

CHALLENGING THE FUTURE:

Designing for Sustainable Living & Working

Inaugural Symposium
Prof. Dr. MSc David V. Keyson

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Introduction

The growing awareness of the need to create sustainable environments and products that can foster improved quality of life reflects a global shift from consuming to caring societies. Sustainable living and working focuses on maintaining and enhancing the quality of living over time, as related to environmental (planet) variables, socio-economic (profit) factors, and individual (people) life styles.

Despite all the talk about sustainability and wealth of technology, very few examples that actually help reduce the consumption of natural resources can be found in today's households. Rather, more and more, stand-alone products are being purchased and plugged in, while products such as rain showers are reigning in popularity. Many electrical products are not even smart enough to switch themselves off when not in use or able to communicate to users their actual energy consumption. While there is a wealth of sensor and actuator technology, very few examples can be found of applications to improve the social quality of living and working. Instead, there are many examples of care organizations that are struggling with reduced budgets for monitoring elderly living at home, and of companies that are being confronted by the costs of high levels of burnout, relating to environmental stress factors including office design and commute times.

Similar to recent developments in automotive design, sustainable product and service design can offer new commercial opportunities for companies struggling to find the cutting edge in the market. In the late 1980s, quality was a key concept for companies competing with low cost imitations. Today sustainability offers a similar cost-benefit potential when projected across the phases of product production, use and recycling. Product definitions need to be re-thought as we seek more durable and responsible designs that shift our values from consumption of scarce materials and high impact activities on the natural environment to more meaningful, enriching and delightful ways of living and working.

Research has begun at Delft University and elsewhere on examining the differences between incremental versus radical sustainable product development. Many incremental improvements in products have led to a rebound effect. For example, people may choose to leave their outside lights on all night since they have energy efficient light bulbs, or take longer showers with water saving showerheads. An integral approach to sustainable living and working research is needed whereby the environment, product role and human behavior are taken into account. Towards this goal, on the occasion of Professor David Keyson's inaugural talk, this booklet contains a series of papers, which provides

a wide spectrum on critical issues relating to the role of user centered-design shaping sustainable behavior. The first paper by Professor Gert Spaargaren from Wageningen University, a distinguished sociologist, deals with the topic of the role of citizen consumers as change agents while considering the current social landscape for environmental change. The second paper by Professor Cees Midden, from Eindhoven University, discusses persuasive techniques and results from empirical research towards shaping user behavior in relation to sustainability. Looking into developing countries, Professor Krithi Ramamritham discusses in the third talk how rural farmers in India can gain expert information vital to sustainability and growth in the third paper. Pascal Soboll, a distinguished designer working at IDEO, explores what sustainability will mean in our everyday lives in the not so distant future and what kind of products and services might we expect, and Ramia Maze explores new concepts for interaction design in relation to energy consumption, in the fourth and fifth talks, respectively.

- David Keyson



Grasping the intangible

Interaction design for sustainability

Prof. David Keyson, TU Delft

DAVID KEYSON heads the program in Sustainable Living and Work at the Faculty of Industrial Design Engineering at Delft University of Technology and leads the research focus on Social Contextual Interaction Design as part of the ID Studio Lab. His educational work focuses on interactive technology design in the context of smart products and environments.

Prior to joining TU Delft, he worked at Philips Research as a Senior Research Scientist in Media Interaction and at Xerox in the department of Industrial Design and Human Interface. He holds a PhD from the Technical University of Eindhoven in Perception and Technology and a Masters of Science in Ergonomics from Loughborough University.

Professor Keyson has authored over 100 scientific papers, including papers in Presence, Ergonomics, Applied Ergonomics, Displays, Universal Access Information Society and Personal Ubiquitous Computing. He holds 16 patents relating to input devices and design principles of multimodal user-system interaction.

Grasping the Intangible

Interaction design for sustainability

Mijnheer de Rector Magnificus, leden van het College van Bestuur, Collegae hoogleraren en andere leden van de universitaire gemeenschap. Zeer gewaardeerde toehoorders.

David Keyson

Dames en heren, Chancellor of the university, members of the board of governors, fellow professors and university colleagues, Ladies and Gentlemen...

It is a privilege to stand before you. I would like to take this opportunity to stop and consider the role of my field, namely interaction design, in relation to design for sustainability. In this manner we will look beyond technology and consider the human interaction factor.

Looking around us, this auditorium includes a main projector which is consuming 3 kilowatts of electricity along with the other side displays and lights, the total consumption here is over 5 kilowatt hours, so...I'll try not to talk too long.

On the bright side of sustainability, Delft is the first university in the Netherlands to receive a geothermal exploration permit. Warm water extracted from deep aquifers at a depth of over 2,000 meters could potentially be used to heat our campus buildings, saving 5 million cubic meters of natural gas per year.

Let us now take a closer look at the issue of sustainability facing us today in terms of our environment before examining how sustainable behavior can be influenced through design.

Sustainability focuses on maintaining and enhancing the quality of living over time, as related to three P's, environmental (planet) variables, socio-economic (profit) factors, and individual (people) lifestyles.

The oldest story of human mankind in relation to the earth and sustainability can be found in the Old Testament. According to the story of creation, the human race did not appear on the first day, but only on the sixth day prior to the Sabbath.

The timing of mankind on earth implies that earth does not exist for the sole benefit of humankind, and our species does not constitute the purpose of creation.

According to the cosmology of the ancient Israelites, as pointed out by Jan Boersema in his book, The Torah and Stoics of Humankind and Nature, nature has a "value of its own", a value that does not derive from nature's significance to human society.¹

The fact that the God of the Hebrew bible makes a covenant with the animals and blesses them is unique. This is a conception encountered neither in the contemporaneous Near East, nor among the Greek philosophers. It may be concluded that based on the story of creation, God's love as depicted in the bible extends to life in all its myriad forms.

Thus for the spiritually inclined, the tale of creation serves as a source of inspiration and forms a cornerstone for a general ethics protecting nature and the environment.

Unfortunately, we seem to take nature's resilience to withstand the impact of mankind on this planet and the ever availability of fossil fuels for granted. Many of us are familiar with the need to reduce our carbon footprint and reliance on diminishing fossil fuels, but it would appear that the urgency for change has not dawned upon us.

OUR ENVIRONMENT

In terms of objective measurements, a study from the Institute for Research in Environmental Sciences at the University of Colorado shows that the Arctic Sea ice extent for September 2009 was 5.36 million square kilometers, the third-lowest since the start of satellite records in 1979.²

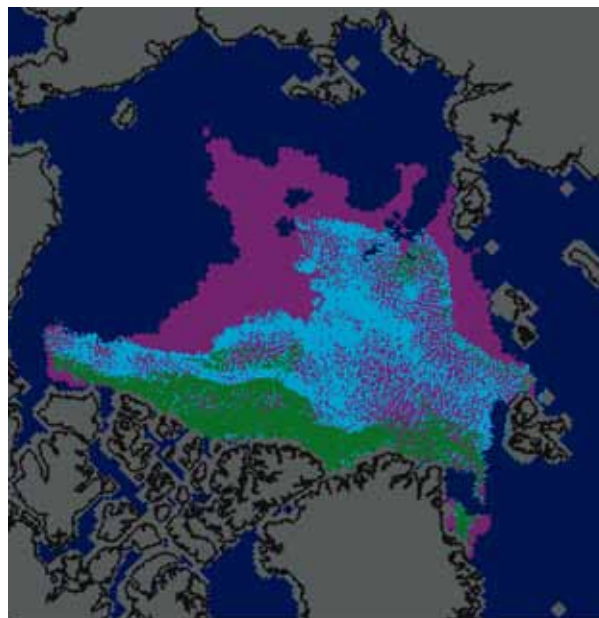
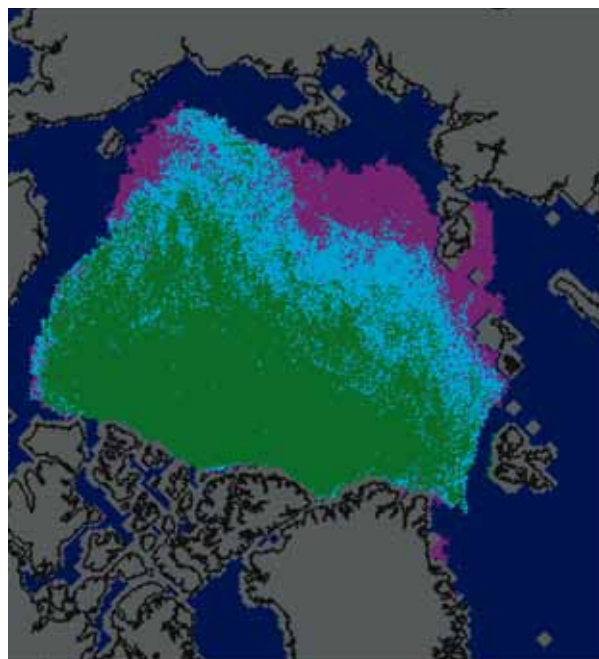
Arctic sea ice has been declining at a rate of 11.2% per decade. A recent study published in the journal, *Science*, by Jonathan Bamber's team at Bristol University shows that if the West Antarctic Ice Sheet would collapse, sea levels around the world would be raised by three meters.³

17 million people in Bangladesh alone would be displaced by a sea level rise of 1.5 meters. Levels on the U.S. seaboards would rise 25% more than the global average and threaten cities like New York, Washington DC and San Francisco.

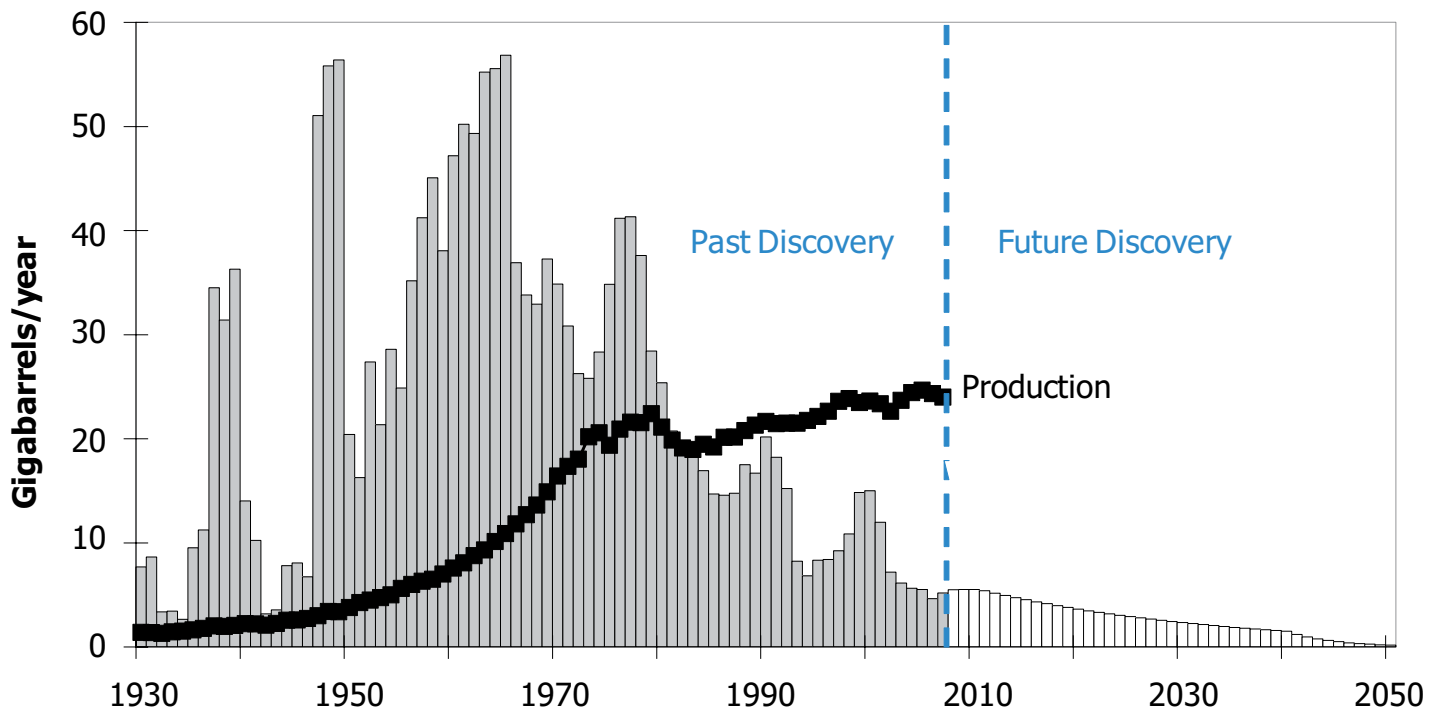
Apart from the need to reduce CO₂ emissions into the environment, we are now close to or at peak oil production levels in relation to the amount of oil discovery. In order to meet growing world energy demands, increasingly, more and more energy intensive and high carbon footprints means of energy exploration and production are being pursued.⁴

A seemingly viable approach would be to pursue nuclear energy. At the moment there are about 60 years worth of uranium left. However, if electricity generation from nuclear grows steadily to the point of supplying the entire world's electricity, this figure would be about three years.⁴

Furthermore, it seems quite dangerous to entrust regimes with nuclear power. History has demonstrated in Europe 60 years ago and today that hostile regimes with the goals to wipe a people or land off the map are still ever present.



Arctic sea ice at the end of the melt season, 1981-2000 average (top) & 2009 average (bottom); photocredit: NSIDC courtesy C. Fowler and J. Maslanik, University of Colorado Boulder



Peak oil discovery and the gap between discovery and production; credit: the association for the study of Peak Oil.

In short, nuclear technology can be made safe but we can't trust mankind with nuclear power. This brings us closer to the need to educate and involve people in promoting alternative means of energy such as thermal, wind and solar.

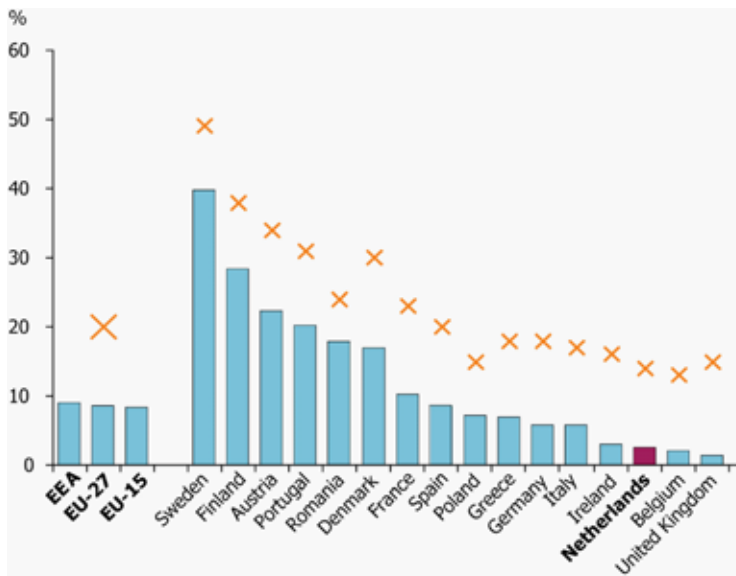
Despite having the fourth largest wind-energy capacity in Europe, the Netherlands has a ways to go towards meeting the goals set out in terms of reaching the 20% level of total energy consumption from renewable sources by 2020.⁵

To meet these goals, a drastic change in energy related user behaviour is necessary in the near future. This will require a balanced combination of new policy, infrastructure and product design. Countries such as Sweden have managed to cover already nearly half of their energy use from renewable resources. The potential energy savings for green buildings as

compared to conventional buildings is 30%. In the case of residential buildings which account for about 27% of the energy market in Europe, it would appear that the greatest savings impact could be made in the area of space heating, which requires the most energy.⁵

Outside of the EU, a number of significant policy initiatives and programs to address energy efficiency have recently been put into place. For example, the building technologies program in the USA targets, for 2020, includes for new buildings a 70% reduction in energy use and a 30% reduction in energy use for existing buildings as well as a 30% increase in on-site power generation, encouraging the design and construction of zero energy homes.⁵

The good news towards meeting renewable energy targets is that we are at the beginning of a consumer lifestyle and attitude shift that has begun to embrace



Renewables as a % of final energy consumption by Member State (2005); credit: copyright EEA, Copenhagen, 2008 (<http://www.eea.europa.eu>).

greener products and technologies. For example, it is now totally “in” to drive a hybrid vehicle, whereas only a few years ago the electric car was projected by the US automotive industry as not feasible for many years to come, while the Hummer SUV was portrayed as a fantastic vehicle.

ATTITUDES & AWARENESS

Perhaps the deeper challenge facing society today is to achieve and maintain a suitable quality of life, while reducing to a sustainable level, the environmental burden to which our activities give rise.

This will probably also require a different kind of economy, rooted less in material throughput, being the amount of material circulating in the economy per unit of time or place. In theory, such an economy is feasible. This will not only require switching over to renewable energy, but rethinking what we consider quality of life to be.

Quality of being must be derived less from matters, including goods and services, embodying high environmental pressure and more from activities having little impact on the environment and nature.

Such activities do not necessarily have to be purely ‘spiritual’; there are numerous more homely alternatives. Nature should be valued more as a defining factor of our well being. For example, an inspiring work of art in the garden instead of a new kitchen. Rather than going to the tropical swimming pool, have a children’s party at home. Instead of speeding down a remote ski slope with a group of friends, join the local amateur choir or enjoy a good glass of wine. Instead of buying fast food, take pleasure in “slow food” as a focal family event.

As described by John Ehrenfeld, co-founder of the industrial ecology concept, key values in slow food are subsistence, authenticity, family, participation, the world of nature, aesthetics, and personal creativity.⁶

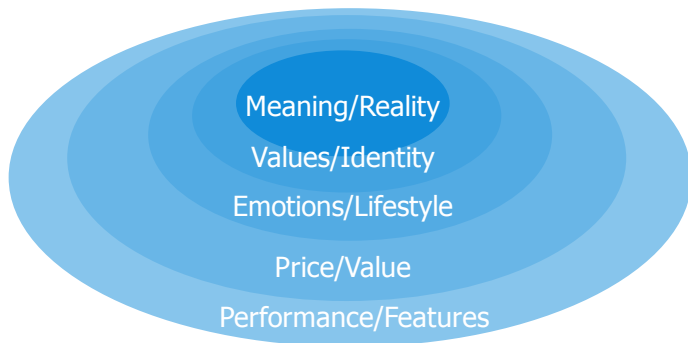
The challenge for designers is to create products and services with core meanings and values that focus on the “being,” or flourishing mode of human existence, rather than the unsustainable “having” mode to which consumers cling to now.



Photocredit: Laura Kolb, Flickr



Photocredit: Chany Crystal, Flickr



Levels of Meaning

Emotions can be strong, like the charge you get when buying a new gadget such as an automatic bread maker, but they are often short lived or become over inflated. Value and meaning need to be put into products to extend attachment and the sense of being.⁷

The growing market for creating “being” experiences is highlighted by the record number of visitors to Yellowstone national park, which was over 900,000, up 11.4% from the same month in 2008. In the last decade, organic food sales in the USA have increased by 80% and continue to do so despite the recession.

Along the line of creating meaningful products which will endure over time is the notion of ‘elimination design.’ For example, Caroline Pfister and her colleagues exploited the elimination design potential of minimalist interior design. They proposed a bathroom without ledges or shelves, leaving nowhere for plastic bottles to accumulate. The outcome was a bathroom with liquid dispensed from a refillable bladder replacing one of the wall-tiles. An interesting aspect of the design was the tactile aesthetics of using the bladder – which was found to be more pleasurable than using the typically uncontrollable plastic bottles which are designed more for the supermarket shelf than for use in the shower.

Furthermore, the design was accompanied by a campaign reversing the marketing hype that every one of us has a different skin and hair type, needing a different product for the face, the body and the hair.

Beyond the need to eliminate toxic materials, which is central in the cradle to cradle principle, detailed by Michael Braungart and William McDonough, is the need for designers to consider how we can reduce material production and transportation costs while extending product lifecycles by designing products that consumers can easily maintain or upgrade.⁸ Today it is often cheaper, easier and faster to buy a new washing machine rather than fix the old one.

SYSTEMS THINKING

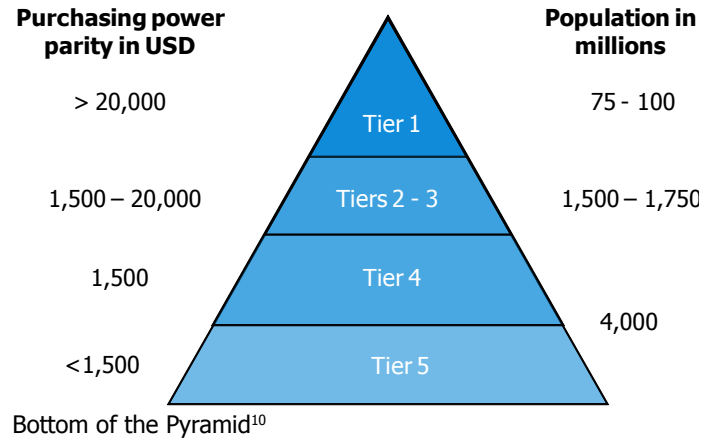
Doppelt makes the case that global warming and today's other ecological and socio-economic problems are not technical in nature; rather they represent a crisis of thought. Every society has a shared "mental frame" - core beliefs and assumptions - that shape the way people make decisions and behave.

Effective solutions will arise only when new, sustainable forms of thinking emerge. Sustainable thinking requires clear a understanding of the systems humans are part of, the use of proven strategies for facilitating personal team and organizational change, ethical rules to guide behavior and a creative rather than problem-solving orientation.

Consider the case of Indonesia, with a population of 237 million citizens and the second-richest country in the world in terms of terrestrial biodiversity, after Brazil. Though covering only 1.3% of the earth's land surface, Indonesia represents 10% of the world's tropical forest and is home to 20% of the all the world's species of flora and fauna, 17% of the world's bird species, and more than 25% of the world's fish species. On the other hand, Indonesia has the fastest rate of deforestation in the world today.⁹

Indonesia is now losing tropical forest the size of Maryland every year, and the carbon released by cutting and clearing trees, much of it done illegally, has made Indonesia the third-largest source of greenhouse gas emissions in the world after the United States and China; Brazil is number four for the same reason.

Indonesia is faced with low levels of education, with only 6,000 PhDs in the country, and with just 6% of the national budget going to education. The lack of education means that instead of producing \$10,000 worth of products from one tree, which today are manufactured in China and Vietnam and sold in western countries, a single tree fetches only \$100. If Dutch product design knowledge could be exported



to Indonesia, only a small number of trees would be required to generate substantial income.

Energy poverty means information poverty, given increasingly more and more is digitally available. The World Bank estimates that roughly 1.6 billion people, or about one out of every four people on the planet, have no access to an electricity grid.

The Netherlands today produces as much electricity annually as all of sub-Saharan Africa, excluding South Africa, being 20 gigawatts. Within this region, 75% of households, or about 550 million people, have no access to an electricity network.⁹ Add to this fact that more than 4 billion people live on less than \$2 per day.¹⁰ How can poverty, HIV/AIDS, unsafe drinking water and Malaria be tackled without even enough energy to turn on the lights?

Towards closing the bottom of the pyramid gap, design efforts are needed to build kits which can enable local villagers to generate their own energy using for example wind and solar power. Products need to be designed that can run on renewable energy, such as solar powered smart phones. With renewable energy we can begin to provide services such as health information to rural areas.

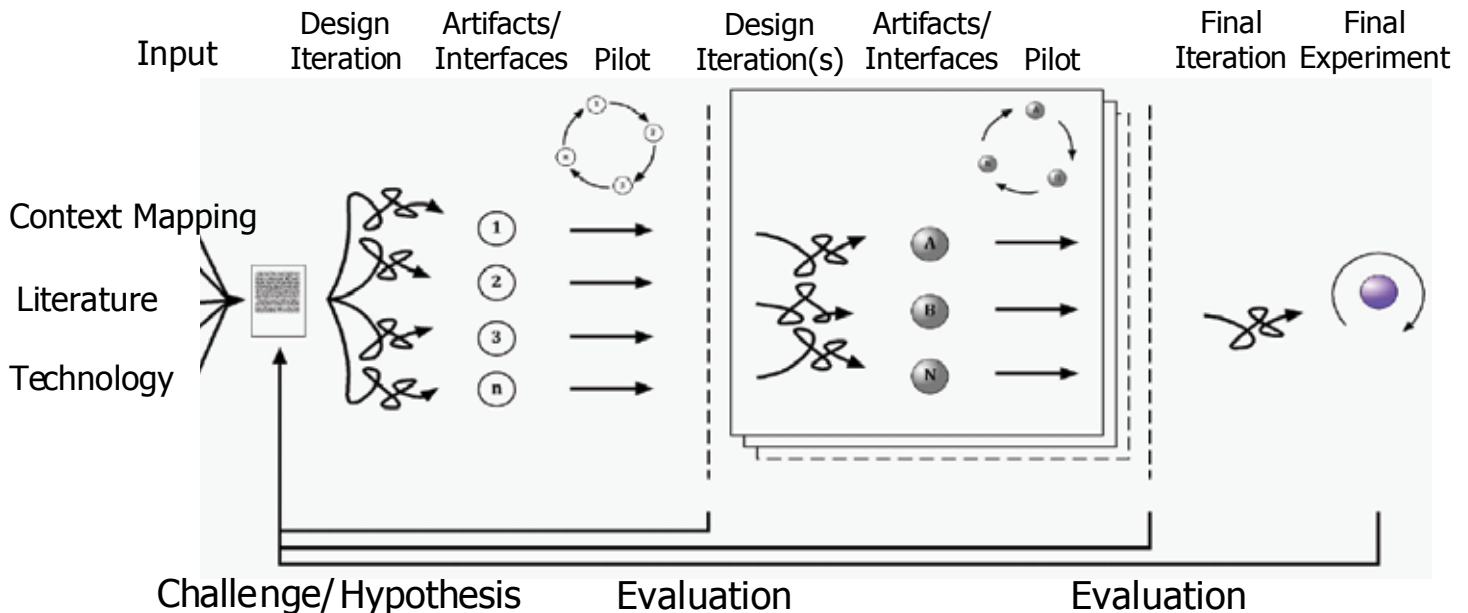


Tangible cultural interface¹¹

We demonstrated that illiterate and semi-literate villagers can access and directly benefit from health information services providing that a means can be found to power a system and the user interface is simple. In the PhD work of Vikram Parmar, under the supervision of Cees de Bont and myself, a tangible interface, similar to a set of tools was used to access health information. The test village had only intermittent power, thus a solar battery charged system was proposed. Health related information was displayed in a socially-culturally engaging, persuasive manner. For example, by visualizing an accepted authority, or by deploying a filmed street play or puppet show¹¹. To study the influence of complex cultural barriers to change research grounded in the field is needed.

Increasingly, we are conducting more and more research in the field based on a method which I call "empirical research through design." Research hypothesis are embedded as controllable variables in a working prototype which is studied in a real-world context. Results can be analyzed using formal statistics common to the social sciences. This method bridges the world of building applied design knowledge, with the need to

ERDM model¹²



develop fundamental interaction design theory.¹² In a recently completed survey of over 500 papers over the past two years in the leading conference on interaction design, CHI (Computer Human Interaction), we found an upward trend, from zero to 15%, of in-field studies in which a product or service running on either physical or mobile carrier platforms, was left with the user for evaluation.

Let us take a look now at studying sustainable behavior in households in the Western world. We face a dynamic and complex future, due to societal issues such as an aging society, looming energy and water shortages, climate change problems and growing constraints on mobility. Within this context, the home plays a key role; it is one of the key drivers in energy and water consumption while influencing our quality of living, lifestyle, and well-being.

Sustainable behavior change involves a number of interrelated factors, including motivation and perceived ability which can be influenced by the design of products and services and opportunities which relates to the context in which decisions are made.¹³ Context includes the built environment, financial rewards, legislation, and the provision of energy-efficient equipment.

To support the measurement of physical behaviors in the home and office relating to sustainable practices, a portable testing platform has been created. Together with Aadjan van der Helm and Marc de Hoogh, we have developed the Context Aware Suitcase or simply called CAS.

Essentially this is a physical toolbox on wheels that contains a small computer hosting a database of activity sensing algorithms and reusable blocks of program code along with activity sensors and display actuators. Within a matter of hours an environment can be equipped with wireless monitoring. Direct user feedback relating to product or service usability can also be collected.

Towards studying sustainable behavior, a proposal



Prototyping toolbox

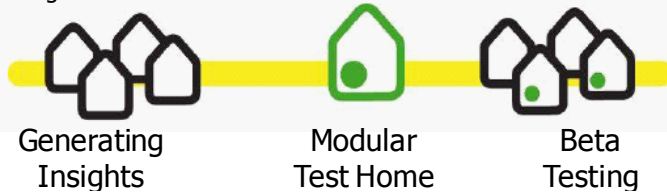
for national funding to build a lab for studying the relationship between sustainable behavior and design innovation was submitted on behalf of TU Delft, by the European funded LivingLab Delft team, under Dan van Eijk, involving the faculties, Industrial Design Engineering, Science and Engineering, Faculty of Technology, Policy and Management and Architecture.

As a multidisciplinary effort, a wide range of relevant industry and research institutes in the Netherlands were invited to include their expertise in developing the lab plan.

The Living Laboratory can help build insights into sustainability and the newly emerging concept of "interactive social research". Participants spending time in the Living Laboratory can be connected to a community of stakeholders to exchange information about the sustainability of systems, services, and reflect on the implementation of sustainable actions and practices.

The lab dwellings are planned to be energy neutral or positive and will include state-of-the-art sustainable design and architectural components which can be modularly changed. Research is projected along three

Living Labs



tiers: early insight studies, user studies involving daily routines in a living laboratory and beta user testing of prototype product and service designs in target homes.

Along with living labs, the emergence of social drivers as a force for change can be seen. For example there is a growing number of transition towns, which are grass-root community efforts aimed at adopting sustainable technologies and living practices.

Furthermore cities such as Melbourne and Vancouver have begun to plan residential and office buildings which will be built as environments for studying sustainable technologies and occupant behavior.

Along with the emergence of transition towns is the emergence of social networks aimed at energy savings by creating shared community awareness. Companies such as Microsoft and Google have recently launched networks which can be linked to off-the shelf energy consumption monitoring equipment. The notion of communities of households suggest a re-examination of how we define a domestic infrastructure.

Traditionally, a within household approach to infrastructure has been taken, emphasizing systems that will make homes more smart and sustainable. In actuality, houses are connected via infrastructures to commercial corporations and governmental agencies that not only produce, but also sell, regulate, and move resources around that determine the exact costs of consumption.

A community of users may have more say if electricity on the grid is generated via coal, wind, or waterpower, providing such insights are made available.

Interactive energy saving games have also been studied in our faculty and elsewhere as a means to enhance community awareness and positively influence the adoption of energy savings measures. Privacy issues and security will need to be ensured to develop consumer trust in networked information.

Awareness by end-users of energy consumption will most likely become more salient as we shift from a centralized infrastructure model of electricity supply as almost invisible commodity to a demand based system which emphasizes end-consumer services and needs such as efficient thermal heating and lighting solutions.

This shift will be supported by the emergence of smart grids which will help communities of users to locally produce and distribute energy, combined with smart household appliances that can help manage grid peak consumption levels.

In short, in a demand-driven service market, the consumer will become increasingly involved in decisions relating to sustainable practices, including energy consumption, as well as local energy generation and distribution as part of an emerging distributed economy.

One can envision a host of other shared smart living product-services, including home care, local food production and distribution, and working at home in a connected social setting, to reduce demands on the transportation infrastructure.

Within this context the combination of the living labs to study user behavior, and social media services to connect consumers and stake holders, provides a means to study and develop demand-driven sustainable services.

In terms of designing interactive sustainable environments and services we can learn from Biomimicry, a term coined by Janine Benyus, which is about innovation inspired by nature.¹⁴ Smart buildings should be able to breathe and adapt to outdoor climate changes and indoor activities much like a penguin can regulate

body temperature to within 2 or 3 degrees given outdoor temperatures of 20 or minus 20 Celsius and activity levels.

The length and degree of layering of feathers, flapping wings, laying on the black or white side of the body, and blubber for heat and energy storage are part of a smart system to regulate body temperature.

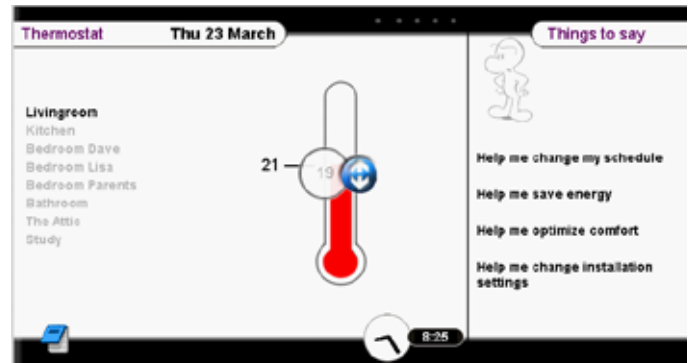
In earlier work by my first PhD student at TU Delft, Elyon De Koven, we focused on the role of an intelligent thermostat that could collaboratively interact with the user and give suggestions on saving energy and improving comfort based on system observed room usage and activity patterns.¹⁶

The thermostat application contains hierarchical task models which are used interpret and guide the user's intentions as expressed via the touch screen or by speech. Low level intentions are communicated by selecting options on the screen, while higher level goals are addressed via the "things to say" screen.

Similarly smart rooms should completely switch off all products when no one is around. A phantom standby load occurs in most appliances that use electricity, such as VCRs, televisions, stereos, computers and kitchen appliances. The British Government's 2006 Energy Review found that standby modes on electric devices accounted for 8% of all British domestic power consumption. Plug level remote control is already afforded by products such as Plugwise which is now being tested in offices at our reactor institute.

To inform home occupants about sustainability, in the PhD work of Martijn Vastenburg we explored how home messaging could be given in a non-obtrusive and context sensitive manner.¹⁵

Based upon user-defined preferences messages could either be displayed in the foreground as a moving image, with dynamic room lighting changes, or as a static background image that slowly came into view.



Emperor penguins; photocredit: Glenn Grant, NSF (top). Intelligent thermostat¹⁶ (bottom).

Towards developing products which take the user and context into account, I introduced about five years ago a masters level course called Interactive Technology Design as a part of our Design for Interaction master's program.

Central to the educational approach are formal lectures on design theory combined with learning tools and hands on prototyping building. For example one of the groups last year under supervision of my PhD student, Thomas Visser considered how social connectedness for the elderly living independently at home could be enhanced via an interactive product. The student was inspired by Snowglobe awareness prototype.



Panorama of ID-Studiolab



In this video of a student project, inspired by Thomas' work we see how two boxes containing pictures are networked to create an emotional link, motion detection near one box triggers a light on the other box which can be situated in the home of a family member or friend.

We had a 40% increase in student numbers this year in our Design for Interaction masters program, placing a heavy burden on existing labs.

By combining research labs with graduate student workshops we can use space more efficiently and spark the creativity and imagination of students in our faculty. Joint labs would further enhance the interaction between research staff working on projects in the areas of mobility, living and work, and health and students in related project areas.

Towards building links in education, we started a new joint minor in September with the faculty of Architecture called Interactive Environments. We envision expanding the minor next year to include teaching staff from the faculty Science and Engineering, while including projects in the area of sustainable living and work.

ACKNOWLEDGEMENTS

Finally, a few words of thanks. Not long after I arrived in Delft from Philips Research, the apparent need which I saw for developing a creative and inspiring interaction design research lab was shared by three talented people, Kees Overbeeke, Paul Hekkert, and Pieter Jan Stappers. This led to the ID-Studio lab with Pieter Jan as our appointed lab director.

With a high level of commitment of people such as Aadjan van der Helm, the studio lab has developed into a thriving design research environment. Behind the scenes talented people, including Rob Luxen and Marc De Hoogh have pushed hardware and software boundaries to develop working products based often on radically creative design ideas.

Competent managers in any organization come and go, and there is always an element of luck involved.

We are most fortunate with Cees de Bont as our dean and Daan van Eijk as department head. We are increasingly growing in international strength.

I am sure your success is most appreciated by the dedicated pioneers of our faculty, including Hans Dirken

who is here today.

Along with managers, there is an element of luck when you hire a PhD student. Again, I feel fortunate in having had such excellent PhD students, who have succeeded so well in further developing their academic careers, Elyon, Marco, Miguel, Martijn, and Vikram it has been an honor to work with you.

I look forward to working with my new PhD students and will bestow upon them the zeal for scientific enquiry which I adopted from my PhD mentor, Don Bouwhuis. The Design For Sustainability group with Han Brezet, Conny Bakker, and Sacha Silvester with whom I have been working closely with this past year, is a source of endless inspiration. A special thanks to Shauna in helping organize the events of today and visuals and to Monique for working behind the scenes.

Closer to home is my family. Part of my upbringing included hours following my father around at the Stanford University library and helping copy volumes of books at the Mitchel Park library, not to mention my Mother who filled our house with music and a passion for learning and work. I am very grateful that they are here today along with my two very special sisters Melanie and Terry. Though you live far away, my in-laws and family here in the Netherlands; Hans, Lotti, Ezra, Rivka and kids, have been of great support.

My boys, Jonathan, Nadav, Gideon, and Naftali are my daily source of pride and joy. Last but not least, to my partner for life Jose, I say our journey ahead has only begun and what a great time we have had.

I would like to thank all of you for joining me here today and thinking about the challenges in understanding and influencing sustainable behavior through design.

In the words of Albert Einstein - "All meaningful and lasting change starts first in your imagination and then works its way out. Imagination is more important than knowledge."

I have spoken. Ik heb gezegd!

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