a profile (track) in a certain direction.
The abbreviations, tracks and the content of the modules are available at **www.moe.hu.nl**.

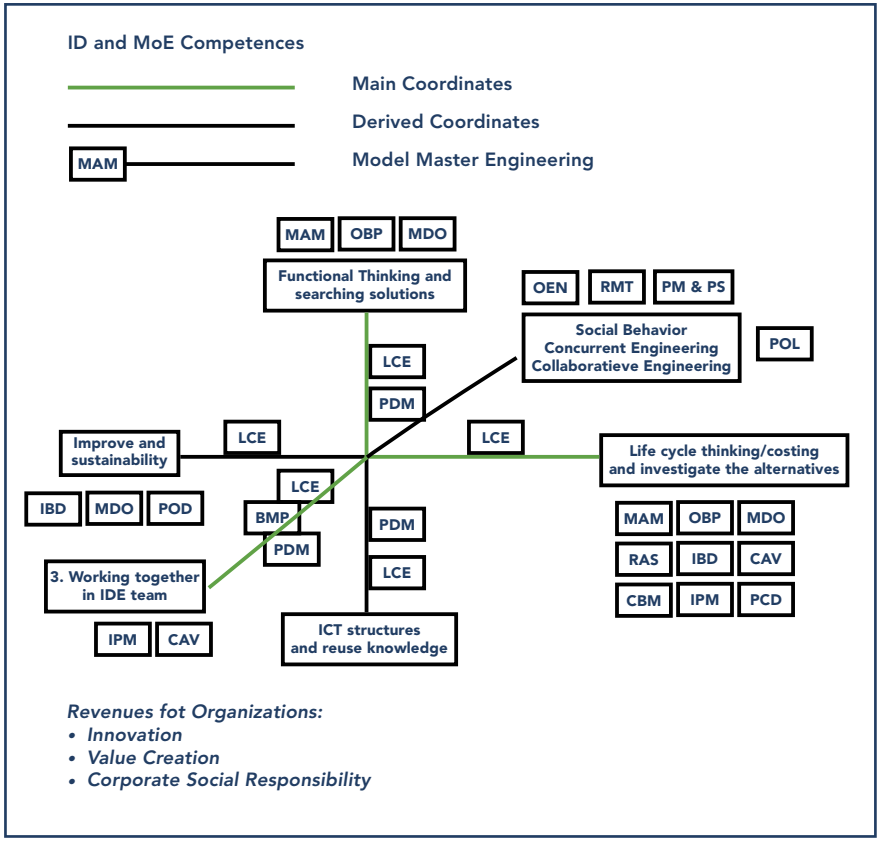

Figure 3: Adapted from Zaal and Bruijsten (2013).

Effective applicability of the model

The first study as a practical example of the operationalization of the ID-model is of Roger Ham[15] concerning the availability of spare parts in a production plant of Kerry[16]. The result of his study is that 'The costs of spare parts are not only the purchase price, but are also dependent on two other important cost components, the logistic and financial cost component'. The costs of spare parts are obvious but the cost of absence or of Down Time because the spare part is not available are often not foreseen and thus not calculated. To determine which parts are essential he made a BFc-RCM spare part decision scheme. BFc-RCM stands for Business Functional critical-Reliability Centered Maintenance, a model in which he combined business, maintenance and the criticality and

availability of spare parts. In his study he showed the lack of awareness of the criticality of spare parts for the maintenance function trough the organization. Cost control from a financial view on top is missing the logistic and maintenance perspectives.

One of the main aims is to develop a spare part management strategy that fits in the corporate and business strategy of the company. Figure 4 below shows the integrated approach to determine the added value of each spare part. By measuring the system's effectiveness of spare part management in the three areas, a holistic is guaranteed to all cost areas.

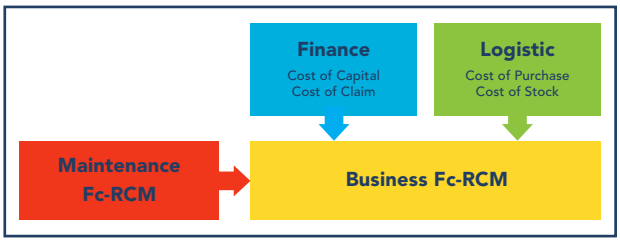

Figure 4: BFc-RCM (Ham, 2013).

Figure 5, Added Value Inventory Management, makes clear in what area improvement is possible and it gains a clear understanding to all departments of the spare part strategy.

The presented approach corresponds with the philosophy of the master course. The innovative approach of Spare Part management is an integrated part of the maintenance strategy of the Kerry company. This turnaround, an direct result of the thesis project, will lead to an improvement of their business results.

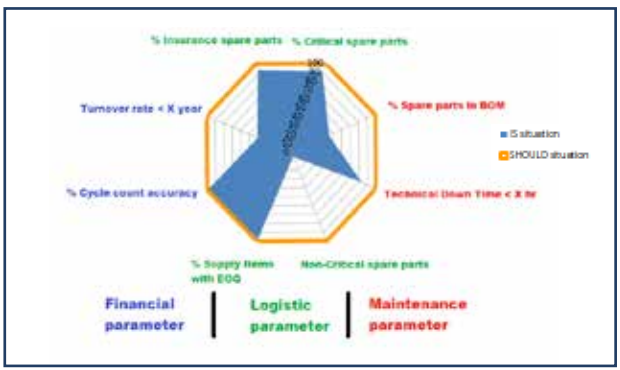

Figure 5: AVIM dashboard (Ham, 2013).

The second study is of Lars Eelman[17]. He asked why the Naval Maintenance & Sustainment Agency is applying RCM so poorly and why so many RCM implementation projects are petering out despite RCM justify maintenance. The result of his research was that we have to make a selection process in the way assets need maintenance. In the present performance they make no distinction in the maintenance need. This causes a lot of unnecessary costs and wasted time. In theory RCM is the best way to perform maintenance, in practise the success is very low. According the research of Eelman the main causes are that RCM is not adopted in the mission statement and goals of the organisation and the management asks Full RCM for each system. Full RCM is valuable in time and money and a lot of unnecessary paperwork is needed. Figure 6 shows the classification table for the RCM selection process which Eelman designed to come to the right level of maintenance for every system.

Criteria	Notification	1	2	3	4	Total
		(1=low, 4=high)				
System importance	Level of risk regarding mission fulfillment when system is not available					
Risk SHE	Hazards involved in operating and maintaining the system • to employees and people in surrounding areas and communities • to environment					
Risk economic loss	Level of risk regarding economic loss due to • corrective maintenance • image • SHE penalties/lump sum payment					
Maintenance budget	Yearly maintenance budget (expected)					
Technical complexity	A dimension of the complexity of the technical engineering of the system					
Maintenance complexity	A dimension of the complexity of the maintenance engineering of the system					
Involvement of third parties	A dimension for the interpendence between the organization and third parties					
(Residual) life cycle	A dimension for the expected life cycle of the system					
Legislation	A dimension for the obligations set by the legislation					

Category A Full-RCM	Category B Fc-RCM	Category C ECM
Score 28-36	Score 19-27	Score 9-18

Figure 6: RCM Criteria Table Eelman, 2012.

The score of each criteria is an indication of the need of maintenance and the total score of the level of maintenance. The sequence in the table has been determined by the system importance.

The criticality of the criteria is visualized in figure 7 so that the score makes clear the weighing of each criterion. The weighing has to be performed by the Asset Manager, because the Asset Manager is responsible for the asset integrity performance and the allocation of the maintenance budgets. He constantly need to weigh the maintenance costs against the customer agreed availability, reliability and performance.

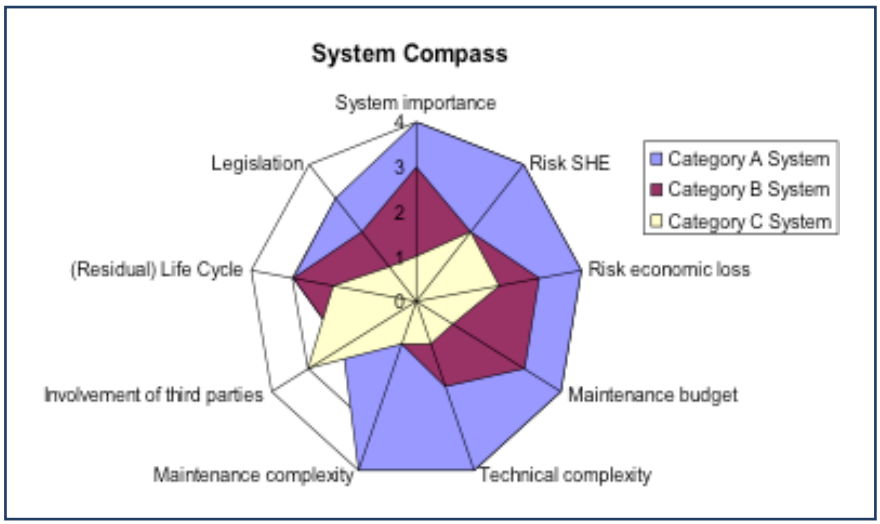

Figure 7: System Compass Eelman, 2012.

The approach he suggested fits into the philosophy of ID. The use of 9 criteria for the RCM selection process concerns an integrated view. For the weighing of the criteria the management can only decide in collaboration with other stakeholders.

The third study is of Hassan Jamaladin[18]. He is a civil engineer, working for the Province Utrecht, NL, responsible for the maintenance of civil structures. His organization was looking for a way to decrease the maintenance costs but that wasn't possible with the present, traditional way of performing maintenance. They wanted to change to risk based maintenance management. See figure 8.

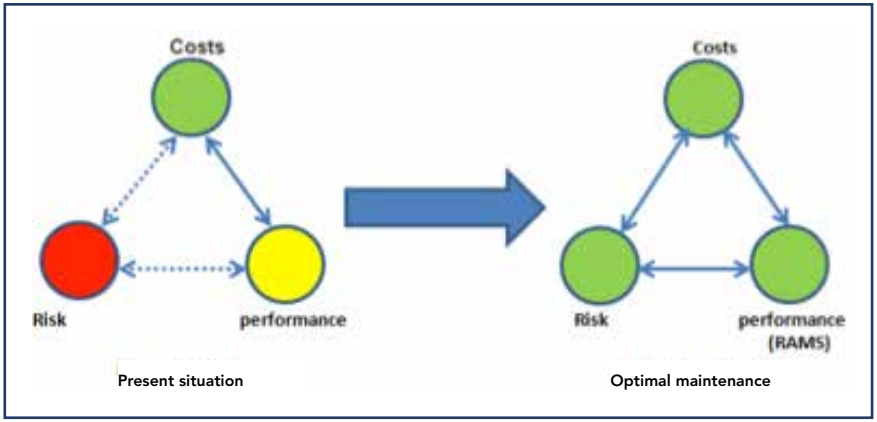

Figure 8: Jamaladin, 2012.

Risk based management could make it possible for the management to set up a preventive maintenance plan for managing civil structures if the risks affecting the performance of an object or system are known. This approach would ensure more continuity and a more efficient use of the civil structures.
The purpose was to design a maintenance method which resulted in reduced financial and social costs. The result was a FMECA[19] based on RAMSSHEEP[20] aspects. Method and aspects are more common in the industrial assets but not for civil structures. The method will give more transparency in the costs in connection with the desired performance. Before that a lot of work has to be done. The method comes from outside the sector of civil structures, so some actions have to be made. A functional decomposition has to described of the civil structures and the standard functions and requirements have to be determined in terms of RAMSSHEEP. Research on the criticality of the components has to be done. After that a risk framework and a risk matrix should be set up. A risk-based inspection to the actual condition of the civil structures and Life Cycle Cost Management has to be introduced. Advantages of this method are that there is more transparency between the maintenance activities and the performance compared with the traditional way of maintenance. A risk analysis makes clear if risks are acceptable. It leads to an optimal balance between the investment of public money and the required performance level. Using LCC Management maintenance can be done at the economically optimal moment and this can lead to savings up to 30% of the present costs.
Again the approach in this case study is based on aspects of the ID philosophy. Functional decomposition and LCC Management are key aspects. Using aspects

of RAMSSHEEP demands a broad view on the asset management process. The performance can only be done by co-operation between the involved departments and the decision makers.

General conclusion

In this paper we started with an explanation of ID, the benefits of it and the connection with the master course Master of Engineering. In three thesis master studies, track Maintenance & Asset Management, we showed how organizational issues can be solved by using elements of ID. Yet, the described results have not been achieved and further research has to be done. Further research has also to be done in what way to the conditions are stimulating.

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20) RAMSSHEEP: Reliability, Availability, Maintainability, Safety, Security, Health, Environment, Economics, Politics.

TITLE
International
Research Hatchery
on Green Business

PRESENTER
Rina Bao

ORGANIZATION
Turku University
of Applied Sciences,
Finland

MAIL ADDRESS
rina.bao@turkuamk.fi

INTERNATIONAL RESEARCH HATCHERY ON GREEN BUSINESS

Introduction

Universities across Europe execute different pedagogical strategies and practices to educate future professionals in innovative ways. Creativity expert Sir Ken Robinson argued that "understanding how individual, cultural, economic roles interconnect is the key to transforming the education system into a 21st-century process that has creativity and innovation at its center" (Robinson, 2011). The new culture of learning, Innovation Pedagogy, has been developed and implemented at the Turku University of Applied Sciences (TUAS) for the past few years. It is a learning and teaching approach which strives to narrow the gap between skills gained in theoretical learning and working life, skills in research and development (Kairisto-Mertanen et al, 2011).

A new pedagogical process, Research Hatchery (REHA), was originally developed at TUAS. REHA is an educational research, development and innovation process embedding the innovation pedagogy into learning and teaching concepts. REHA involves small groups of students in real research and development projects from their university or companies, from which students gain study credits. REHA student projects have been successfully implemented among Finnish students in TUAS since 2004. Through REHA, it is hoped that a new generation of professionals will be educated to adopt and utilize knowledge in innovative thinking and creation (Räsänen & Kyllönen, 2013).

In Spring 2014 the first international REHA was successfully conducted in the Faculty of Technology, Environment and Business (TEB), TUAS. Eleven exchange students from seven countries participated in the international REHA on the Export of Education in Waste Management.

The REHA was a great success and received positive feedback from students. This success inspired TEB to further develop the concept in the network of Consortium on Applied Research and Professional Education (CARPE). The CARPE network is the first strategic alliance of five European universities of applied sciences in Germany, Spain, Finland, United Kingdom and the Netherlands.

This article illustrates an appealing proposal for an international Research Hatchery (REHA) among CARPE partners on Green Business as a novel initiative, which will be called CARPE REHA. This initiative aims to assist partners to develop joint study programs and strengthen the collaboration in the link between education, research, businesses and organizations. By embedding the innovation pedagogy in the research hatchery method at an international level, this project will improve students' internationalization and innovation competencies. A platform/network with environmental know-how will be introduced or re-examined in the local economy and strengthen the information and cost-efficient co-operation with a greener mindset.

How to implement CARPE REHA?

CARPE REHA will take place from September to December 2014. Groups of 5-10 students within any field of study from each partner university will be invited to examine the existence, function, role and activities of local networks that co-ordinate and promote green business strategies and practices to small and medium sized enterprises (SMEs). During the first few weeks, each group becomes familiar with green business and resource efficiency in a brainstorming session to teach each other and communicate through social media and web conferencing systems e.g. Anymeeting, Webex, Google Hangouts, TeamViewer or Facebook. Later, students will investigate on the green business network locally and carry out interviews on some SMEs. To complete the REHA, students from all partner universities will exchange final group reports and be present at an online seminar through a video conference. Students will obtain study credit points after completing the CARPE REHA project as a minimum requirement of 3 ECTS, which equals out at 81 working hours.

Throughout the REHA process, students' innovation competencies will be measured by the Innovation Competencies Development Barometer(INCODE Barometer) at three dimensions: individual, interpersonal and networking level (Watt et al, 2013).

Is CARPE REHA an open innovation accelerator?

The European Union has been taking imposing steps to foster green business and environmental reform in recent years. According to a recent EU report "SMEs, Resource Efficiency And Green Markets," more than 42 percent confirmed that resource efficiency actions have decreased production costs and that half of the SMEs active in green businesses provide products and services with environmental features. In TUAS, the eGreenNet project is a good example

of strengthening and developing a system of the environmental know-how and expertise in the Turku area by creating resource and cost efficient models and platforms of co-operation for SMEs. Thus, Green Business has been chosen as CARPE REHA topic to gather similar information from partner universities' cities to learn from best practices and foster the local economy.

Open innovation may become a daily general topic everywhere from enterprises to education institutes. How to connect these two entities through opening the innovation bridge? CARPE REHA can make open innovation happen at three levels and achieve a win-win situation. Firstly, CARPE partners will experience a new range of students' co-operation as an initiative that will enrich the collaboration and add a fresh dimension to the partnership. It will enhance the communication and mobility among partners and fulfill one of the CARPE strategic plans: to develop a joint study program. Secondly, students will learn to collaborate with other fellow students from different disciplines, various universities and ethnic backgrounds, to develop their innovation competencies and gain on-the-job practice. Graduates from almost all of the disciplines will require such information on resource, material and cost efficiency or 'green jobs' one way or another. Thirdly, through introducing and re-examining networks and platforms in Green Business, SMEs share knowledge and experience of successful approaches and support them to invest time and resources in environmental efficiency and improvements, which leads to producing less waste and saving the business money. Last but not the least, several elements have been taken into account; entrepreneurship, social responsibility, creativity, sustainability and internationalization as important themes in the education, research and institutional policies.

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PRESENTER
Sigrid Gilis
Dr. ir. Vincent Ryckaert
ORGANIZATION
IMEC, Leuven, Belgium
MAIL ADDRESS
sigrid.gilis@imec.betim.

DOES OPEN INNOVATION IMPLIES OPEN IP IN AN R&D ENVIRONMENT?

Introduction

Does the popular trend towards Open Innovation, defined here as the trend beating the non-innovative syndrome by releasing the opinion that business potential can be optimized by the use of others' IP or your own IP by others, imply Open IP, meaning the use of a more non-exclusive set-up to more soft IP regimes, in an R&D environment?

The general aim of this paper therefore consists of one main research question: Does the tendency observed by IMEC towards less Open IP jeopardizes the potential of applying Open Innovation?

Open Innovation is a hot topic nowadays but does it imply Open IP? Is there a demand for more Open IP by 3rd parties or internally? Or can we still live up to the need of more Open Innovation, by not relying entirely on our own research, but by sharing risks, innovations, ideas and revenues with external partners, academia or 3rd parties and still keeping our IP sufficient or even more safe (or rather closed) as the market seems to demand.

General framework

In order to make the assessment and to find an answer to all the questions above, it is necessary to define the two key vectors which determine this paper in concreto, namely Open Innovation and Open IP.

Open Innovation at IMEC can imply first of all the transfer or license of proprietary and self-developed IPR to a 3rd party in order to exploit this IPR and bring products to the market instead of IMEC doing that itself. Secondly Open Innovation also captures the activities of IMEC obtaining 3rd party IPR, which shall be exploited by IMEC, instead of that 3rd party itself.

An Open IP regime implies a system which gives IP access rights to partners such as academia, the government or industrial parties on a non-exclusive basis. The less open a company's IP regime will be, the more exclusivities will be granted

to one partner with the consequence that the IP access rights will be more limited. IMEC serves, inter alia, as a technology sharing environment with a rather open IP regime which offers a platform providing (i) focus for universities in their research in the early stage of the R&D Life Cycle and (ii) basic insight and solutions for industrial partners in the later R&D Life Cycle as the image below shows (fig. 1).

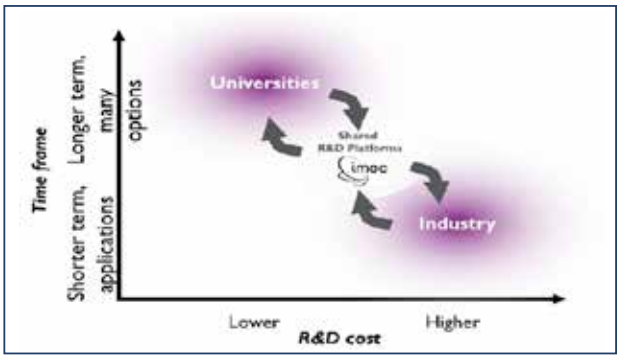

Figure 1: IMEC.

The interaction of Open Innovation and Open IP in IMEC's R&D Life Cycle

The image displayed hereunder (fig. 2), shows IMEC's R&D Life Cycle and the creation of intellectual property within IMEC during each innovative stage, going from left to right from the early stage to the late stage.

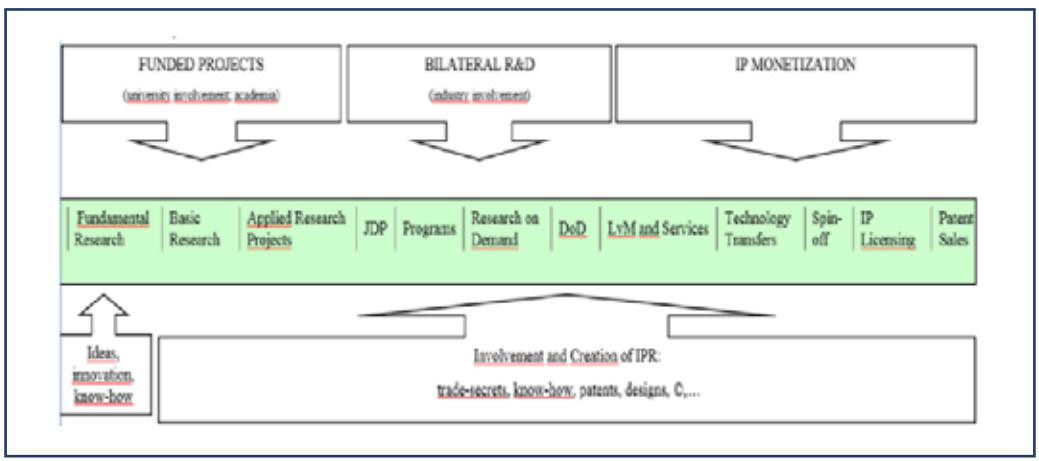

Figure 2: IMEC.

IMEC has developed an open multi-partner model, which enables cost and IP sharing with all partners in all fairness to the eco-system. This is put in practice by granting non-exclusive 'use and exploitation' rights (to make/have made, sell, offer to sell) to 'semiconductor' products by Technology Transfers via Residents creating jointly owned results with IMEC; by allowing co-ownership without accounting for such jointly created results; by granting access to IMEC Background and by granting access to material and equipment (under normal use clauses). All these 'tools' achieve a non-blocking effect for our partners, which is one of the main key features of IMEC's IP Policy to safeguard the success of its business model.
The initial key features of the IMEC IP Business Policy were (1) avoiding IP blocking of our Partners and giving them the freedom to operate, (2) securing the IP Rights of our Partners and (3) fail-safe, meaning using realistic project and contract concepts to ensure compliance amongst every party involved.
This policy and strategy already implies a certain openness towards innovation. Trade secrets are hardly used, most generated IPR will be shared (for instance jointly owned) and the involved partners are giving the necessary licenses and rights to further use the inventions and IPR in existing or future programs and projects, reinvesting in innovation. Publications and thus sharing information are also encouraged, in combination with patents. Sharing materials is done under evaluation agreements. Disclosing information and sharing without non-disclosure-agreements is not an issue for selected (non-sensitive) information, because the overuse of NDAs is not demanded nor desirable in a proper IP policy.

So how more Open IP does Open innovation expects? Regarding IMEC's IP strategy we feel we are already known as open because of our non-exclusive IP model and starting point, but if we do not handle our IPR correctly and use the existing protection scheme that IP gives us, what would be left of the value proposition we can offer to our paying partners and to which liabilities would we be bound by introducing more openness?

Our partners, consisting of industry, academia and the government do not seem to demand or dictate us to handle an open IP business or strategy. For some industry partners, we are already known as too open. On the part of the university, the IMEC model of non-exclusive deal making seems to be conflicting with their spin-off creation or the like focus.

This means that during the fast growing tendency and general demand for Open Innovation, there is no demand in the innovative environment of IMEC to be

more open, to share technology and innovation in a broad sense and to move forward to an open IP regime. The government aims to gain more IPR, academia ask to obtain more exclusivities during collaborations with IMEC and industrial partners demand to work on an exclusive basis without joint ownership of IPR as well. The key factors of Open Innovation and Open IP seem to behave inversely, due to the demand for exclusive (less open) IP schemes and the current practice of a limited applicability of the Open Innovation tendency.

Open Innovation and Open IP as a paradox

As the analysis above implies, our partners, consisting of industry, academia and the government do not seem to demand or dictate us to handle an open IP business or strategy. Furthermore, at the moment, IMEC is engaging in the more competitive field of IP Monetization and is trying out new models for extracting IP VALUE as it seems necessary to have full value extraction to fund the entire investments. In a relation to create more openness or live up to the trend of more Open Innovation, the competitive field seems to be contradictory. Open Innovation and less Open IP are interacting as a paradox.

Although both appear to be contradictory, it is possible to combine them by using the R&D life cycle as a tool to follow the tendency of Open Innovation. Both apparent contradictory key vectors meet in the early stage of the IMEC R&D Life Cycle (fig. 3).

Open Innovation Late R&D Life Cycle | Early R&D Life Cycle

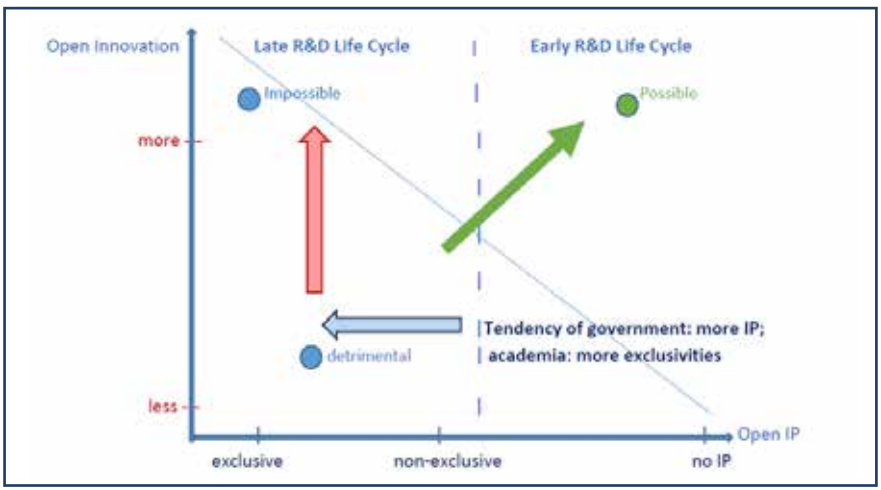

Figure 3: IMEC.

Open Innovation, defined as optimizing business potential by the use or input of others' IP or by the outsourcing of IMEC's IP to 3rd parties to let them exploit the IP, is impossible in the late R&D life cycle.
At that stage and in the case with mid- or long term R&D collaborations with partners, such as Development on Demands, Low Volume Manufacturing, Services, Technology Transfers, Monetization and the creation of Spin-Offs, the results and outcome are or should be highly developed. To regain and market high R&D investment efforts, the late stage in the R&D life cycle implies the need and demand for exclusivities, less Open IP and therefore less Open Innovation. One has to conclude that Open Innovation with exclusive rights in the late stage of the R&D Life Cycle is impossible.

Furthermore, and as stated earlier, there is a tendency of the government to regain more IP and the demand for more exclusivities on the academia side increases. However, less Open Innovation in combination with more exclusive intellectual property rights, so less Open IP, is detrimental for the development and promotion of innovation and research.

In the early stage of the R&D Life Cycle the research is still in a start-up phase during the collaboration. Basic and Fundamental Research are performed, Applied Research Projects are carried out and Joint Development Programs are entered into. During this stage, the outcome and results of the collaboration between the parties involved are still premature and need to be emerged on the basis of further R&D investments and efforts.

It is at this stage that Open Innovation and Open IP, as in non-exclusive IPR or no IPR (such as the use of open source software) can and actually should be combined. At this stage Open Innovation and Open IP can meet so technology sharing can take place, keeping in mind the stimulating research environment with a certain realistic protection of the innovations and research, under an open IP model according to IMEC's IP Strategy.
Bearing that in mind and from IMEC's perspective, more open is not the way to go regarding the demands and needs of our partners. Being less open is not necessarily bad if it is rightly positioned in the R&D Life Cycle, but in accordance with our open model which always serves as a baseline. Open Innovation and Open IP are impossible or detrimental in certain stages in the R&D Life Cycle and therefore they seem to be irreconcilable.
However, Open Innovation and Open IP are a paradox and can be combined in the early stage of the R&D Life Cycle. Open Innovation needs to be given a better place. Therefore IMEC believes it is high time to discuss the need for a

sound and balanced R&D Life Cycle together with governments, academia and industry in the European Union in order to create true EU collaboration, defining the expectations of Open Innovation and offering accelerators and tools to prosper R&D in light of the current tendencies.

Open Innovation meets Open IP: IMEC tools, insights and accelerators

In light of the above, IMEC is trying to meet all changes in the R&D environment and the demands regarding IP access rights regimes, taking into account and reconciling with the tendency towards open Innovation.

First of all IMEC has adapted and refined the 3 key features of its IP Business Policy into (1) avoiding IP blocking, unless a case-by-case analysis (based on predictability) shows that this is no longer needed or allows it; (2) securing IP Rights for our Partners and IMEC: for our Partners whenever it becomes possible taking into account (1) and (2) and for IMEC where necessary to ensure value extraction; (3) fail-safe: compute loss of opportunity in case of policy deviation and implement safeguarding measures. Hence, the focus shifts to value creation instead of politically inspired non-discussions and the strict implementation of the Policy.

Furthermore, IMEC is promoting non-blocking approaches for the IP market policy-wise.

Recently, IMEC is even exploring the field of using patent pools to share IPR with 3rd parties (including academia) in related R&D fields.

The IMEC IP model and environment is more dynamic than ever before and is reconcilable with the Open Innovation trend, however by the use of approaches that offer a secure and more "closed" IP Business Model to keep up with all the sharpened expectations of our partners.

PRESENTER
Sam Waes

ORGANIZATION
Verhaert, Kruibeke, Belgium

MAIL ADDRESS
fsam.waes@verhaert.com

[abstract]

Technology has always been an important driver for innovation. The landscape and requirements have been changing dramatically. The fusion of technologies and the transfer of technology between sectors create new dimensions. Products become systems, systems grow into services, leading to an integration of technics and business models. Organizing innovation in the new reality is creating opportunities and challenges.

Verhaert will illustrate with cases the transfer of technologies and more specific space technologies offered new potential in different industry segments such as FMCG, consumer products but also in medical applications; always keeping the value creation for the end user in mind.

Verhaert New Products and Services has a long history of more than 40 years in the development services & innovation consulting of new technologies & products for diverse markets, such as safety, telecom, security, robotics, life sciences, transport, environment, energy, materials.

We are a leading center for integrated product innovation services divided in three units and business models:

- *Project office: providing multi-disciplinary Contract R&D services*
- *Consulting Office: providing Innovation consultancies and technical consultants*
- *Masters in Innovation: a platform to train, stimulate and incubate innovators*

Combining the three services, we provide Managed Innovation Services covering strategic, tactical and operational aspects of the product innovation life cycle.

VALUATION OF START-UP COMPANIES - PRINCIPLES AND PRACTICES

[abstract]

There is no substantial difference in the principles of valuation of a technology/IP based start-up and other businesses (whether parts/arms/divisions/projects). The methods consist of the same 3-4 basic approaches.

However, value when considered 'hard data' - objective, quantifiable uncontestable - can only be calculated 'ex post'! Once I know what happened under certain conditions, I can record and report value, as would a historian. This is equal to viewing and analyzing the value of a given corporation based on its stock value. It gives me an overview of past performance but such analysis is, as anyone knows, not the same as a prediction that it will continue this way. If this were so, the concept of traded shares would be reduced to the absurd.

Further, 'ex ante' valuation is not an exact science, but more like - if not an art - a master's craft and most of us would have to be considered apprentices on a life-long steep learning curve.

The most widely reported ex ante methods include:

- The cost based approach, meaning that the value is equal to the accumulated costs of bringing the start-up company to where it is at the moment of valuation. For most purposes, except for corporate spinoffs, this is not useful for the valuation apprentice. I have seen examples where second or third round investors actually take over (near) bankrupt companies with a view to injecting new capital into them, but without the original founders. In one other embodiment, we could say that (semi-)public finance instruments in Europe seemingly fund projects on a cost-based approach and within the limits of the state subvention rules (and thereby absurdly contributing to reducing innovation finance in Europe).

- The income based approach, which extrapolates value from past profitability. The only examples of using this method would be to exchange real past performance with a budgeted performance.
  In most cases, start-up founders are imaginative dreamers when they present their always steeply growing EBITDA charts - I am guilty of having done so, too.

- The market-based approach is practiced in response to the weaknesses of the other methods, namely by assuming that value could be equal to at which rates similar start-up companies were funded in the recent past. This is a powerful tool but not easy to use outside the USA, Israel, Sweden, Switzerland and a few other places where there (seem to) exist markets for private (ienot institutional) investment. In Europe most start-up funding is distorted by (semi-)public intervention in start-up funding.

- Some, very advanced, valuators use several factors which are deemed to contribute to a given budgeted future result (a fixed €-value) to make assessments of the probability of how the selected factors might develop under certain scenarios, the result being a complex polynomial tuned by making multiple regression analysis on many past cases for which the valuator has sufficient data. The method is well known in pharma investments. For almost 25 years, I have tried to practice my own small-scale early stage funding together with fools and friends. Over the years I have snitched bits and pieces of practical methods to help me select my winners (which often they were not). I call the method BIPS, Balanced Intellectual Property Scorecard. BIPS is a method, which some university seed funds in Europe use, as it brings together different quantitative and qualitative assessments in one combined score.
  Actually, BIPS could be said to be a combination of the above 4 mentioned methods. The method does not result in a fixed €-value but rather tries to assess the impact of the combined risks involved in funding the different start-ups under assessment. BIPS delivers guidelines to reduce risk. For investors this method gives a yardstick for whether or not a given start-up team is making progress. Many years of practice has convinced me that BIPS is really what all good investors do, maybe under the guise of other names which go down well with the real money masters!


Sustainability: think global, act local

SMART SUSTAINABLE INNOVATION: THE GLOBAL PERSPECTIVE

This collection is based on the HU TII conference 'Smart Sustainable Innovation: the Global Perspective' held in Utrecht on 13-14 May 2014. 'Sustainable' has several meanings: durable, green and cost-effective/ affordable. 'Smart' combines skillful and knowledgeable, the successful elements of the enterprise economy and the innovation of ideas economy while promoting a high-quality environment, improving energy and promoting social cohesion.
The conference was a joint initiative of HU University of Applied Sciences Utrecht (HU), the European association Technology Innovation International (TII) and several Dutch partners.
The convention has brought together an audience of sustainability experts and innovation management professionals from around Europe and beyond (15 nationalities!).

More than 45 papers were submitted for the conference, which deepened the collaboration between professionals – academic as well as practitioner-driven – from both the private and public sectors who share the same passion for innovation and technology transfer. The conference also included the formal launch of the Centre of Expertise 'Smart Sustainable Cities' of HU UAS Utrecht.

This publication aims to promote a wide range of joint research and practice-based projects covering the eight conference topics:

- Smart Sustainable Cities: The Physical Transition
- Innovation across Continents (including the China Chapter TII)
- Social Innovation and New Forms of Entrepreneurship
- The Circular Economy
- Smart Sustainable Cities: Policy and Regulatory Transition
- Science2business for smart growth
- Smart Sustainable Cities: The Social Design
- Open Innovation Accelerators.

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