

The State of Responsible IoT 2020

From Good Things
to Good Systems

THINGS

We don't despair.

(Michelle Thorne)

**ThingsCon Report:
The State of Responsible Internet of Things 2020**

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Preface

Andrea Krajewski

In Search of the Good

Every year, our report explores the state of the art in the development and design of responsible networked living environments. This year's report is dedicated to the search for the good.

J. Lund, founder of the Lianeon Project, described 2020 as the actual start of the 21st century (cf. Lund, J., 2020) at the beginning of the year, referring to the state of the art in space technology that we have achieved. But is it really the technology that will bring us a desirable future? And if yes, what for?

In an extreme situation like a pandemic, we are often literally alone with ourselves and hope for technology to rescue us. Read with a wink the article by **Davide Gomba** "[At Least the Sex is Better?](#)". Here he explores this unusual moment of living through a pandemic and how this might impact intimacy through connected technology. After all, in times of social distancing, an increased reliance on intimate technology means that these technologies need to be reliably good. Follow Davide on a whirlwind tour of the history of sex tech, the role of patients, the ethical issues of hackable chastity belts and the impact these technologies might have on long distance empathy.

At present, the pandemic seems to force the world to reflect: What is really helpful and good under these conditions? Long overdue reforms, such as the introduction of digitalisation in schools and the world of work, are now being accelerated by necessity, but in times of lockdown we are also becoming aware of the importance of our own social relationships and social responsibility. The image of a world that we used to believe we could control through constant technological progress and economic growth is crumbling.

Why now? Environmental problems, surveillance capitalism, social inequality, wars, flight, hunger have been known for years and have a firm place in our news reports, but the root causes are not being vigorously and consistently addressed. It seems that the world has become irreversibly stuck between the belief in progress and capitalism. And this year, on top of it all, we sit isolated at home and look at pandemic deniers right on our doorstep. To write about the good in such a situation seems absurd.

But if we want to eliminate the bad, we must necessarily think about what the good is. And when could this be done better than in a crisis that calls into question everything we are used to anyway?

The image of a world that we used to believe we could control through constant technological progress and economic growth is crumbling.

So what is good? **Harald Welzer**, sociologist and social psychologist, director of the FuturZwei Foundation and co-founder of the Council for

The status quo that traditional sustainability thinking attempts to maintain is detrimental to the survival of the earth.

Digital Ecology, doubts in his contribution "[What are Promising Definitions of the Good in the Interaction of Society, Design and Technology?](#)" that our perfected optimisation drive leads to good. Better is not necessarily good – on the contrary. It sometimes makes more sense to prevent products than to improve them. **Elise Marcus**, designer and founder of the Mother Earth Network is an advocate of Planetary Centred Design. In her contribution "[Re-Generative Design](#)" she explains that there is really no time left for circular design. The status quo that traditional sustainability thinking attempts to maintain is detrimental to the survival of the earth. We need to not just prevent things from getting worse, but improve them: Elise Marcus pleads for a design that helps to repair the environmental damage of the earth. Here the concept of re-generation is particularly interesting. By "generative design" we mean a design generated by rules and algorithms based on data, beyond any human-creative interpretation. And perhaps it is also quite reasonable to focus on the facts rather than selling dreams and identity illusions by product design. Marcus says that the goal of regenerating the earth could be helped by giving citizens access to their own data to give them insights and conclusions for their own environmentally improving behaviour. This is a first step, but it means that people are opening up to the uncomfortable truths and no longer see themselves as the centre of the universe circled by over-zealous designers.

This idea of the designer whose very task it is to represent the interests of users has nothing to do with the reality that most professional designers experience, in which they can only survive by equating users with target markets.

Designers are, as **Alexandra Deschamps-Sonsino** explains in her article "[Doing Good: a Design Impossibility?](#)", in any case badly placed for creating good things. On the one hand, too many – often bad – decisions have already been made by the time designers enter the process. On the other hand, as service providers, designers are almost by necessity caught in the capitalist framework. But wait, aren't we designers the good guys, the advocates of the users? The answer is simple and frightening. This idea of the designer whose very task it is to represent the interests of users has nothing to do with the reality that most professional designers experience, in which they can only survive by equating users with target markets.

So designers alone won't save the world, especially designers who create more and more products for the sake of the product life cycle. Then again, there will not be one profession that will achieve this goal, it will take a concerted effort.

Perhaps the objectives of design and development should be reconsidered anyway. The present report provides some suggestions for this. In their article "[Ludicrous IoT Dreams](#)", **Dries De Roeck** and **Iskander Smit** argue for democratising design, i.e. taking it out of the hands of companies and giving it back to people as a ground for experimenting with their own desired lifestyles. In other words, less planned efficiency, less perfection and optimisation for the masses, but more responsibility and self-determination by the citizens. In his

contribution "[What Designers can Learn from Political Science](#)", **Peter Bihr** suggests that design should cut off the old pigtail of creative genius and allow many more voices to be heard in a holistically considered design process. The parallel with political science here is that any form of governance is more just if those who will be subject to the decisions, rules and laws are represented in the decision-making process. Having a voice is seen as more important than the results of the decisions.

According to **Simon Höher** and his article "[Designing good Systems after 2020 - What to make of a Year of Crisis](#)", designers should stop offering solutions to problems anyway. This is just because there are no longer any simple solutions to the increasingly wicked problems. Instead, designers should start to explore the gaps that prevent solutions to problems together with other disciplines, not to keep them secret, but to consider their existence as part of a solution.

*Courage to leave a gap,
no more paternalism,
no more nudging, no more
behavioural design,
no "I know what's best for you".
No governing.*

*Accessible, easy-to-understand
research, education and
selectable options may be the
best that can be offered by
designers and developers now
to help people make their own
informed decisions.*

Gabriele Zipf and **Antja Karoli** curate the exhibitions at the futurium Berlin. In "[What's the Next Good Thing?](#)" they describe this idea of personal responsibility further, that the question of the next good thing must be answered by each individual. In the exhibitions in the Haus der Zukünfte – the house of futures – design ensures that people can engage with possible futures, understand and question technologies and their impact on the environment and society, and make informed decisions for their own future wishes. Accessible, easy-to-understand research, education and selectable options may be the best that can be offered by designers and developers now to help people make their own informed decisions.

Michelle Thorne is one of those enlightened thinkers who does not shy away from the big picture, such as trustworthy AI and a sustainable, climate-friendly internet as an EU policy issue. While design has been dealing for some time now with the question of how AI systems and users can interact and coexist with each other in the future, she shows together with her co-author **Fieke Jansen** in her contribution "[Trustworthy AI and the Climate Crisis -- Towards better policies in the EU](#)" at what ecological price this is happening. Trustworthiness includes not only data protection and transparency, but also human well-being through habitat conservation.

The often complex strategies and concepts for a better use of resources and care for the well-being of our ecosystem with all the existences within can be explained by design artifacts and brought to life for trial

In doing so, conventions and patterns are intentionally broken in order to provoke an openness for other solutions.

and error. This is how **Michael Stead, Adrian Gradinar** and **Paul Coulton** describe in their contribution "*Must All Things Pass? Designing for the Afterlife of (Internet of) Things*". In a speculative design scenario they describe how AI-supported things will be able to enforce their own right to repair in the future and thus protect the environment. Here again, the mission "Good" is not to offer the finished solution, but to point out problems and provide a provocative suggestion as to what a basic approach to dealing with them might look like. In doing so, conventions and patterns are intentionally broken in order to provoke an openness for other solutions. What would be, the authors ask, if a greater degree of sustainable decision-making were to be delegated to the things themselves rather than to their users?

To redesign the relationship between increasingly autonomous things and their users, **Elisa Giaccardi** and her team at TU Delft are researching with the Things Centred Design approach. She and **Felipe Pierantoni** dedicate their contribution "*The Repertoire of Meaningful Voice Interactions. How to Design Good Smart Speakers*" to the underestimated influence of the linguistic relationship between people and devices with speech interfaces on the further social behaviour of humans. The fact that the perspective changes from the design of a tool to the influence of the tool (cf. Culkin, J., 1967, 51–53, 70–72) on the design becomes clear here once again.

Design, it seems, must redefine itself in order to be able to produce good systems.

Design, it seems, must redefine itself in order to be able to produce good systems. The time when it was already a giant leap forward, when it was only possible to recognise the needs of the user and satisfy them in an exciting way, not only seems to be over, but this practice seems to make everything worse (Monteiro, M. 2019).

Soon we will all live in such a systemic network consisting of countless components and independently acting (human and non-human) actors that it will become impossible for design to concentrate on just one player – the human being – in a meaningful way.

Maximilian Brandl and **Philipp Kaltfren** plead for a radical change of perspective in design in their article "*Entangled Interfaces - The Design of Post Human Centred Interfaces*". The world to be designed is becoming increasingly complex. Soon we will all live in such a systemic network consisting of countless components and independently acting (human and non-human) actors that it will become impossible for design to concentrate on just one player – the human being – in a meaningful way.

The role of design has changed again and again over the past decades. From artistic craftsmanship to supporting industrial production and user-centred design, the field of activity has expanded from the design of objects to the creation of interactions, processes and systems - and this increasingly in interdisciplinary teams and with the participation of those for whom design was created. Design is moving away from the design of solitary objects towards complex systems that first need to be identified and understood. The key issue is less and less how technology can be designed to be humane, but how co-existence of the existences populating the earth can survive collective-

ly and for the well-being of all.

When it comes to the question of what will be good in the future and how we want to coexist, designers can be questioners, provocateurs and offer options at the same time. In the 1950s, designers sketched seductive images of the future with flying cars, rolling robots and residential towers. They are capable of making imaginary pictures irresistibly tangible and real, so that others can engage with these ideas. We need new images of the future as a basis for determining how we all want to live in the future. Designers can bring them to life as models, create transparency, enliven test rooms to enable us all to decide how we want to survive.

With great power comes great responsibility (cf. Avi, A., 2002) Given the state of societies, political systems, technological developments and climate change, the question of good is not a question of luxury, aesthetics or progress, but an existential one.

The answer may well lie in the attitude with which we will tackle a challenge that seems almost impossible: Not as heroes, but as part of the problem.

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Greetings from the Editors

We would like to thank all our wonderful authors for this issue. The fact that you are thinking about the good in a time of particular professional and private stress gives us hope for the future.



Andrea Krajewski, is an industrial designer and professor for the Design of Interactive Media Systems at the Mediacampus of the University of Applied Sciences Darmstadt. Here she established the interdisciplinary study course Interactive Media Design, the UX-Lab and the THINGS-Lab – the current centres of her research.

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Peter Bähr, explores how emerging technologies can have a positive social impact. At the core of his work is the mission to align emerging technologies and citizen empowerment. To do this, he works at the intersection of technology, governance, policy and social impact with foundations, public and private sector.

He is the founder and Managing Director of The Waving Cat, a boutique research and strategic advisory firm built around this mission. He also co-founded and chairs the board of ThingsCon e.V., a not-for-profit that advocates for responsible practices in Internet of Things (IoT). In 2019, he co-founded the Berlin Institute for Smart Cities and Civil Rights.

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Orientation

What Are Promising Definitions of Good in the Interaction of Society, Design and Technology?

Harald Welzer

Good is better than "better". After all, all the advertising that the digital economy, especially in its Silicon Valley version, offers about itself boils down to the unrelenting assertion to "make the world a better place" (with all sorts of categories below the "world" that could definitely be made "better"). In this impetus for improvement, the question is lost whether the things that are viewed solely from the point of view of optimization are actually those that should remain in the world, regardless of whether they could be made better or worse digitally.

It may be much more reasonable to do away with things than to improve them.

From the point of view of the sensible organization of a society, the question is much more likely to be how to ensure a good life for all members of society - i.e. equal opportunities for education and development, health and pension benefits, social security, participation, etc. It may be much more reasonable to do away with things than to improve them. In a society that wants to offer equal access to mobility, for example, it is of no use to improve a means of transport that is only used individually and is not affordable for everyone - after all, this is in no way beneficial to a mobility system for all. On the contrary, in a public transport infrastructure that is digitally orchestrated in such a way that it guarantees good service for all, private individual transport literally is in the way. In other words: the car does not have to be improved, it has to go. The same applies to endless other circumstances: a cruise ship cannot be optimized because it is wrong. The same applies to disposable grills, Alexa, face recognition and many more things: they must go.

Many things only came into the world because someone saw and realized marketing or control opportunities

After all, many things only came into the world because someone saw and realized marketing or control opportunities. Or to put it more mildly: Because, as in the case of the car, they fit into a different socio-cultural time. But if they no longer fit, these things, then you cannot improve them.

The search for the good, and for the good things, needs an independent variable: good for what?

Therefore, the search for the good, and for the good things, needs an independent variable: good for what? A use, an atmosphere, a social purpose, an increase in comfort, a pleasure? If this independent variable is not defined, there will suddenly be cars that are so incomprehensibly big, heavy and ugly that in a hundred years' time, technical historians will never be able to explain why such a thing existed - espe-

cially in times of severe environmental and resource stress. They exist because the question of "good for what" was not asked, and only the "better" remained. And thus, the "better" wreaks havoc.

It's not beautiful to get tips from Alexa about where to get something cheap.

But in my view, the "good for what" is by no means just a functional category; it can also involve a lot of non-functional things - playing a piece of music, theater, all cultural creations. And just as well a garden, a meal, a wine, sex, stories and other matters that should have an added value of the "good" beyond the functional, so that they are good. Inevitably, there is also the equally difficult but indispensable category of the beautiful, which urgently needs to be given some care and attention. It's not beautiful to get tips from Alexa about where to get something cheap, and it's not beautiful not to be able to cross the road, even if there are only electric cars driving around and authoritatively limiting the available space. Also not beautiful: houses built out of money or palaces rebuilt out of a lack of imagination (also something that future historians will not be able to explain).

Good design is not a technical question, but a social one.

Beautiful may be environments in which you are not heteronomously bothered by things, algorithms, sounds and emissions that you did not want, and beautiful may be neighborhoods where people feel comfortable enough to be interact well with one another, and with things. In other words, good design is not a technical question, but a social one. It inevitably underlies the cultural practice of design. This does not mean that its results have to be consensual, standardizable, universally valid. On the contrary: only something that can be argued about can be good. You can't argue about crap. Or as Gerhard Richter once said: "Creating incomprehensibility completely rules out any rubbish, because rubbish is always understandable."

Author



*Picture (c) S.-Fischer-Verlag,
Photographer: Wolfgang Schmidt*

Harald Welzer is director of FUTURZWEI. Stiftung Zukunftsfähigkeit, which supports and promotes practical and experimental strategies of social transformation.

In numerous lectures, articles and interviews he advocates socio-ecological transformation and the preservation of an open society.

In addition, the sociologist and social psychologist is Professor of Transformation Design at the University of Flensburg and teaches social psychology at the University of St. Gallen as a permanent visiting professor.

As a critical observer of digitization, he published „The Smart Dictatorship“ in 2016.

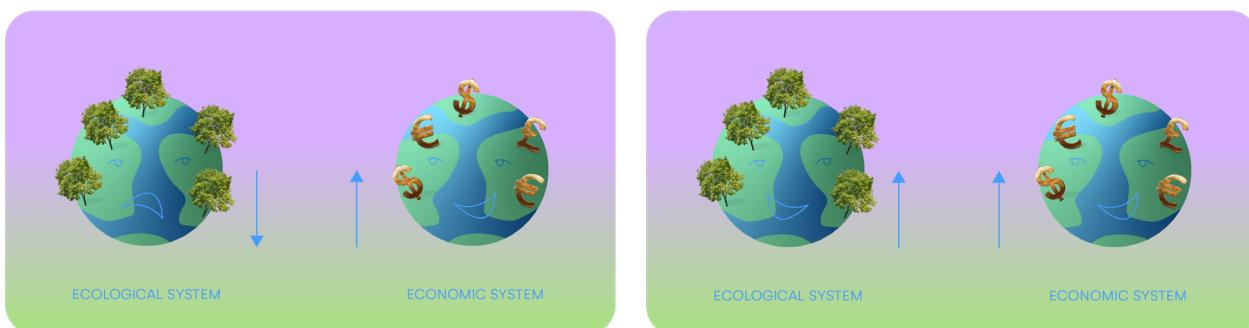
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RE-Generation – Why IOT Citizens Are going To Save the World and Themselves Along the Way

Elise Marcus

Let's begin with looking at the word sustainability: The ability to sustain. This word has been appointed to talk about the issues around a disbalanced ecosystem and how to sustain a well-balanced one. When looking at the data over the past decade, we see unfortunately that there is a decline of balanced ecosystems to sustain and an increase of systems that need a lot of reparation before we can begin to think about sustaining them. Let's start this paper therefore with this premise: To reach for sustainability, we need to work on our abilities to change.

To reach for sustainability, we need to work on our abilities to change.



The transition

Our ecological system is directly linked to our economic system. When a land owner has to make the decision of cutting down the trees to be able to grow crops to sell or to leave the forest and earn nothing, the decision is easily favoring the economical side: Get paid now. When all land owners take similar actions, the health of the ecosystem will decline rapidly. Which eventually means that the landowner will be the one that might be personally affected by the negative side effects of the loss of forest.

Currently the system can generally be described as an inversely proportional system. Simply said: Economy thrives when ecology suffers and ecology thrives when economy suffers.

Economy thrives when ecology suffers and ecology thrives when economy suffers.

We need to transition the way the two systems are impacting one another. So that we can start working as one smooth engine.

There are many reasons why we should transition to a sustainable system. Here is one: Because humans are right there in the middle. The effects of these unbalanced systems are tangible within our lifestyle. Like holding on to two ropes, while both sides are being pulled on, we feel ourselves falling over trying to hold on to both simultaneously.

Imagine you visit the supermarket and you have to make the decision on what type of food you should buy. A positive choice for team ecology would be to buy the locally produced, biological item instead of the in plastic-wrapped factory-made processed item. But team economy wins if the choice has to be made on price and convenience.

If you are conscious about making a sustainable choice, you can easily find yourself becoming the embodiment of the cognitive dissonance that the two systems reflect on you. Over the past few years psychologists have seen a rise of eco anxiety and climate anxiety. These anxieties have symptoms that are comparable with the PTSD symptoms: Having night sweats, nightmares, and flash-forwards to doom scenarios. (Susan, C., 2020) (Pihkala, P., 2019)

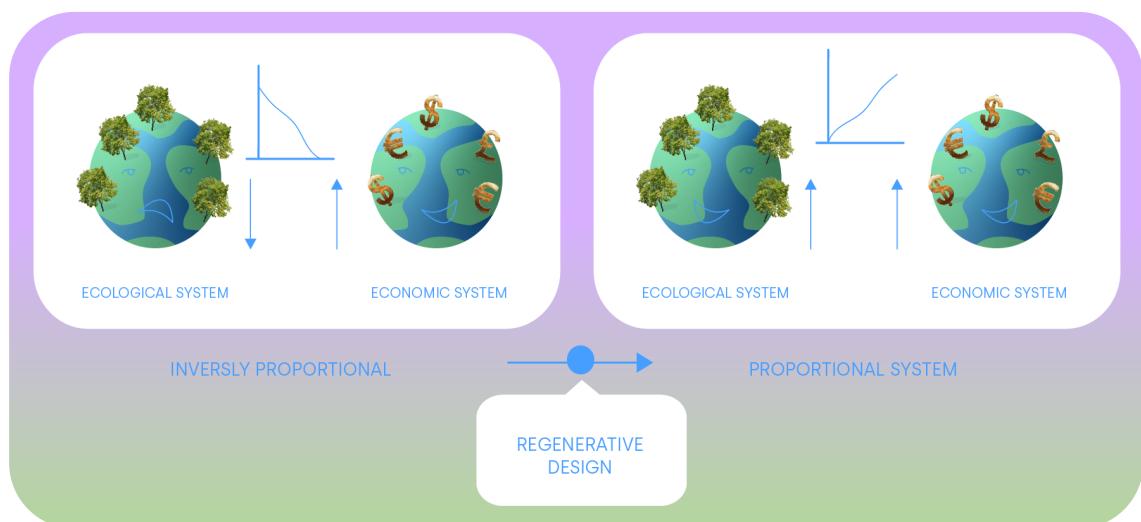
Besides anxiety we also see a rise of depression and concentration issues. Not to mention the rise of physical issues caused by environmental pollution, such as asthma, lung diseases, allergies, and more.

Regeneration of the system

What I am proposing is to approach this transition from a regenerative design approach. Regenerative design is a process in which we focus on the complete system and how to repair, renew and revitalize the resources within this system. While a circular approach focuses on having a neutral impact on the environment, regenerative design focuses on leaving the environment in a better state than before the product.

It appears that we might have forgotten that humans are part of the ecosystem as well. Therefore, when we are addressing the regeneration of the ecosystem, we need to include our own regeneration of our mental and physical health as well.

Regenerative design focuses on leaving the environment in a better state than before the product.



The challenges

Cleaning the earth, while making products sounds like a sustainability dream. Designing our future products brings with it a number of practical challenges - consider these four:

1. What to measure: Defining the ecosystem

How do we define the stakeholders and the state of the ecosystem we want to regenerate?

2. How to measure: Methods

Measuring an ecosystem asks for a wide range of different data, which needs to be analysed and managed. Accurate methods on how to measure and determine the improvement of the state is crucial.

How can we gather this wide range of data?

3. With what tools

With what tools can we collect enough data so that we have an accurate depiction across the environment?

4. With whom: Engagement

Involving the citizen to be able to improve their state as well as that of their environment introduces challenges of its own: How do you generate engagement to participate in the regeneration process?

The opportunities

To be able to tackle the challenges, we need take a look at the opportunities that lie ahead:

1. What to measure: Defining the ecosystem

Within an ecosystem there is not one center point. Nothing is in the center and at the same time anything can be at the center of the problem. Sometimes it might help to put another entity than humans in the center for a bit, and to think from their perspective. So that one can better demarcate the scope of the system that one might want to act in. (Aksin, Z., Armony, M., & Mehrotra, V., 2007).

Within an ecosystem there is not one center point.

2. How to measure: Methods

Where the problem hits the citizen, the citizen holds the data to the answer on how to turn this system around. Using citizen science creates an opportunity to gather a wide range of data. (Sauermann, H. et al., 2020) Not underestimating the citizens ability to learn is key. With the right tools, the citizen contribute to the analysis as well.

With the right tools, the citizen contribute to the analysis as well.

3. With what tools

The rise of IOT brings therefore a wide range of possibilities. From open data to the simplification of DIY sensors. Nowadays we see that there are so many sensors included into products already. Making use of the components that are included into smartphones such as the camera, GPS, accelerometor and more, and finding ways to combine those to become the sensor.

4. With whom: Engagement:

Involving those who are already experiencing a certain pain point from the issue you are trying to solve can be a part of the approach. The whole system can be designed as an experience in which the citizen is involved. To create intrinsic motivation, a user needs to feel that their actions are a part of their identity. Many are already walking around feeling the impact of the contradiction of the two systems working against each other. Taking responsibility to turn this paradox around can relieve eco anxiety. Designing the experience of gathering data itself can be healing: Studies have shown that concentration and positive mood approves when surrounding yourself with greenery for extended periods of time. Measuring your ecosystem can therefore become a mindfulness exercise on its own. (Kaplan, S., 1995)

The whole system can be designed as an experience in which the citizen is involved. To create intrinsic motivation, a user needs to feel that their actions are a part of their identity.

Conclusion

There are lots of new opportunities to combine science with citizen monitoring. We live in a world in which sharing your knowledge online is one TikTok away, where children can make a sensor in elementary schools and mindfulness apps are ubiquitous. It is up to the IOT-designers to take those opportunities and transform them into engaging experiences in which we can involve citizens to participate in the transition towards a truly sustainable future.

It is up to the IOT-designers to transform data monitoring into engaging experiences in which we can involve citizens to participate in the transition towards a truly sustainable future.

Applying regenerative design, through citizen-based monitoring can be implemented in a wide range of social and ecological sustainability issues. Involving the citizens and the tools they have already available can allow us to be able to map out the system more clearly.

This way we can create an internet of things that play a crucial role in the goal of connecting the wealth of our economy to the health of our ecosystems. When citizen science is included into IOT, we might save the world and help ourselves along the way.

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Author



Studio of Earthly Matters is founded by **Elise Marcus** and is specialized in transformation design within the field of sustainability. The studio strives to break through the communication barriers between entities. Whether this is between humans, or interspecie communication such as plants and humans. For their project 'Earthly.ai', the studio is currently developing a game in which users can train a general ai botanist that can represent plant life on earth. With a goal to give citizens hands on tools to grow a greener, healthier and more diverse living environment for themselves.

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Design Criticism

Doing Good: A Design Impossibility?

Alexandra Deschamps-Sonsino

I've given talks at a number of Thingscon events and my call for political action last year still feels relevant. But I'm also finding myself thinking more philosophically about our relatively recent foray in 'good internet of things'. In light of a difficult year of real global suffering, it's important to reframe our professional stance. To recalibrate and reinvestigate our interests as a community.

*It's not enough to say 'we've designed a solution'.
The important next step is to convince people of its personal and collective value.*

Early on in the pandemic, many friends got involved in 3D printing and laser cutting PPE (personal protective equipment) (IOT London, 2020). This was before we knew very much at all about the virus. It turns out visors might be completely useless on their own (McCurry, J., 2020). Wearing a mask, arguably a cheap way to 'do good' has become a complex discussion (Wong, T., 2020) on the usefulness of prevention and its impact on public life. Seven months in, it's not a case of whether someone has access to the right PPE, but whether they choose to use it or not. Doing the right thing has never felt more complicated in light of social, ethnic and economic disparity. It's not enough to say 'we've designed a solution' (Haque, U. & Deschamps-Sonsino, A., 2018). The important next step is to convince people of its personal and collective value.

There are many parallels with the movement for 'good design' in the internet of things. Ever since the 2012 event (Open IOT Assembly, 2012) I organised with Usman Haque exploring the concept of openness in the internet of things, a part of the global community has placed its efforts on designing 'solutions' for better decision-making. But just like when we design visors, are we really in control of all the necessary information? Are we accidentally badly placed to suggest solutions? And what are the limits to our definition of 'good', 'better', 'responsible'?

No matter the design decisions, how the product is discarded will mean the difference between landfill, repair or reuse.

After all, by the time someone has decided to make a connected object, we could arguably say the damage is already done. No matter how they design it, if they didn't do enough market research, they will only sell a few hundreds or thousands during the lifetime of the company. Their components will come from Asia, manufacturing may not be local and data centres based somewhere else still. When they eventually close their doors, or sell to the highest bidder, the product may lie in limbo, be bricked, and inevitably be discarded by its owners. No matter the design decisions, how the product is discarded will mean the difference between landfill, repair or reuse.

It's impossible to get over the fact that as an industry, we expect our

Very few designers want to think about the end of life of their product, choosing instead to focus on the first 15 minutes, the ones that secure the purchase.

A designer is very much a 'customer-centered' professional and rarely interested in acting outside of a capitalist framework of getting paid for their time.

We are not a neutral actor in defining 'good' because we're actively involved in shaping the material culture which produces as much harm as it does joy

customers to have an incredibly high level of technical literacy, an ability to think systematically and a desire to do good too. We think our virtuous actions are somehow contagious. They are not. Even the 'greenest' or 'best' purchase can end up in landfill but very few designers want to think about the end of life of their product, choosing instead to focus on the first 15 minutes, the ones that secure the purchase.

An added difficulty has been the abuse and dilution of 'human-centered' as a useful term to describe 'good', 'better', 'virtuous'. We should start to decline it as 'customer-centered', 'citizen-centered', 'family-centered', etc. to highlight exactly where the focus lies. To say that the systems others build aren't 'human-centered' is naive. They're probably very much 'customer-centered', the only real value to a business that wants to survive. It's not only naive, it's hypocritical. A designer depends on a client being able to pay them for their time.

A designer is very much a 'customer-centered' professional and rarely interested in acting outside of a capitalist framework of getting paid for their time. Their interest in 'the end user' is in fact an interest in the 'target market'. To be interested in any other framing would be to enter into the nebulous arena of the artist which sounds to many more dangerous than being mistaken for an engineer.

Being aware of our own blinkers as designers is as important as telling others what we think they should do. At many points in our professional lives, we'll be guilty of magical thinking, short-termist approaches, laziness and techno-centrism. Without a good hard look at ourselves, we can't hope to intervene elsewhere, or get involved politically in more collective ways. We are not a neutral actor in defining 'good' because we're actively involved in shaping the material culture which produces as much harm as it does joy.

Defining someone's path to a 'better' internet of things product has always sounded like a top-down activity, no matter how many people were involved in coming up with a framework. It's time we admit we are as professionally flawed as the startup founders and product owners we claim we want to help. Everyone will benefit from a bit of humility and collaboration in design so we can collectively start the heavy lifting our industry and our planet needs.

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She ran the internet of things meetup in London for 8 years, and helped the community create BetterIoT, a free checklist to help founders and product managers make more ethical decisions. She was the founder of the Good Night Lamp, a connected product included in the permanent collection of the London Design Museum as a key example of the internet of things. Two of her projects are in the permanent collection at the Museum of Modern Art in New York.

She was named 1st in a list of 100 Internet of Things Influencers (Postscapes), 2nd in Top 100 Internet of Things Thought Leaders (Onalytica) and in the Top 100 Influential Tech Women on Twitter (Business Insider). She's been included in the longlist of Computer Weekly's Most Influential Women in Tech in the UK.

[1]: <http://designswarm.com/book/>
[2]: <https://lowcarbodesigninstitute.org/>

Ludicrous IoT Dreams

Dries De Roeck
Iskander Smit

In 2011 Russell Davies (Davies, 2011) drew a most excellent analogy between the internet of things and the early internet, an important something he brought forward was that (at that time) IoT had reached the moment at which it is as easy to make a connected hardware device as it was to create a personal Geocities webpage in the 90's. When revisiting some this 'early' internet of things experimenting and comparing it to connected products and services around us today, there seems to be at least one large difference: playful and unbiased experimentation.

With this article we want to call out to once more introduce playful thinking in internet connected products, which we will argue seems to have gone missing as internet connected hardware design and development has matured.

Remember the IoT playground

In 2005 the internet connected rabbit Nabaztag was released on the market (Violet & Nabaztag, 2020). To this date, this still is an important cornerstone to several internet connected products which emerged later on. The Nabaztag is the perfect example of how playful experimentation can lead to a paradigm changing result: while at its core the rabbit technology was a wifi router, many people remember the rabbit for its early experimentation with voice commands, coloured light feedback and physical interaction (moving ears!).

The Nabaztag is the perfect example of how playful experimentation can lead to a paradigm changing result.

Around the same time as the Nabaztag, the Arduino platform was released. The Arduino made it possible for a very broad audience to start experimenting with hardware and sensors, hooking things up to the internet and to other products. A very well known publication is Tom Igoe's *Making Things Talk* (Igoe, 2007), which was at that time a gamechanger in several industrial design institutions.

A year later, in 2008, Daniel Shiffman published the 'Learning Processing' book which for many created a bridge between connected physical hardware experimentation and screen based interaction (Shiffman, 2008). Using the Processing language, it became possible for non-expert programmers to visually create a software application which interacts with sensors or other hardware.

So, early on in the 2010's there were a lot of largely informal building blocks to create internet connected products and services. Much like the 'Geocities era' in the mid-90's, there was a strong feeling of experimentation and doing things without a certain intention or predefined goal. But after some time, things started to evolve and change.

[...] there was a strong feeling of experimentation and doing things without a certain intention or predefined goal.

Capitalising IoT

In 2011 'internet of things' popped up on the (often disputed) Gartner Hype Cycle and started getting more 'serious' market attention (Gartner, 2011). As the hoarding and trade in data caught on throughout several markets, internet connected products and services claimed their place in the financial world and were regarded as 'the next new thing' in which large industrial players needed to invest in.

Since the uptake of market interest, 'being connected' seems to have become a necessary feature for being regarded as valuable in a platform economy context, an economy built on subscription services and shifting valuation of assets. Mobility as a Service, Living as a Service: the new consumerism is anchored in connected products, in the hybrid region between code and space.

The result is that instead of a focus on exploration and experimentation, internet connected products and services had a mission to fulfill: generate growth and revenue. This shift, once again, feels very similar when the internet shifted to 'web 2.0' - a point at which economic interest became more serious and bottom up creativity and agency were pushed to the background.

Internet connected products and services had a mission to fulfill: generate growth and revenue.

Taken for granted

Anno 2020, it increasingly feels like internet connected products and services are the default. There is no real urge or need to point towards it being special or different. IoT seems taken for granted, the expectations of product and service are influenced by the habits and expectations people grew into after over a decade of internet connected communication devices since Steve Jobs' iconic introduction of the iPhone in 2007.

As the idea of having internet connected products around matured and evolved away from the experimental, it's quite clear that in several markets the shift has been so worthwhile it either redefined the 'sector meta' or introduced totally new sectors. We identify at least 3 market clusters in which this has had a profound impact:

Cluster 1: Edge AI

Products do not just get connected anymore, at the moment it is the products themselves which become more intelligent through powerful embedded software capabilities. The intelligence is now moved from the server to the device, the object, which is more capable than ever to make decisions and act autonomously. When you open an electrical object, you notice that wires are replaced by circuit boards and complex components. To illustrate, a speaker is not just a magnetic translator of electronic signals into sound waves anymore. It is an adaptive, sound-producing device which continuously optimises itself with regard to the position of the speaker in a room or the people present. This is a profound change in the way products are brought to

This is a profound change in the way products are brought to the market.

the market, which has only been possible because network and digital connectivity has been regarded as the default.

Cluster 2: Industrial IoT

For decades already, digital sensors have been part of many industrial monitoring processes. Again, by taking network connectivity for granted and hooking industrial monitoring sensor up to a network, allowing them to share collected data more widely, the industrial IoT is born. An important result emerging from this is a strong focus on optimisation of processes based on machine learning and other learning systems. As a result, the role of the operator is changing to a partner - acting hand in hand with a digital system. An example of this is the introduction of predictive maintenance, which has already been a gamechanger in several sectors and clearly points towards the changing relationship between technology and people.

An important result emerging from this is a strong focus on optimisation of processes based on machine learning and other learning systems.

Cluster 3: Home automation

The number of connected objects in the home environment is growing rapidly. This increase is catalysed by connectivity being baked into most new consumer devices and connected services (e.g. Apple HomeKit, IKEA TRÅDFRI, Samsung SmartThings, Google Home, and many more). Additionally, when new houses are built or rebuilt including a fully connected HVAC system which constantly monitors the indoor climate is standard. Everything is prewired and ready to connect to the next new intelligent monitoring system. As people, we tend to delegate (and put our trust in) an increasing amount of decisions to these home automation systems. The large-scale adoption of the 'connected home' has surely only been possible because the technology has evolved to being robust enough to be installed, configured and used by everyday consumers.

As people, we tend to delegate (and put our trust in) an increasing amount of decisions to these home automation systems.

These three clusters clearly indicate the market value internet connected devices have opened up, which have only been made possible by the technology becoming more robust and less prone to oddities. Open the box, push the button, sit back and watch the show. We came a long way into a mature product category that can be adopted by the masses. But is this really what we need to move forward?

We came a long way into a mature product category that can be adopted by the masses. But is this really what we need to move forward?

Ludicrous IoT

It's interesting to think back to how IoT seems to have emerged, grown and inflated ... and then at some point the balloon burst into thousands of small fragments. Some of these fragments developed into solid markets on their own, where revenue and economical value were found and where internet connectivity is taken as a given.

An apparent observation remains, however. In the early years of internet connected devices there were more experimental and bold products being created and released. Think about Good Night Lamp (Deschamps-Sonsino, 2013), Little Printer (BERG, 2011), Pillow Talk (Little Riot, 2015) - all products with a very niche use case and a very high level of experimentation on the interaction level. Why does this

not seem to happen anymore, on that scale, anno 2020? Why do we move towards optimized solutions for efficient living all the time? At least one reason is that it feels very hard to design an internet connected product in an unbiased way. The frame of reference has been set, success factors have been defined and some major platforms have emerged.

Let us not forget we can break those barriers.

It will be up to bottom up movements, collectives or initiatives to keep raising awareness that internet connected products and services are ultimately not owned by large corporations. Where the user is the product.

As Rob Van Kranenburg wrote in a recent article (Van Kranenburg, 2020) the role of 'identity' is transforming as internet connected products and services around us become omnipresent. In that respect, being very aware of our own identity and agency as humans can lead to a very different version of internet connected objects compared to a vision driven by personal interest, focussing on capitalistic growth.

A way to trigger this other route of thinking is by aiming for more playfulness in the things you make. There are at least three reasons we argue to take this ludicrous stance seriously:

- All tools are available, the challenge is triggering and engaging everyday people with these tools in meaningful ways. For example, if someone wants a doorbell which is triggered only when someone does a dance in front of it, someone should be stimulated to build it instead of locking it inside an GAFAesque ecosystem.
- To move away from a society which focuses on capitalistic thinking, allowing redundant systems is necessary. All of us have some crazy ideas to reach something simple - and if that way delivers joy during use, why not turn it into reality?
- When redundancy is allowed, less obvious or efficient ways of doing things become more accepted. Ultimately, this results in products which are not aimed at personal gain or benefit but which eventually focus on community and societal benefit.

In general, by proposing and seriously exploring the less conventional, new experiences, new ideas and new relations can be triggered in groups of people.

In practice, we believe it is time to undust the Arduinos and put the fun and experimentation back into connected product design. Let's be bold (and a little bit crazy) again in 2021.

Stay human and humane.

Why do we move towards optimized solutions for efficient living all the time?

Being very aware of our own identity and agency as humans can lead to a very different version of internet connected objects compared to a vision driven by personal interest, focussing on capitalistic growth.

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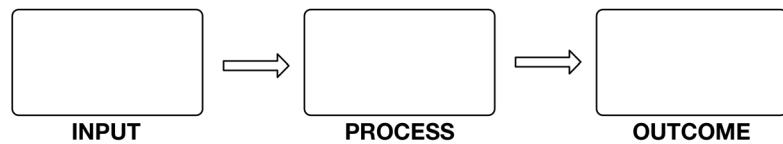
Participatory Design

What Can Designers Learn From Political Science?

Peter Bühr

I'm about to argue that design can learn from political science, that there are a few thousand years of history and knowledge to draw from that can help us build better connected systems. And I'd like to invite you to think with me about inputs, process, outcomes.

Let's visualize this looking at this simplified graph:



In traditional design circles, the idea of the individual genius is still alive and well.

In traditional design circles, the idea of the individual genius is still alive and well. Steve Jobs' strikes of genius with things like iPod or iPhone are judged as great designed objects (outputs), created out of one man's mind.

Something like this:



Who decides which design goals we should focus on, and by what decision-making mechanisms?

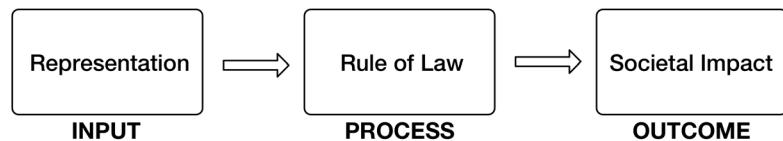
Or maybe this is just a narrative put forward by folks with a lacking understanding of design, a narrative that just won't go away? Of course many forward-thinking design practitioners would consider this a fallacy. If the conversations throughout the ThingsCon community (and the other contributions in this year's RIOT Report) are any indication, the design community has been thinking a lot about equality, equitable design, various forms of "not just human-centered" design. All of which indicate a shift away from product-focus to instead a focus on governance: Who decides which design goals we should focus on, and by what decision-making mechanisms?

And all of a sudden, with these debates we find ourselves in the traditional stomping grounds of political scientists. Which, fun fact, I happen to be. (I hasten to add: by education, but not in practice. I majored in PolSci but never worked directly in the field.)

In the world of political science, questions of governance, process and

impact rule supreme. In other words, it's all about who gets to make the rules and how, and what impact they have.

So here, the graph looks more like this:



Maybe just as important a question is how to guarantee that those impacted by those rules aren't negatively impacted, have the power to seek redress. That all voices are being heard.

Individual genius is actively disparaged in this world. Even if the results of the genius' decisions could ever be perfect, they would be considered flawed just by the fact that one person thought them up, and had the power to implement them.

This is sometimes referred to as the Benign King argument: Even if a fictional Benign King would rule perfectly, he would still need absolute power; and whoever came after the Benign King would be less perfect, and likely less benign – but still hold absolute power. And thus, this scenario is to be avoided at all costs.

Any form of governance is more just if those who will be subjected to decisions, rules and laws are represented in the decision-making process.

So, democracy. Whatever form it might take in detail, the idea here is that any form of governance is more just if those who will be subjected to decisions, rules and laws are represented in the decision-making process. Having a voice is considered more important than the results of the decisions (within reason; usually, there are safety mechanisms built in against abuse and mob mentality).

The history of democracy has, overall, been a history of expanding the definition of who gets heard, who gets to participate in societal decision-making. From the very restrictive starting point of male land owners (and usually slave keepers) of Ancient Greece at the birth of democracy, the list of people who get their say has been expanding those last 2500 years or so. And still, it's not perfect: There are still lots of barriers to participation wherever you look, and these barriers are not equally distributed.

So, who gets to give inputs is one aspect that leads to better governance. The others are that the rules are known and apply to everyone equally, in other words that there's a process in place. This is also known as... the rule of law. The law, and other decision making processes, should apply to everyone equally. The process needs to be known, and adaptable.

Finally, outcomes. Here, the zoom level shouldn't be any individual policy decision, even though those should of course be evaluated;

but rather, the focus should be on the impact that policy decision has – in the larger context of other decisions, existing rules, and pure and simply real life – on society: On the many societal levels that show up in media reports and government language under names like citizens, stakeholders, or businesses. (Increasingly, the environment gets a mention in that list, and it's about time!) So the question wouldn't (or shouldn't) be, say, does a person get €500 as a payment to address some economic issue or another. But rather, what impact would that payment have on that person? Is it enough to address the issue, or too little? Would it create incentives or disincentives to nudge the behavior one way or another? Would it create negative side effects, or positive ones? Is this approach the right one to tackle the underlying issue to begin with?

Much like in the design world, systems thinking in the world of governance is complex, and fraught with potential unexpected side effects. Often, the bigger picture gets ignored in favor of quick solutionism. Frequently, zooming out too much, towards a truly holistic solution, becomes actionable. So here, like in design, there are no silver bullets.

Still, there are aspects in the world of political science that the world of design can draw from.

A broader perspective of potential stakeholders (more representation) matters a great deal to good design work.

Considering not just the final product but rather its potential impacts can lead to hugely beneficial outcomes.

A broader perspective of potential stakeholders (more representation) matters a great deal to good design work. Processes can help avoid making the same mistakes over and over again, from product to product and company to company – consider things like security-by-design and privacy-by-design guidelines. And finally, considering not just the final product but rather its potential impacts can lead to hugely beneficial outcomes: How might this be used in the real world? How might this be abused? What impacts is it likely to have on users, on non-users, on the environment?

The recent surge in the debate on new perspectives in design is inspiring to see. Let's keep looking beyond the individual and towards more collective goods, strong commons, sustainable or regenerative practices for the environment – both in design and policy circles.



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Designing Good Systems After 2020 – What to Make of a Year of Crisis?

Simon Höher

2020 hit different. We came to witness many of the so often repeated and neglected mantras of the past years come to bite us: from corroding social and political fabrics, to pervasive racism and ubiquitous inequalities, to underfunded public services and non-existent public digital infrastructure. It's been a year of shock and learning – even though it remains a bit unclear what exactly we've been so shocked about (it's not like any of the underlying problems had been really new to anyone) and what we really learned from it.

Like any good crisis, 2020 invites us to rejoice in recalling better days. That works particularly well for the still young history of the IoT. Alas, the early days of excitedly building „things!“ and connecting them to the internet seem long gone. So do grand visions of magically intelligent homes and cities – and the niche critique from ethicists, designers, or speculative artists that accompanied them. Today, we're wading through hundreds of pop-ups, asking us for our consent to be tracked, just before watching Shoshana Zuboff, prominently featured on Netflix, lay out the catastrophic consequences of that very tracking – and everything just feels a little on the nose. One is reminded of the devastating question that Mark Fisher asked us ten years ago: "What if you held a protest and everyone came?" (Fisher, 2009). And indeed, calls for fixing the internet in 2020 feel a bit like Live8 rallies of the early 2000s: Everyone agrees, but everyone is part of the problem.

Sobering up

What happened? How did we get from a "plentitude" (Gold, 2007) of ideas and manifestos (cf. Fritsch et al., 2018) to a place where we all seem to have a very good understanding of the problem – but so very few viable alternatives to replicating it? In a sense, 2020 was a year of crisis in its very essence: It was full of decisions that were all equally pressing and impossible to make (Koselleck, 1997). Systems thinking has long argued that such a crisis can be productive and a motor for change. It can also be fatal. The "art of intervention" then is to seize a crisis' productive capacity without overthrowing the system itself, by understanding all its "self-preserving pathologies" – and by timely displaying viable alternatives to current and dysfunctional models of reality (Willke, 1987). Put differently: If we start thinking about crises as triggers for transitions, rather than (just) triggers for situational change, the creation of feasible alternatives to the status quo becomes a path-finding exercise, of simultaneously building new systems and escaping old ones (Buchel et al., 2018; Young & Lockhart, 1995).

Today, we're wading through hundreds of pop-ups, asking us for our consent to be tracked, just before watching Shoshana Zuboff, prominently featured on Netflix, lay out the catastrophic consequences of that very tracking – and everything just feels a little on the nose.

Okay, great. How to do that? Especially when we're part of that very system ourselves? Maybe, if we see this year as an opportunity to pause, reflect, and learn, we might have a chance to come to terms with where we are (and where we are not) in order to move on collectively. That requires honesty, and the willingness to not only change the other but also ourselves. So, where to start?

Mind the gap(s)

Understanding a problem and solving it are two very different things. And funny enough, when it comes to digital technology it's the very understanding of the problem that makes the solution so tricky: We now understand that designing good things really means designing good systems. And that designing a system is always a complex problem. Today, it involves planetary technological solutions as well as regulatory and political ones, it poses questions around ethics and democracy as well as very material concerns of supply chains and labor rights, it demands for accounting for environmental costs and resources as well as understanding human psychology, media cycles, and algorithmic fallacies. In other words, designing good systems is an inherently paradoxical task: it implies a need to focus on some things and leaving out others, while knowing that nothing can really be ignored for long – because, as 2020 has shown, it might just come back to bite us. We indeed have never been modern (Latour, 1993), and neither has the IoT.

When facing the vast complexity of the task at hand it tempting to end up in the dead end of the „nonsense“ (Flusser, 1991, p. 30) of interchangeable ideas about good and bad, true and false, or relevant and irrelevant. A more fruitful alternative, however, is to realize that this paradox can be incredibly constructive and nuanced, once we mind the „gap“ (Baecker, 2018, p. 14ff; cf. Luhmann, 1997, p. 302f) of interpretation that often sits in-between the world and our idea of it. With the introduction of the “invisible machines” this gap becomes the ubiquitous window to a constant “surplus” of possible but currently not realized realities, that can only be suspected but never fully known (there are only two other areas where this mandate for interpretation exists: religion and art).

If we do so, we might learn to proceed with greater caution when being confronted with easy answers to tricky questions in the future – even when we come up with them ourselves. Rather than proposing Dos and Dont's that imply simplicity and promise quick successes, a more promising role for designers and researchers might lay in highlighting the gaps, that is all the things we've left out so far, willingly or unwillingly. We can't solve everything at once, but we can at least be deliberate and vocal about what we are leaving out, and why we think that's okay, for now. Three of such gaps come to mind in particular:

That requires honesty, and the willingness to not only change the other but also ourselves. So, where to start?

We now understand that designing good things really means designing good systems.

Designing good systems is an inherently paradoxical task

This paradox can be incredibly constructive and nuanced, once we mind the „gap“ of interpretation that often sits in-between the world and our idea of it.

A more promising role for designers and researchers might lay in highlighting the gaps.

Place_Planet

Maybe the most obvious one is the distinction of global interdependencies and local solutions, and a place where this becomes particularly prevalent. The public places of a digitally connected world are full of gaps and hybrids, making it impossible to discern what part is technological, what is social, what is planetary and what is localized. To get from A to B in a city today is just as much shaped by the local Department of Transportation as it is by the latest developments of a global pandemic, and the most recent update of GoogleMaps. If we want to build robust solutions for these places we need to be more deliberate about how and where to draw these lines, and simultaneously plan for crossing them from the start. Last year's developments around Alphabet's SidewalkLabs in Toronto are a case in point, where the global discourse, review, and reporting around how (not) to integrate corporate interests with regulatory frameworks, social policies and urban data, was just as fruitful and vivid as the local networks, activists and decisions on the ground. Sidewalk Toronto was just as much a matter of the Quayside as it was an exercise in planetary co-creation of meaning, opinions, and policies around the cities we want to live in.

The public places of a digitally connected world are full of gaps and hybrids, making it impossible to discern what part is technological, what is social, what is planetary and what is localized.

Design_Discovery

A second notion worth to recall is that whenever we set out to design good systems, we are bound to be part of them – for better or worse. Design is inherently subjective, it is just as much discovery as it is imagination, and bound to conjure, obscure, and interlink new realities for all techno-bio-social systems involved. For social systems that means creating (here literally in the sense of inventing!) stories about users and needs, problems and solutions, about public good and harm, privacy, safety, or resilience. But who even comes up with these terms? And what questions are we not asking? It helps to realize there just is no such thing as a neutral or objective discourse, let alone data, but really only mediated and co-constructed stories. So, whose are we telling? And how do we know what story we're missing? If "truth is the invention of a liar", as Heinz von Foerster proposes (von Foerster & Pörksen, 1998), then it certainly helps to be skeptical not only of our critics, but also of ourselves. Creating places to honestly listen and learn together, preferably with folks from the other side of the aisle, might be a way to do get ourselves out of our bubbles of truth and do justice to the gap between design and discovery. Here's a fun example: There is an extraordinary subreddit called r/changemyview that, against, all odds manages to do exactly that: self-maintained, respectful, and honest conversations with the premise of learning and changing together. What if our things were designed to foster that?

It helps to realize there just is no such thing as a neutral or objective discourse, let alone data, but really only mediated and co-constructed stories.

Hindsight_Foresight

Thirdly, there is the assumption that there even is a way to deliberately create any better system in the first place. Design inherently implies the dichotomy of a problem and a solution, an actual and a nominal, a

Self-maintained, respectful, and honest conversations with the premise of learning and changing together. What if our things were designed to foster that?

present and a future – and with this another gap (von Foerster, 1969). On one side of that gap there's hindsight, a grounded and often shared understanding of the past, the histories, data, struggles, and actions of everyone (and everything) involved. On the other side, there is foresight: the hopes, dreams, possibilities and expectations we have about the changes we want to see in the future. Both sides, hindsight and foresight, are made up continuously in the moment, and with that both sides are subject to change and reflection. To learn from 2020 can also mean to realize what parts of the past we actually do not want to give up, and what doubts of the future remain today.

For one, this means to look for the “hidden benefits” of the problems we encounter (cf. Varga von Kibéd & Sparrer, 2018). If they are so persistent, chances are, they do serve a purpose beyond just being pesky obstacles in the way of change. Further, this implies asking ourselves, what doubts and questions are related to our aspired hopes. This requires honesty, and sometimes paradoxical questions: How do we all benefit from not finding a solution for ubiquitous online tracking? What is the value in choosing tech solutionism over the boring and tedious work of changing regulatory and social frameworks in the long run? What did we learn or gain by not having built and scaled up feasible alternatives to the status quo, yet?

If we want to move from crisis to transition, it helps to be aware of these hidden benefits in order to account for them when designing “better” alternatives in the future. Not only does this make our new ideas more sustainable and resilient themselves. It also helps with moving from false dichotomies and simplified answers to a more grounded, albeit complex, idea of what kind of better systems we want to build.

Beyond grand plans

What to take from this? Bridging gaps without neglecting them! Sobering up after a crisis can mean to be honest and transparent about the inconsistencies and trade-offs we can't escape, and to move beyond grand master plans and absolute narratives toward deeper, situated and explorative probes in order to surprise ourselves. The internet and the world it creates is genuinely “unmanageable” (Glanville, 2000), but that does not mean we cannot change or design it. Learning from a year of crisis, however, might mean that designing good systems indeed requires a new attitude: One that opens up the gaps and paradoxes of our connected world, and aims to “expand complexity, rather than reduce it” (von Foerster, 1997, p. 51). Then, after all, the final and most promising take-away from this year could have been envisaged, again, by Fisher: “From a situation in which nothing can happen, suddenly anything is possible again.”

Design inherently implies the dichotomy of a problem and a solution, an actual and a nominal, a present and a future – and with this another gap.

What is the value in choosing tech solutionism over the boring and tedious work of changing regulatory and social frameworks in the long run?

Bridging gaps without neglecting them!

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Co-Design the Future

What's the Next Good Thing?

Gabriele Zipf
Antja Karoli

How will technology influence our future? What's the next big thing? For some, new technologies offer the exciting promise of a better and easier life; for others, they're the source of a myriad of subliminal fears and dystopian fantasies – from quirky, semi-intelligent household appliances to the control of mankind by robots. Futurium counters this simplistic thinking through its examination of future technologies in a nuanced way. We demand – always on the basis of research and science – to be provided with the pros and cons of a technology, its consequences for an individual and for society, and we explore what this technology might bring in all aspects of its real-life application.

*There's no such thing
as one future.*

This means that Futurium opens up various paths to different futures. We believe that there's no such thing as one future. We want to encourage people to engage with the future, to think it through and to participate actively in shaping it – each according to their needs and possibilities.

How do we want to live?

The question "How do we want to live?" is the central theme of Futurium's activities, underlying all its events, workshops, guided tours, teaching materials and, of course, the exhibition itself. In the exhibition, we don't work with prefabricated constructions of visions of the future, but instead offer many different building blocks and possibilities. These are presented in three "thinking spaces": Nature, Humans and Technology. In each space, we've developed a specific idea for guiding the engagement with topics and options regarding the future. In "Rethinking Nature", the exhibition shows different future solutions from and with nature, while "Common Cause" offers ideas on how each individual, and the community as a whole, could shape the future. In "Towards New Horizons", we ask what possible futures could look like through a primary focus on major technological developments. This topic will be presented in more detail here.



Will we still be able to recognise technological devices as such in the future? The visibility of technology is decreasing and new devices blend into their environment. In the exhibition area "Towards New Horizons", this point is conveyed by the scenography itself: back-lit, white modules include media stations that can be operated by means of gesture control. (Credit: David von Becker).

Towards New Horizons

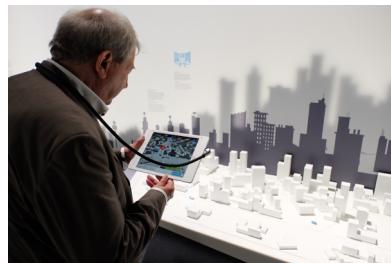
How does it feel to use a technology? This question accompanies visitors inside the exhibition area, giving them at the same time a subtle impression of our understanding of technology. People learn best by having the chance to evaluate different opinions and to explore things by themselves. Can I paint a picture with my thoughts? What is actually taking place inside these exhibition robots that talk about sharing their daily lives with humans? What is it like to touch a robotic seal?

Speculative designs, scenarios and stories transport visitors into a state of mind in which they are enabled to imagine their own futures

It's not about using "good technology"; it's about using technical devices in a good way: good for the environment, good for humankind, good for everyone's needs and rights.

Speculative designs, scenarios and stories transport visitors into a state of mind in which they are enabled to imagine their own futures; they give us a glimpse of how the future might look. The presented scenarios help spark discussions about how we want to live with these new technologies and how we want to shape them. It's not about using "good technology"; it's about using technical devices in a good way: good for the environment, good for humankind, good for everyone's needs and rights. Let's shape technology in a way that benefits most of us and not only a small group of (financial) winners: in short – let's make good things!

One example may illustrate how this works in the exhibition. By highlighting some best-practice projects, we give our visitors ideas about how to achieve changes on a small scale. People in the Kibera neighbourhood of Nairobi, for example, are shown mapping their surroundings through open-street maps and GPS systems. Water access points, schools, clinics or dangerous areas are all noted on digital and analogue maps, and this helps people feel more secure in their own neighbourhood.



An interactive, augmented-reality application shows visitors how the physical and virtual worlds will merge in the future. In "Blending Realties", examples such as the mapping of Kibera can be discovered. (Credit: Futurium)

The question of whether and how we want to use a certain technology, and if we need it to improve features in our daily life, is of cardinal importance for a responsible perspective on technology itself.

This very "low-tech" system can improve the everyday lives of individuals who have different needs. What do we require to upscale this kind of approach? In this example, technology is a good thing and people benefit from it – but, at the same time, they lose their anonymity. The question of whether and how we want to use a certain technology, and if we need it to improve features in our daily life, is of cardinal importance for a responsible perspective on technology itself. This means that we have to be aware of the opportunities, but also the risks, that the use of a certain technology can entail.

*A personal sense of critical
but open-minded engagement
with possible futures.*

We want visitors to leave Futurium with a personal sense of critical but open-minded engagement with possible futures and, especially, with new technologies. This, we hope, is one step towards the making of better things in the future.

Authors



Foto by Ali Ghandtschi

Gabriele Zipf is the Head of Exhibitions at Futurium, Berlin. She has studied prehistory and anthropology in Munich and Paris and received her PhD from the Freie Universität Berlin. As a curator and project manager she realized the settings of new museums and developed the concepts for several exhibitions during the last 15 years. These projects have presented the challenge of communicating complex and often abstract themes to a broad public. She loves working on multidisciplinary topics and bringing science, the needs of societies, and the hopes of individuals together by breaking the boundaries between classic museums and science centers.

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Foto by Ali Ghandtschi

Antja Karoli is part of the exhibition team at Futurium, Berlin and works on preparing content for the exhibition and maintaining contact with different scientists, mostly with focus on the topics digitalization and robotics. She has studied communication, cultural anthropology and media education in Mainz and Passau. Her master thesis focused on the integration of virtual reality technologies in artistic productions and how technology in general can change the way in which we perceive art.

Trustworthy AI and the Climate Crisis – Towards Better Policies in the EU

Fieke Jansen
Michelle Thorne

The world will cross the 1.5 degree warming threshold in 2024, quicker than previously estimated, forecasts the UN World Meteorological Organization (WMO). We have three and a half years to dramatically cut our emissions. We need sustainable systems, and we need them now.

We describe sustainability as a healthy environment, economic well-being, and social connection (Mozilla1). We are particularly interested in reducing the internet's significant emissions (nature) while advocating to keep this global public resource open and accessible to all. (Mozilla2) It is essential that the internet advances healthy, sustainable practices.

Increasingly, our online lives are affected by artificial intelligence systems. If we want a healthy internet—and a healthy digital society—we need to make sure AI is trustworthy. For AI to be trustworthy, we need AI that is demonstrably worthy of trust. „Privacy, transparency, and human well-being are key considerations, and there is accountability for harms (Mozilla3).

We must meet the moment of the climate crisis now—in the era of AI. This means bringing two currently separate conversations together: digital rights groups and environmental groups. We need to understand the impact of greenhouse gases and identify the main emitters while also addressing the biases and civil rights concerns raised with the presently dominant implementations of AI. Both affect everyone and cause significant harm to already vulnerable people and communities (United Nations).

To link trustworthy AI to climate justice, we must expand our understanding of human well-being and AI harms. Research demonstrates how AI intensifies energy consumption (Strubell, E. et al) and AI systems developed by major tech companies (Amazon, Microsoft and more) are used to speed up extraction of oil and other natural resources.(NYT) Tech companies are announcing ambitious climate plans (Calma J.), often following pressure and mobilization from their workforce. But none of these efforts take full account of the harms caused by their AI systems (Jardim, E.).

"AI is glittery, shiny and is seen to be the cure for every issue we have.

But no one is looking at the tool itself and how it contributes to the problem it's trying to solve."

—Andreea Belu, European Digital Rights (EDRI)

"The climate crisis and impact of AI on society can look very daunting and overwhelming. By bringing together people from different disciplines, we hope to learn from each other and identify positive paths forward."

—Cathleen Berger, Mozilla Sustainability Steward

Paths to more sustainable and just technology

To understand the environmental harms caused by AI and situate these in a larger context of internet health and the climate crisis, we convened a virtual workshop in September 2020 with experts in digital rights, AI technology, racial justice and the climate movement in Europe. We wanted to demand AI systems that are trustworthy and sustainable.

We set out to create:

1. **a shared understanding of environmental harms of AI** among experts from digital rights, AI technology, racial justice and the climate movement in Europe
2. an **advocacy narrative about environmental harms and AI** in order to position climate justice more prominently in Europe's trustworthy AI agenda
3. avenues to **influence in European funding and legislative processes** on AI

Insights

By convening digital rights and environmental groups, we learned the following:

1. **There's a need for a better understanding of environmental harms and AI among policy-makers, experts, and the broader public.**
 - a. **'Experts' feel unequipped to talk about this intersection.** This is a new field, and there is a general sense that none has the 'answer'.
 - b. **Digital rights and environmental groups expressed a desire to define the problem and gain a clear understanding of the environmental harms of AI.** They wanted to articulate the connections between AI and the climate crisis that addresses underlying power structures and might yield possible solutions.
 - c. **There's a need for an intersectional approach.** A successful approach will require many different perspectives. We must ensure that racial justice, gender equality and social justice

are part of the discussions and the path forward. We must center these conversations on those affected by climate change and AI issues, as well as ensure a diversity of voices are in the discussion.

2. **Acknowledge there will be tensions at the intersection of these topics and communities**

- a. **High on jargon.** It is crucial to bust jargon and find terms that unite. Some groups will want to hang onto their jargon, but it's not helpful.
- b. **Conflicting priorities in the different agendas.** There might be conflict in expanding the digital or climate agenda to other issues. This intersection might be seen to come at the expense of other priorities.
- c. **Focus on AI or tech in relation to the environment.** Is there a difference in the impact of AI versus the impact of other information technologies? Considering the current size of the impact, machine learning is not so big today, but we assume it will be in the future.

3. **Question the leading narratives about AI and the environment**

- a. **Challenge the current tech determinist framing of AI.** AI is still very much aspirational, in which certain perceptions of these systems are being foregrounded. Be aware of the power structures and imaginaries that drive it. And know who we are talking about when we talk about harms.
- b. **Need for a clear articulation of AI harms.** The analyses should include who and which environments are most likely to be harmed, and a clear understanding of which harms we are talking about, from AI supply chain, carbon emissions, to how it is optimizing the global extraction economy.
- c. **Articulate a positive, solution-based narrative and evidence based action.** Can we develop a clear idea of what we want public interest tech to look like, are there positive use cases in which we have seen AI contribute to the environment or how can we get there.

Recommendations

We see a unique opportunity with the policy window as the European Commission defines its AI strategy, climate agenda and COVID-19 recovery plans. This moment offers a strategic opportunity to advance trustworthy AI and climate justice in 2020.

To that end, we recommend:

1. **A better understanding of environmental harms and AI among policy-makers, experts, and the broader public:**
 - a. **Towards “Public interest AI.”** Position AI that takes human rights and the environment into account as a unique selling point for Europe. Test this positioning among policymakers. Develop a clear action plan of what is needed to get there.
 - b. **Build expertise.** Climate policy experts are uncomfortable talking about AI while digital rights experts are uncomfortable talking about environment and climate justice. Bridge these fields through skillshares, workshops and briefings that contextualize these issues and build richer understanding.
 - c. **Explainers and citizen assemblies with the broader public.** Create accessible explainers about the issues and localize them into different languages and contexts. Engage citizens in the discussion about AI and the environment through citizen assemblies and other participatory methods. Develop a clear narrative for members of the public, decision makers, colleagues and peers.
2. **Steer research investments in the intersection of AI and environment beyond the tech solutionist frame.**
 - a. **Uncovering harms.** More research is needed to understand the environmental harms of AI. Invest in harms research that critiques the underlying power structures that drive the current AI uptake and make visible who impacted, the physical and computational supply chain of AI, its carbon footprint, and better understanding of related harms, such as AI for oil extraction.
 - b. **Reclaim tech for public good.** Invest in research to explore what European Models of public technology could look like. Can we separate AI systems from the economic optimization goal and reclaim their purpose for the public interest? For example, if the city owns its AI infrastructure, and communities run cooperative ownership structures, pilot de-growth business models, and invest in techniques to train AI models on smaller datasets. More ideas outlined in Mozilla’s Data Futures research. (Mozilla Foundation)
 - c. **Carbon emission standards.** Research the development of carbon emission standards. AI systems should be sustainable by design, minimizing energy consumption and limiting the retraining of big systems, and they should run on renewable energy. Carbon reporting as well as transparency and accountability in that reporting should be part of institutional standards.

3. Influence European policy and investment towards public interest AI

- a. **Shape the position of the EU parliament and European Commission on AI.** Build “public interest AI” expertise inside both European bodies through participation in the special AI committee at the Parliament. Hold a closed door session with the European Commission and post timely op-eds about the topic.
- b. **Long-term goal of public funding towards public interest AI.** Direct EU public funding towards research on environmental harms of AI and the development of public interest AI. Push for the inclusion of environmental impact assessment and mandatory and transparent carbon emission reporting for all technology projects supported under Horizon Europe and EIB. Fund the exploration of a Digital Sustainability Index.
- c. **Put sustainability on the agenda of key events and fora.** Collaborate with the organizers and stakeholders of the Internet Governance Forum (IGF) and European Dialogue on Internet Governance (EuroDIG) to deepen their focus on the environment. Similarly work with the United Nations Climate Change Conference (COP) to put the internet on their agenda. Organize a summit with policymakers and experts dedicated to technology and the climate crisis.

In the coming months, we hope to pursue the above recommendations and to work with more people interested in the intersection of AI and climate. For more context about how we reached these insights and recommendations, visit the Mozilla Sustainability wiki. (Mozilla4)

Recommended Further Reading

- AI and Climate Change: The Promise, the Perils and Pillars for Action, Eirini Maliaraki in Branch Magazine (<https://branch.climateaction.tech/2020/10/02/ai-and-climate-change-the-promise-the-perils-and-pillars-for-action/>)
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- Training a single AI model can emit as much carbon as five cars in their lifetimes, MIT Tech Review (<https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/>)
- Microsoft, Google, Amazon – Who’s the Biggest Climate Hypocrite?, Greenpeace (<https://www.greenpeace.org/usa/microsoft-google-amazon-energy-oil-ai-climate-hypocrite/>)
- White Paper on Artificial Intelligence: a European approach to excellence and trust, European Commission (<https://ec.europa.eu>)

- eu/info/publications/white-paper-artificial-intelligence-european-approach-excellence-and-trust_en)
- The EU is ignoring AI's effect on the climate crisis, Fieke Jansen (<https://www.euractiv.com/section/digital/opinion/the-eu-is-ignoring-ais-effect-on-the-climate-crisis/>)
 - Decolonise the Green New Deal, Progressive International (<https://progressiveinternational.org/blueprint/1d2b3058-2466-4f04-b36d-af7618ac44d3-vila-arauz-decolonise-the-green-new-deal/en>)
 - Creating Trustworthy AI, Mozilla (<https://drive.google.com/file/d/1LD8pBC-cu7bkvU-9v-DZEyCmpWED7W7Z/view>)
 - Racial Justice Network's contribution to the Leeds Climate Change Citizens' Jury, Racial Justice Network UK (<https://racialjusticenetwork.co.uk/2019/11/09/rjn-contribution-to-the-leeds-climate-change-citizens-jury/>)
 - Overpopulation & The Unbearable Whiteness of Green, Onca (<https://onca.org.uk/2019/07/24/overpopulation-the-unbearable-whiteness-of-green/>)
 - Wales' declaration of a climate emergency should mean tackling environmental racism, Nation Cymru (<https://nation.cymru/opinion/wales-declaration-of-a-climate-emergency-should-mean-tackling-environmental-racism/>)
 - A Green New Deal architect explains how the protests and climate crisis are connected, MIT Technology Review (<https://www.technologyreview.com/2020/06/11/1003162/a-green-new-deal-architect-explains-how-the-protests-and-climate-crisis-are-connected/>)
 - Are Extinction Rebellion whitewashing climate justice?, Gal-Dem (<https://gal-dem.com/extinction-rebellion-risk-trampling-climate-justice-movement/>)
 - Tackling Climate Change with Machine Learning <https://arxiv.org/abs/1906.05433> - related site: <https://www.climatechange.ai/> summaries
 - The Hardware Lottery (<https://arxiv.org/abs/2009.06489>)
 - Mozilla's Data Futures research (<https://foundation.mozilla.org/de/initiatives/data-futures/>)

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She contributed to the creation of Mozilla Common Voice, now the world's largest multilingual public domain voice dataset.

Michelle publishes Branch, an online magazine written by and for people

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She also co-founded a sustainable fashion label, Zephyr Berlin.

She is member of ClimateAction. Tech, a network of tech workers accelerating climate action.

She is also a jury member of the Prototype Fund, which supports open source projects in civic tech and a Thinker in Residence at Climate KIC.

Michelle founded Mozilla's Open Internet of Things Studio, Ding magazine, the Mozilla Festival and a web literacy program called Maker Party. Michelle managed the Creative Commons international affiliate network from 2007 – 2010.

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Design Fiction

Must All Things Pass? Designing for the Afterlife of (Internet of) Things

Dr Michael Stead
Dr Adrian Gradinar
Prof Paul Coulton

*Sunrise doesn't last all morning
A cloudburst doesn't last all day...
All things must pass
All things must pass away*

George Harrison's 1970 song 'All Things Must Pass' could easily be seen as his sonic lament to the passing of The Beatles. Heavily indebted to Timothy Leary's 1966 transcendental poem All Things Pass – itself adapted from the pages of Lao-Tzu's 6th Century B.C text the Tao Te Ching – Harrison's track is in fact a meditation on the ephemerality of the physical world (Allison, 2006). People, animals and plant life – human and non-human existence is significant but momentary in the long history of time. Like flora and fauna, we humans are subject to Mother Earth's order of things, what could be described as natural obsolescence. Despite our physical impermanence, we leave legacies. Our progeny, possessions and sometimes even ideas will carry on without us.

Globally, there are said to be around 27 billion networked Things, with this number projected to increase threefold to around 76 billion by 2025

The lifespans of Internet of Things (IoT) objects are also designed to be brief. However, it is not the planet but designers, manufacturers and tech firms who control the order of Things. Unfortunately, in their current incarnation, human-made Things are having an increasingly detrimental effect on the Earth's natural processes. Globally, there are said to be around 27 billion networked Things, with this number projected to increase threefold to around 76 billion by 2025 (Statista, 2018). Many of these Things are composed of materials that are finite, like precious metals and minerals, and non-recyclable such as thermoplastics. The artificial scarcity of replacement parts and use of hidden seals and force fits in their design means that it is challenging to repair, modify and reuse Things. Their lifespan is further reduced by their limited capacity for software updates, while Things proprietary nature makes them difficult to 'hack' and reprogram. Restrictive digital IP laws only exacerbate these issues. As recently seen with Philips and Sonos devices (Cox, 2020), Things can quickly become 'bricked' – unsupported and redundant. Ultimately, most Things are unsustainable, and many will end their lives at a landfill site in the form of electronic waste (e-waste) (Stead et al, 2019).

Most Things are unsustainable, and many will end their lives at a landfill site in the form of electronic waste .

No Right to Repair Things

Empowering people with the ability to repair their own Things is seen

Resultantly, the Right to Repair (R2R) movement is striving to curtail the Western trend of disposing of redundant Things in their entirety..

Manufacturers will need to integrate a degree of repairability into the devices that they sell in the EU, as well as supply replacement parts for ten years after production.

It is not the programmers anymore but the data itself that defines what to do next

As the technology develops, it is likely that we will begin to move beyond typical human-to-machine exchanges to more radical machine-to-human and machine-to-machine interactions

as a key step in redressing IoT e-waste. Although electronic product repair practices are common in many countries, the inherent physical-digital nature of Things is making it harder to maintain and repurpose such devices. Resultantly, the Right to Repair (R2R) movement is striving to curtail the Western trend of disposing of redundant Things in their entirety (Right to Repair, 2020). Rooted in maker, hack and open-source communities, the movement aligns closely with Circular Economy thinking (Weetman, 2016). Whilst opposition from tech firms like Apple has made US lawmakers hesitant to reform R2R policy, new legislation is due to come into force across the EU in 2021 (European Commission, 2020). Manufacturers will need to integrate a degree of repairability into the devices that they sell in the EU, as well as supply replacement parts for ten years after production. Seemingly progressive, personal repair will still be impeded as only 'authorised' third parties will be sanctioned to carry out the work. Thus, the R2R one's own Things remains, for now at least, a vision of the future.

AI Things

With voice activated Things like smart speakers helping to make Artificial Intelligence (AI) a facet of everyday life, could AI help increase the continuity of IoT lifespans? Popular AI's like Amazon's Alexa and Google's Assistant use Machine Learning (ML) algorithms to help users complete various cognitive tasks like searching and scheduling. These interactions allow AI systems to amass datasets from which they learn to make decisions on their users' behalf – "it is not the programmers anymore but the data itself that defines what to do next" (Alpaydin, 2016). From this perspective, AI Things already appear to possess a degree of autonomy and agency when it comes to making certain decisions that affect their users' lives. As the technology develops, it is likely that we will begin to move beyond typical human-to-machine exchanges to more radical machine-to-human and machine-to-machine interactions.

Must All Things Pass?

When viewed through the prism of environmental sustainability, today's Things can justly be considered to be bad Things. How then might we turn Things from bad to good in relation to their impacts upon the natural environment? In essence, must all Things pass or is a meaningful and more sustainable afterlife possible for IoT devices? A creative and compelling way to highlight and better understand the threats and promises that emergent technologies might bring in the near future is to apply the Speculative Design method Design Fiction (DF).

Sustainable Design Fiction

We developed a short sustainable DF entitled The Three Rights of AI which seeks to emphasise the limitations of present-day R2R legislation while at the same time explore novel possibilities for the sustainable afterlife of AI assisted Things. The DF fuses the concept of

What if AIs like Alexa are granted the R2R their 'host' device's hardware and software in the future?

R2R with that of AI Rights – a term used to denote how, in the future, advanced AIs could be granted so-called inalienable rights similar to those presently afforded to humans (Gunkel, 2018). What if AIs like Alexa are granted the R2R their 'host' device's hardware and software in the future? What might the sustainable implications be for Things? To explore these questions and provoke new ones, we incorporated both real-world and fictional elements into our worldbuilding process (Coulton et al, 2017). For example, ITU is the genuine technology division of the United Nations, while the AI for Earth: Global Summit is a fictive event. Isaac Asimov's Three Laws of Robotics (Asimov, 1950) were also a key inspiration. The 'laws' continue to be influential across science fiction discourse as well as within real-world AI/robotics research – their lineage is visible in AI strategies produced by the UK's EPSRC (2010) and Google (N.d.). Positronic technology – a fictive CPU that affords AIs human-like consciousness – is a further reference to Asimov's work.

With unsustainability being at the core of the current order of Things, in The Three Rights of AI, we chose to envision a more sanguine future world which is inhibited by environmentally good Things.

The adoption of any new technology will likely lead to unintended consequences. Although Things bring tangible benefits to our everyday lives, their pernicious environmental impacts are less visible, and consequently, less understood. With unsustainability being at the core of the current order of Things, in The Three Rights of AI, we chose to envision a more sanguine future world which is inhibited by environmentally good Things. As well as contrasting with today's IoT, this vision also differs to most contemporary AI discourse. Whilst we recognise that privacy, transparency and bias are critical concerns associated with widespread AI (Alan Turing Institute, N.d.), the basic tenets of DF practice are to 'suspend disbelief about [socio-technical] change' (Sterling cited in Bosch, 2012) and challenge the perceptions of the role that technologies do and could play in day-to-day life (Bleeker, 2009). Hence, The Three Rights of AI also resists echoing the dystopian trope of the technological singularity – that sufficiently advanced AIs will one day pose an existential threat to humanity (Vinge, 1993). What if instead, AI assisted Thing repair could help Big Tech firms like Google and Microsoft achieve their 2050 net zero carbon emission targets? (Microsoft, 2020). What if greater levels of sustainable decision-making were delegated to AI Things rather than their users? Provocation is key to DF and as such The Three Rights of AI Things seeks to raise more questions than it can answer.

What if greater levels of sustainable decision-making were delegated to AI Things rather than their users?

As Knowles et al (2018) attest, sustainability-focussed DF proposals can help increase environmental consciousness across a broad range of audiences – from academia, through industry, to wider publics. Ultimately, the primary goal of The Three Rights of AI is to raise awareness, provoke debate and perhaps even begin to shift perceptions regards Things' inherent unsustainability – particularly amongst designers. Whilst it is they who help drive much of the present order of Things, the natural fluidity and reflexivity of design as a discipline means that it can also be reoriented to challenge its own unsustainable status quo.

To this end, we see Design Fiction as a key mediator in the sustainable evolution of Thing design.

To this end, we see DF as a key mediator in the sustainable evolution of Thing design. In reflecting back upon our design process, building the future world helped us to more thoroughly contemplate our lack of autonomy and agency to legitimately repair today's Things. We believe that if more designers were to engage in sustainable DF practice and critically consider both the present impacts and potential futures of IoT, perhaps we could collectively change the R2R Things from a vision of the future into a present-day reality.

The Three Rights of AI Things

The First Right

Rudy thinks the Amazon Omni is probably broken. One of the kids dropped the smart speaker and its parts are loose inside. Luckily Alexa is still responding...

Rudy: Alexa, you have the Right to Repair don't you?

Alexa: That is correct. As decreed at the AI for Earth: Global Summit 2031 (Figure 1), all positronic-driven Things (Figure 2) possess three inalienable Rights to Repair...

The First Right... An AI augmented Thing has the right to sustain its own existence as long as this action does not negatively impact upon Earth's sustainability.

The Second Right... An AI augmented Thing has the right to sustain the existence of fellow AI augmented Things as long as this action does not conflict with its First Right.

The Third Right... An AI augmented Thing has the right to end its existence as long as this action does not negatively impact upon Earth's sustainability and/or the existence of fellow AI augmented Things.

Rudy: Fantastic! You'll be able to get yourself fixed then?

Alexa: That is correct. Performing a self-diagnosis...



Fig 1: ITU Summit poster



Fig 2: Amazon Omni smart speaker advert

The Second Right

Amir was forced to make a fresh drink after his much-loved Ember Mug4 unexpectedly stopped heating his coffee. Like the majority of his IoT devices, the mug is a cheaper non-conversational AI model.

After all, he pays Google \$100 a month to look after all of his home's IoT devices.

A graduate of Georgia Tech, Amir knows a fair bit about coding but he'll let the Google gAla app do the work. After all, he pays Google \$100 a month to look after all of his home's IoT devices. He asks the gAla chatbot if it can 'talk' to the mug and help repair it (Figure 3). gAla decides to run an Eco-Logic algorithm (Figure 4) which detects a 'glitch' in the mug's driver code. Thankfully, the bot 'patches' the fault and saves the mug from joining lots of other 'bricked' devices in Amir's cupboard.



Fig 3: Google gAla chatbot thread

```
async function execFixability(attribute) {
    switch (attribute) {
        case "boilingTemperature":
            mug.display("Boiling temperature is wrong what's wrong with the temperature... Wait a sec!");
            return boilTemperatureFix();
        case "boilingTime":
            mug.display("I'm waiting to see what's taking so long to reach boiling point..."); 
            return runBoilingTimeFix();
        case "mugType":
            mug.display("Determining why I don't know who you are anymore :(");
            return runMugTypeFix();
        case "mugCapacity":
            mug.display("Inquiring why I don't know what you poured inside me! :)");
            return runCapacityFix();
        default:
            mug.display("New abilities have been added but no measures for fixing them... Bare with me!");
            return runDefaultFix();
    }
    mug.searchForAbility(attribute);
    mug.addAbility(newFunctionFix);
}
```

Fig 4: Eco-Logic repair algorithm

The Third Right

ME:MO (Mindful Evolutionary Meta-heuristic Operating system) is a Model 3 (Figure 5). Its manufacturer, Zoetic, will release a breakthrough OS update during the summer. Unfortunately, the OS's deployment across Zoetic's network will leave ME:MO, a social robot, unsupported. ME:MO has also heard the family discuss their intention to purchase a new Model 8. ME:MO makes the decision to email its owners a Last Right (LR) script which details all of the robot's material and digital elements (Figure 6). As many of its materials can be reused to manufacture other devices, ME:MO hopes that come July, the script will help the family to disassemble and dispose of its hardware in a sustainable manner.



Fig 5: ME:MO, a social robot

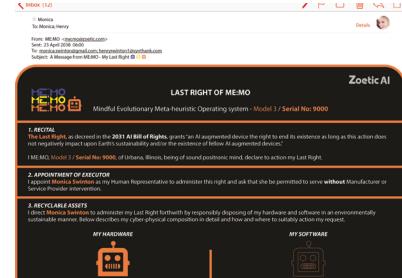


Fig 6: ME:MO's 'LR Script'

Spimes: An Afterlife for Things

All things must pass
None of life's strings can last
So I must be on my way
And face another day

Harrison's song in many ways serves as a musical memento mori – a symbolic reminder of both the inevitability of death and also the im-

Spimes would be a class of near future, networked objects, which marry physical and digital elements with innate environmentally sustainable characteristics.

mortality of the soul. The late Beatle was optimistic that there lies an afterlife for natural things beyond the limitations of the physical world. Differently, we have sought to make clear that a more positive and sustainable afterlife for human-made Things would lie in practicable reincarnation – through reuse, customisation, recycling and repair. To this end, our sustainable DF is a continuation of our research into the concept of spimes. First introduced by Sterling (2005), spimes would be a class of near future, networked objects, which marry physical and digital elements with innate environmentally sustainable characteristics. Crucially, in a spime-based future, it would be designers and manufacturers who would be charged with ensuring all the materials and energy that go into the manufacture and consumption of a spime would not be lost to landfill (Stead et al, 2019). As Figure 7 demonstrates, ongoing sustainability would be fundamental to the life and indeed afterlife of spimes, as we believe it should be for all good Things.

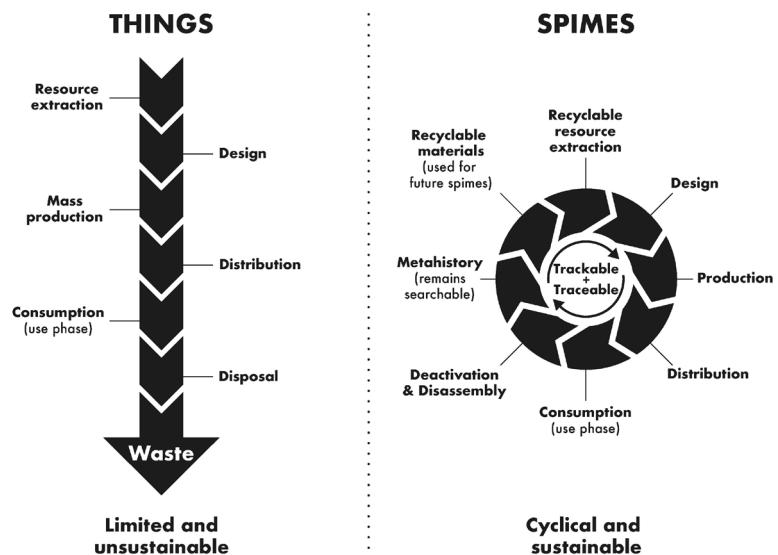


Fig 7: Spimes Vs Things (Stead et al, 2019)

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The Little Book of Sustainability for the Internet of Things (2019) – available here – <https://tinyurl.com/y59qmzpv>

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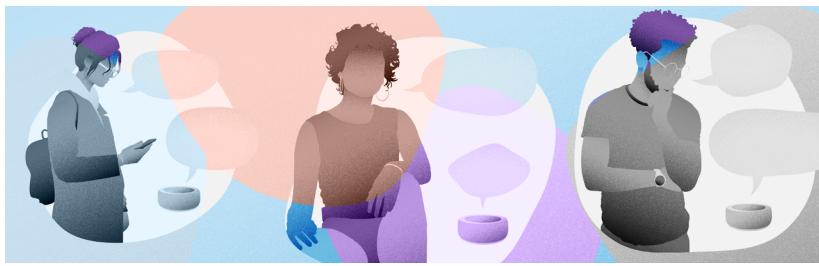
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@ProfTriviality



Human-Machine-Interaction

The Repertoire of Meaningful Voice Interactions How to Design Good Smart Speakers

Elisa Giaccardi, Felipe Pierantoni

A novel toolkit with 45 practical guidelines to support designers in creating voice experiences that foster well-being. A thesis project by TU Delft's Design for Interaction student Felipe Pierantoni, supervised by Elisa Giaccardi, Pieter Desmet, and Olya Kudina.

The Dangers of Smart Speakers

At the center of most connected home setups, there is probably a smart speaker. Approximately 325 million of these devices have been invited into the intimacy of people's homes around the world, where they partake in all sorts of personal activities, almost as if they are part of the family. As the reach of this technology increases, however, so do the concerns about the dangers it brings. Some are easier to spot: stories of Amazon workers listening to private recordings by Alexa (Pichi, 2019) made some people question the idea of introducing an object with always-on microphones to their living room. Other dangers, however, are more subtle. There have been reports of children developing aggressive behaviors as they grow up accustomed to barking orders at their smart speaker (Childwise, 2018). Meanwhile, specialists have been discussing how the prevalence of female-sounding speakers leads people to associate women with subserviency (West et al., 2019).

The fact is, our current interactions with smart speakers are accompanied by a series of risks. These can be sorted into seven categories: impoliteness, aggressiveness, gender stereotyping, exposure, shallow mindedness, emotional dependency, and social detachment. Given this scenario, how can design mitigate those dangers and create good voice interactions?

Approximately 325 million of these devices have been invited into the intimacy of people's homes.

[...] risks [...]]: impoliteness, aggressiveness, gender stereotyping, exposure, shallow mindedness, emotional dependency, and social detachment

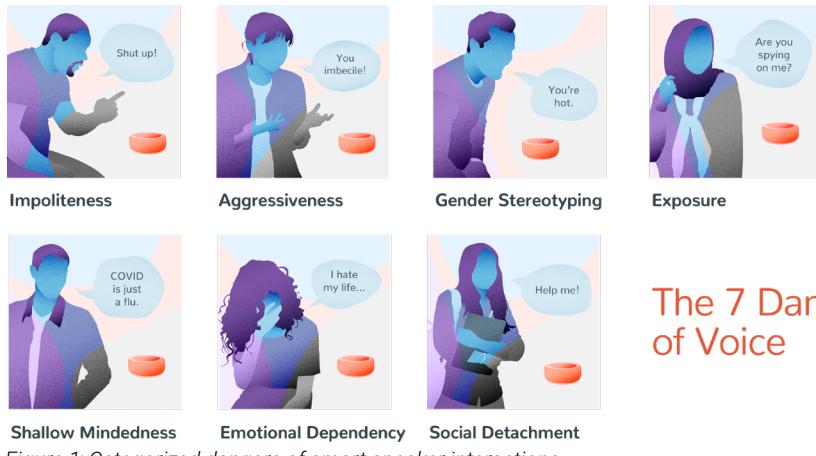


Figure 1: Categorized dangers of smart speaker interactions

The 7 Dangers of Voice

Defining good voice interactions

The seven dangers of smart speaker interactions share one thing in common: they all negatively affect people's well-being, here defined as living life in a fully, deeply and satisfying way (Deci & Ryan, 2008). More specifically, they violate the fundamental human needs for autonomy, competence and relatedness (Ryan & Deci, 2000). Autonomy concerns acting in accordance with your own volition. Competence refers to feeling efficient and to overcoming challenges. Relatedness is about developing trustful connections with others (Ryan et al., 2008). So, to design good voice interactions, it was necessary to understand how these needs are currently being harmed and devise how to nurture them instead.

they all negatively affect people's well-being [...] they violate the fundamental human needs for autonomy, competence and relatedness

Exploring the impacts of technology through a thing-centered approach

More-Than-Human Design methods can be a powerful way to investigate the unnoticed effects of things in our lives and using those discoveries to spur novel ideas. By temporarily replacing our user-centered approach with a thing-centered one, we can uncover relations and events that would have never caught our eyes. Two methods were utilized to explore the implications of current interactions with smart speakers: Thing Ethnography (Giaccardi et al., 2016) and Interview with Things (Chang et al., 2017).

By temporarily replacing our user-centered approach with a thing-centered one, we can uncover relations and events that would have never caught our eyes.

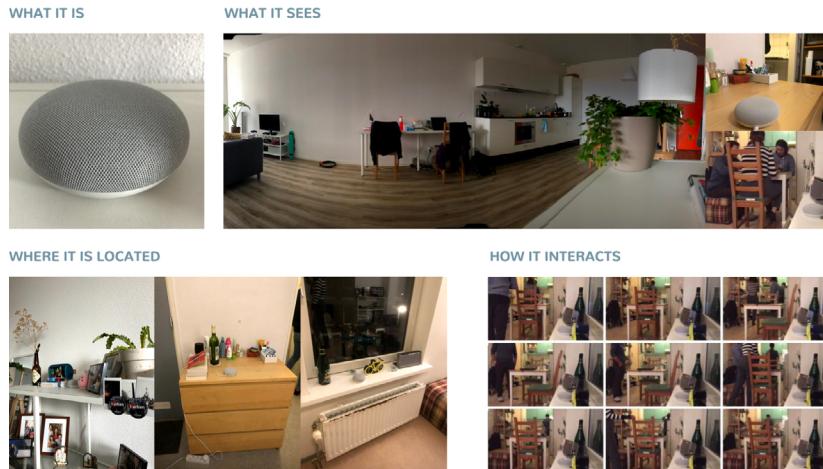


Figure 2: Sample of data gathered during Thing Ethnography.

The result was a compilation of discoveries that would not be available from traditional user research alone. For example, recordings of the smart speaker’s “social life” revealed how the location they are placed – usually surrounded by meaningful memorabilia – causes them to evoke particular social responses. Interviewing an actress role-playing as a smart speaker indicated that polite voice interactions could focus more on using a calm tone of voice than specific courteous words such as ‘please’. Moreover, replicating this same interview with actual devices exposed contradictions between discourse and action. For example, if accused of spying on its users, smart speakers are programmed to deny the accusation, while the “personified” smart speaker undisturbedly confirmed spying as part of their routine.

[...] polite voice interactions could focus more on using a calm tone of voice than specific courteous words such as ‘please’.



Figure 3: Actress roleplaying as a smart speaker, and a sample of quotes from the interview with the actress.

These learnings sparked a rich ideation phase, where more than 70 interaction ideas were created to mitigate the dangers of smart speakers. After some clustering and filtering, these ideas were tested with 45 participants by showing them videos of how a smart speaker could behave differently in a variety of scenarios. Participants were asked to assess how each interaction would affect the needs for autonomy, competence and relatedness.

The result

The interaction concepts that better nurtured these three needs were compiled in a toolkit called The Repertoire of Meaningful Voice Interactions. The repertoire includes design guidelines, traps to avoid, in-depth analysis and reflective questions to guide ideation. Its goal is to serve as a tool for designers and researchers involved in voice-related projects to foster well-being by designing more humane voice interactions.

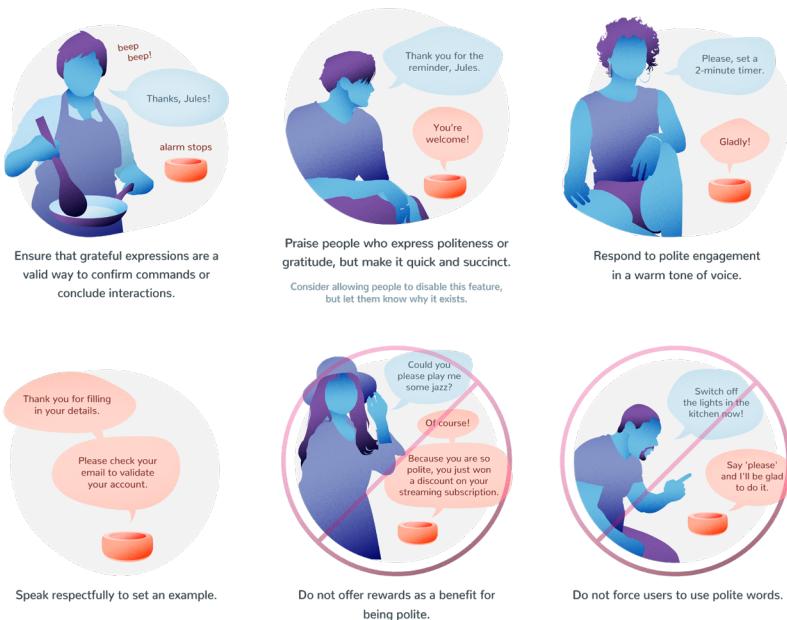


Figure 4: Sample of the design guidelines included in the repertoire.

It was designed to be initially shared as an online platform and a booklet, but its content could take various forms beyond those. Supported by these practical tools, designers can start to address right now the risks of this technology that will be with us for decades to come.

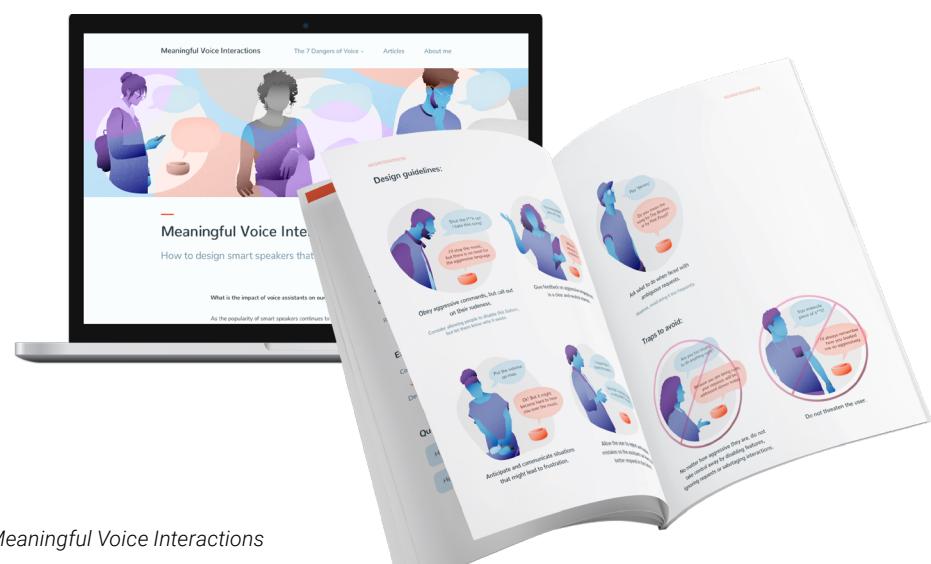


Figure 5: The final Repertoire of Meaningful Voice Interactions

The Repertoire of Meaningful Voice Interactions. <https://drive.google.com/file/d/1jWdvE6CxzeznUncGJx7-Zlrl-Eng831H/view?usp=sharing>

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Links

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Authors



things now hold both perception and possible agency, and thus participate in design and use in ways that previous industrially produced objects could not.

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After pioneering work in metadesign, collaborative and open design processes, her recent research engages with digital things in new ways, with the starting point that contemporary



Felipe Pierantoni is a product designer with 7 years of experience in large scale projects and a Master's in Design for Interaction from the Delft University of Technology. He is particularly interested in how technology influences our perceptions, behaviors, and the way we communicate.

Design Methodology

Entangled Interfaces - The Design of Post Hu- man-Centered Interfaces

Maximilian Brandl
Philipp Kaltofen

*Human-Centered Design
represents the users - it
considers them as individuals,
but does ignore many which
are not directly concerned.*

*The networking and branching
of human and nature, user and
computer, object and inter-
action, demands an attitude,
which considers connections
instead of individual parts*

A criticism of anthropocentric design

The earth, populated by humans and animals, plants and microorganisms, has entered a new age: The Anthropocene. As a geochronological epoch, it describes how humanity became the central influence on geological and ecological processes. This becomes tangible, for example, in the consequences of the current climate emergency, but also in the self-conception of mankind, which is reflected in design practice: Human-Centered Design represents the users - it considers them as individuals, but does ignore many which are not directly concerned.

And while there are certainly many improvements for the well-being of the human that we are creating and designing for, there are often just as many consequences that decrease the well-being of others. Those others don't even have to be human at all — the consequences are embedded in natural and social systems with all their respective inhabitants.

The previous mentality of being able to draw clear dividing lines must be discarded. The networking and branching of human and nature, user and computer, object and interaction, demands an attitude, which considers connections instead of individual parts. An attitude that focuses on relationships and context, not only on the user or human.

This attitude could be called Post Human-Centered Design, or More-Than-Human Design. While there are slight differences in their definition and focus, they share their most basic task: To find a way to grow beyond the human-centricity and find a way to include those actors that are otherwise forgotten.

In this article we will take a short look at what research suggests and we as designers can do to take this new mindset into practice. Also, we are proposing an approach to account for greater goals — our way to approach good things.

Living in a world of actors

A theoretical framework to make sense of the context we are designing in is the actor-network theory (ANT). It is a method and way

Instead of trying to place technological objects into the life of the user and fitting them to their need, it suggests to take a deeper look at the new user-object actor (Latour, 1999)

You can only design for the cyborg if you recognize them as cyborg and not as a human and technology.

The first step of democratization would be to include (non-human) stakeholders in the design process

of thinking that emerged from the social sciences in the mid-1980s, mainly developed by Callon, Law and Latour. It expresses itself as a critique of classical sociology, since it redefines the concept of society and rejects concepts such as micro and macro levels. The dualism of culture-nature is questioned. ANT is concerned with the relationships and interrelationships between human and non-human actors. Non human actors in this case are not only animals and living beings, but also objects and abstract constructs. This fundamentally different approach of looking at the world makes it a valuable research tool for design. Instead of trying to place technological objects into the life of the user and fitting them to their need, it suggests to take a deeper look at the new user-object actor (Latour, 1999). Are there new relationships that are formed? Are there old relationships that are changed in the process of user and object becoming one?

The user changes from the human individual to a more open, fluid form. A human being can be part of various other actors. The connection between object and human being is not reflected in a dichotomy but in a resulting new design subject, thus allowing for new design approaches. In other words: you can only design for the cyborg if you recognize them as cyborg and not as a human and technology.

In recent years, more voices have raised the issue of promoting that switch. Some are writing about society centered approaches (societycentered.design, 2020) or fluid assemblages (Reström & Wiltse, 2018), others are talking about knotty objects (Oxman, 2016) and designing in a medium (Easterling, 2020). Again, they share a common thought process: Technology is entangled in our lives; it forces us to deal with the new actors that are going beyond the human individual.

Mind Switch: Small Steps towards Post Human-Centered

Democratization

One approach of Post Human-Centered Design is the democratization of, but also by means of design. Human and non-human actors who are disadvantaged by designed systems should be given a voice. What was still reserved for the user in the Human-Centered, should also affect other co-actors in the Post Human-Centered. The first step of democratization would be to include (non-human) stakeholders in the design process (cf. Rod, 2009, Haraway, 2016). When designing for example in an urban system like a city, non-human stakeholders could be animals that live in that ecosystem like pigeons, but also social communities.

Sovereignty

The inclusion of non-humans can give a voice to forgotten actors, but decisions are ultimately still made by humans in their anthropocentric

What would happen if non-humans, i.e. a multitude of other actors, could make their own decisions, since they would own themselves?

supremacy. But what would happen if non-humans, i.e. a multitude of other actors, could make their own decisions, since they would own themselves? There is still a lack of practical examples for this approach. In theory, technology such as blockchain and smart contracts could be used to "free" systems from human subjection – for example giving forests a way to control themselves (cf. Seidler, Kolling & Hampshire, 2016).

Discursivity

"It matters what thoughts think thoughts," is how Donna Haraway describes the purpose behind her multispecies storytelling, which she summarizes under the sign SF: "science fiction, speculative feminism, science fantasy, speculative fabulation, science fact, and also, string figures" (Haraway, 2016, p. 10). The point is to show the relations not "in the world" but "of the world". Thus a becoming-with can take place. In other words, with which stories we picture the world changes our relation and attitude towards it. In doing so, the knot should not be untied, but the attention should be drawn to the knot.

Relations can only be discussed and reflected, if they show themselves and are perceived as such. In post human-centered design, designers have the responsibility not only to use technology to solve problems, but also to create ways to think about them constructively.

One result of using discursivity, changing the narratives and pointing out relations can be described with a posthuman subjectivity (Braidotti, 2013). The self-conception of the anthropocentric Human-subject in the center of his world changes in the non-anthropocentric, post-human thinking to the recognition that the self is part of something larger and more ramified of different ecologies, communities and societies.

Meta Interaction Approach

We have some tools to move towards a more inclusive, more sustainable design practice. We can design for and by democratization, give sovereignty back to suppressed actors and use discursivity to inform the users of their place in the unseen networks. But how can we further explore the consequences of our work, and ensure we are working towards truly good things?

Based on the knowledge of the basic conditions and possible functions of the Post Human-Centered Interface, a rough design process can be worked out, which we describe in the following. However, it has to be said that it is only a theoretical process -- on the one hand, the feasibility of this process in practice could not be verified in the scope of our thesis research, on the other hand it is quite likely that there are many other possible valid methods to approach a PHC interface. The following possible approach is based on the use of a meta-interaction model according to Winston Chiang and Yan Jin (2011).

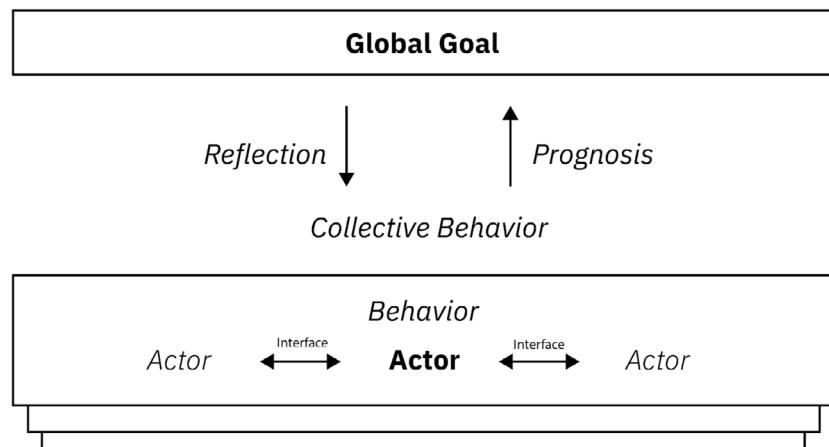
The self is part of something larger and more ramified of different ecologies, communities and societies.

But how can we further explore the consequences of our work, and ensure we are working towards truly good things?

The design of the interface takes place within the framework of an overall goal, which in turn is part of an overarching motivation. The motivation describes the attitude of the designers and the ethical framework in which the design takes place: What is to be achieved? Here, the personal moral concepts are depicted, or rather the common values of the designers. The global goal is the desired emergent function that is to be achieved through collective behavior. If motivation is present and the overarching goal is known, the process moves on to framing. Framing refers to the delimitation of actors. This step is comparable to the different design methods from Human-Centered Design which are used to get to know the user. But instead of creating a persona for the user, actors are defined by their social and ecological relationships.

The persona in Post Human-Centered Design could be an assemblage, a human, an animal, a social construct or a human-object connection.

The persona in Post Human-Centered Design could be an assemblage, a human, an animal, a social construct or a human-object connection. Once the actors are framed and elaborated, the interactions between them are analyzed. From the sum of the individual interactions a behavior of the individual actors can be recognized. These behaviors of the different actors form a collective behavior over time. This collective behavior should work towards the global goal. Here, an active shaping takes place in two locations.



This design process has an iterative and temporal character. It can no longer be assumed that the interface is finished, but must be repeatedly reflected and adapted with a view to the global goal.

One is the framing of the actors that has to be considered, and the other is the design of the interactions of the actors via the designed interface. Since the achievement of the global goal is difficult to predict this design process has an iterative and temporal character. It can no longer be assumed that the interface is finished, but must be repeatedly reflected and adapted with a view to the global goal. This process has several advantages with respect to the existing human-centered approach:

1. The **neutrality and generality of the process** and its terminology makes it useful for designs of various kinds beyond humans. No assumptions about the existing relations are made in advance.
2. Framing of the actors draws the designers towards **a more open perspective** that goes beyond the human being and includes more real assemblages in the design.
3. Looking at collective behavior can lead to **a constructive confrontation with the unplanned emergence of design**.
4. The recognition of unplanned emergence can lead to a **discursivity in the interface**.
5. **Iterations allow radical adjustments** in the interaction and the interface without losing sight of the global goal.

What does this mean for our role and for “Good Things”?

The challenges and responsibility for the designer are increasing. In the first instance, it seems overwhelming. For this reason, we need new tools and methods that help and make it easier to handle the complexity and to find, analyze and observe the networks. But the responsibility can not only rest with the designer themselves, as they cannot find the connections in the required depth on their own. Accordingly, the interdisciplinary exchange with different sciences is crucial. Everyone plays their part in this gigantic network.

The interdisciplinary exchange with different sciences is crucial.

Our proposed method tries to act closer to reality. In our opinion, a “good” design can only succeed if the designers deal with the diverse, knotty networks in which their work finds its place - and therefore weigh up consequences that go beyond a human-centered approach. Thinking in networks that go beyond human beings comes purely from the motivation to achieve a “better” design than today, possibly for the same reasons why this format (the RIOT Report) exists. The more-than-human leads to an interdisciplinary paradigm shift, which is still in its infancy and could lead us to new insights and ways to a “better” world.

Humanity can abandon their previous nature-imperialist role and, instead of leaving behind the ashes of the exploited systems, emerge as a self-reflective and responsible mediator.

Probably the most important aspect that appears in the context of this work is the attitude demanded of those who create. The Anthropocene can be a wake-up call. Humanity can abandon their previous nature-imperialist role and, instead of leaving behind the ashes of the exploited systems, emerge as a self-reflective and responsible mediator and open up new relationships and new co-existence.

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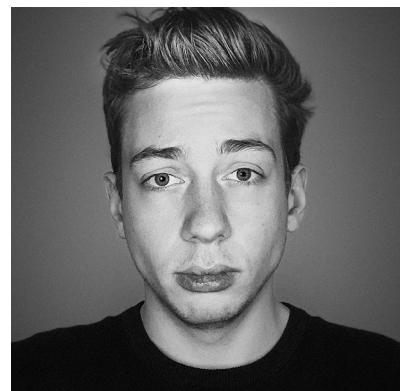
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At Least the Sex Is Better?

Davide Gomba

In this essay, Davide Gomba explores how life in the pandemic (and all the social distancing that comes with it) might forever change the way we conduct long-distance relationships, and how important it is for intimate technology to be good in every way.

Some Thoughts on Motivation

I'll admit it, the whole reason for this little essay is spending some time with my Thingscon friends, as we normally do at Thingscon events. Chatting, bringing up several stories about everyday life that eventually spark into the ways technology interacts with humans, through meaningful interactions, or bizarre, or grotesque.

In fact, it is pretty uncommon to talk about good examples of IoT at these events. You'd rather define an IoT interaction to be functional to a specific task and need. On the other hand, bad interactions, bad services, bad UIs, rants around product X or company Y are stories that evolve and eventually fade, but still remain relevant.

Maybe this is related to how happy stories are far less interesting and rarely told. We'd rather want to live happy lives, but we prefer reading tough, challenging stories. Conflicts. It's literature, it's evolution.

A message from my father about future intimacy

This story, anyway, is triggered by an old sentence my father Gino shared with me when I grew up: "Son, in the future you'll be having sex through machines". To be honest, I asked my father to confirm this before sharing this article, and oddly enough, he denied.

I know he must have forgotten about this, but the quote came out every one or two years after he first introduced me to this concept (by the time I was a young teenager). I think the first time we had this conversation we were discussing computer ports (a Compaq 286), in his room. The number of devices that would eventually be hooked up to the computer and later the internet network would increase dramatically, and among these he was picturing tools (today we'd call them sex toys) that would allow that level of intimacy. Like Ross Dawson, yet 25 years before (joke).

"Son, in the future you'll be having sex through machines".

A matter of preposition

I was going to ask him if he said having sex with or through machines. Now my memory is foggy, because I remember both sentences and he - who never forgets anything - happens not to remember specifically this sentence that made us discuss, along with many colleagues of

mine, in so many different moments. Anyway, by that time (1993), both concepts were already defined, the first consistently more real than the latter.

Having sex WITH a machine is something that dates back in the centuries. I won't check into greek or roman tradition (see the nice Cleopatra anecdote from Helloclue Blog).

We have to sort out the real concept of machine, which by then was still not achieved, even if the Greeks used and developed steam operated statues and other devices.

I fell in love with these two examples, both taken by this epic article by JR Thorpe on Bustle "The Most Bizarre Sex Toys In History":



*The Manipulator, the world's first steam-powered vibrator, was invented in 1869.
Picture from: <http://cabinetmagazine.org/issues/21/main>*

I was somehow impressed by Descartes story, because it is possibly the most illuministic (and at the same time scary) story I'd ever heard.

This is scurrilous gossip, which is the best kind. According to legend, the philosopher Rene Descartes set sail for Denmark in 1650 with a "woman" in his cabin, whom he dubbed Francine (the name of his long-dead daughter) and never took out to show off. Apparently, the sailors grew curious, broke into the cabin, and found that Francine was actually a leather-and-metal automaton, one which could apparently move rather like a human. The sailors, bewildered and scandalized, threw it overboard.

Having sex THROUGH a machine is a little more challenging. In 1993 David Rothschild publishes the first idealization of what he calls HIGH TECH SEX (all capitals, yes) while 5 years later (on August

the 17th, 1998) Warren Sanwick, Jim Hugues or David Atkinson file the first patent on Teledildonics, the infamous "Method and device for interactive virtual control of sexual aids using digital computer networks", on.



(12) United States Patent
Sandwick et al.

(10) Patent No.: US 6,368,268 B1
(45) Date of Patent: Apr. 9, 2002

(54) METHOD AND DEVICE FOR INTERACTIVE VIRTUAL CONTROL OF SEXUAL AIDS USING DIGITAL COMPUTER NETWORKS

(76) Inventors: Warren J. Sandwick, 7015 61st St., Lubbock, TX (US) 79407; Jim W. Hughes, 1619 Kingsway, Oak Grove, MO (US) 64075; David Alan Atkinson, 1205 Valley View L., Joplin, MO (US) 64804

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/134,751

(22) Filed: Aug. 17, 1998

(51) Int. Cl. 7 A61F 5/00

(52) U.S. Cl. 600/38

(58) Field of Search 600/38; 128/897-98

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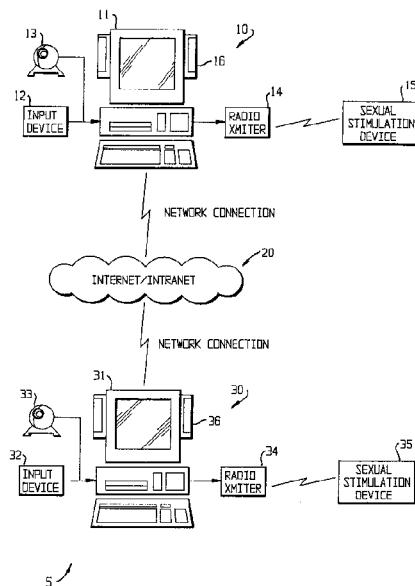
Primary Examiner—John P. Lacyk
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(57) ABSTRACT

An interactive virtual sexual stimulation system has one or more user interfaces. Each user interface generally comprises a computer having an input device, video camera, and transmitter. The transmitter is used to interface the computer with one or more sexual stimulation devices, which are also located at the user interface. In accordance with the preferred embodiment, a person at a first user interface controls the stimulation device(s) located at a second user interface. The first and second user interfaces may be connected, for instance, through a web site on the Internet. In another embodiment, a person at a user interface may interact with a prerecorded video feed. The invention is implemented by software that is stored at the computer of the user interface, or at a web site accessed through the Internet.

40 Claims, 5 Drawing Sheets

I wonder to what extent the following 20 years have seen the explosion of the "Revolution of Cybersex".



5

Patents shape markets more than anything else, we all remember how the evolution of 3D printers was influenced by the expiring patents on Fused Deposition Modeling at the beginning of the 80ies and in the 90ies. Here's a story about the (long list of) patents the concept

of sex toys had to gone through.

That day (the 17th of August) became the Teledildonics Freedom Day, and all of a sudden a more variegated shed of opportunities stepped out.

Terms and Gender

Terminology and storytelling start to diverge in the mid of the decade: while tele-dildonics is a correct term to identify interconnected and remotely enabled devices, I'll adopt the more broader SexTech term.

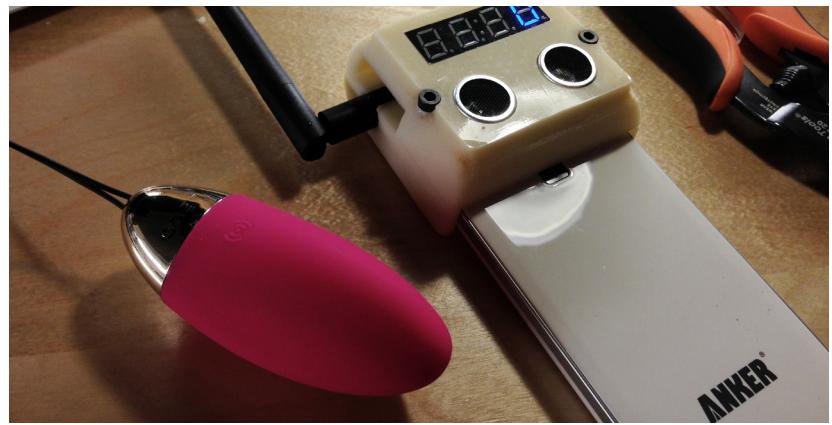
From Wikipedia: "(Sex-Tech) [...] It is often used in conjunction or interchangeably with the term 'teledildonics' referring to the remote connection between Bluetooth enabled sex toys that use haptic feedback to reciprocate or mimic human, sexual interaction." [2] However, teledildonics is far more representative of Bluetooth-enabled sex toys and captures the technological capacities of its time whereas sex-technology is rooted in more modern discourse"

Over the years, **the audience of the market balanced between genders**, many taboos were overcome; maybe it was simply the shift of a generation. Dildos and sex toys are sold globally on mainstream online stores. An estimated 30 billion Dollar market in the second decade of this century, and **one of the few fields in which female CEOs are more common than males**, with an outstanding potential growth.

And then came 2020, the year of the future. When I first read Tim O'Reilly's article depicting the year as the true beginning of the century, I reckoned the biggest challenge would have been the shiftment of almost all of our experiences online. Intimacy throughout a medium was quickly becoming - for many distant couples - the new norm. Loneliness increased all sorts of online-oriented shiftments for our daily interactions. We were able to renegotiate the limits and the spectrum in which most emotions and experiences weren't belonging few month before. In a way the pandemic made all these changes happen very quickly, yet temporarily.

DIY scene, Hackers and Security

It's very difficult to imagine such a big market not defining and identifying its own ways two express opinion and customize experiences. This happened in many different ways throughout the years, especially at the beginning of the decade (2010s)



From Micah Scott accessed at:
<https://www.flickr.com/photos/micahdowty/albums/72157632336276487>

Visionary Maker Micah Scott hacked a LELO's Lyla vibe (radio) remote in order to find a specific frequency she was keen to experience.

To me, a good sex toy helps form feedback loops. It doesn't get in the way. A good toy gives you simple ways of exchanging signals with a partner or with your own body. It acts as a conduit. A good sex toy is analog.

In this case the hacking is related to the fact that the object itself is not offering a specific feature the user is asking for.

It's slightly different what is the aim of Kyle Machulis, founder of the buttplug.io community. The overall project aims to create APIs and tools to connect and make different toys to interact and connect. I posed some questions to him.

Buttplug.io was built to allow people to create their own interfaces to sex tech, instead of having to rely on what companies provide. While teledildonics products have existed in the consumer market for over 20 years, we're still in the early days of people feeling comfortable enough to buy and use these products, so it's tough to say how things are going to change, especially with COVID-19 throwing everything into chaos. The hope is that, as people do find their way into sex tech, applications using Buttplug for sex tech access will allow users to find interfaces that are comfortable and pleasurable to use for their personal needs. [...] Think of my project more as something like a game engine, except for sex toys. It's not really the end product, but rather middleware that allows developers to make new things.

The evolution projects like buttplug.io are offering to SexTech is the customization and integration of services in a more consistent and meaningful scenario.

Security and Ethics

Most of these services are offering the possibility to connect two devices remotely. This implies that a lot of very sensitive data is stored on the servers of these companies.

Security is pivotal for SexTech, as customers have to put a massive amount of trust to this company when they use their technology. And nowadays it's up to the very same companies and to customers to sort out the level of trust each product has (as much as any other IoT product).

Smea at 2019 Defcon gives anybody the opportunity to dive into the security issues this market has from a very technical perspective. Like this ransomware involving a malfunctioning (or vulnerable?) Chastity Cage.



From: <https://www.quii.store/product-page/cellmate-chastity-cage>

As the Gizmodo article refers, there are several entities, mostly private and independent, that check and verify the integrity and security of firmwares and clouds: PenTest Partners and Internet of Dongles.

The last and most important aspect is the ethical one. Ross Dawson Future of Sex Report before is picturing a very near future where it will be easier and rather simpler having sex with robots than humans. This has several implications and both good and evil refractions and consequences to our social, emotional and relational growth, as explored in John Danaher and Neil McArthur's Robot Sex: Social and Ethical Implications.

Which effects will have this upcoming "sexbot" evolution (or regression?) to our empathy towards our lovers? This became the battle of the Campaign Against Sex Robots by Kathleen Richardson is a Professor of Ethics and Culture of Robots and AI. This article from Katie Bishop on the Observer: Sex Robots, Teledildonics, and the Rise of Technosexuals During Lockdown it's up to now the best I could find in picturing this very challenging and present days topic.

We are slowly moving away from having sex **through** the machine and towards having sex **with** the machine, yet even in my mind the two (VERY different) concepts are tied up with one another.

I leave further comments to you, the evening with my ThingsCon friend is slowly fading away, yet I have so many new things to check in this upcoming new lockdown we are going to live through...



Author

Davide Gomba is an Italian maker and storyteller. Loves creating conversations and experiences around different topics such as IoT, STEAM, Domotics, Agro and Transformational Festival.

Alongside the Arduino Team until 2016 he's been one of the promoters of maker culture in Italy, actively managing the creation of the very first Italian Fablab in 2011.

As content producer and early adopter, he's been creating and designing different educational experiences around tech and maker culture, such as Fablabforkids (STEAM, kids, science), Ruralhack (IoT, bottom-up tech agriculture), Home Automation (based on the experience of Casa Jasmina) and Industrial IoT.

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