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Ding

A magazine about the Internet and things

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Words

John Thackara writes about live examples of what a sustainable future will be like. These projects, with a focus on social and ecological design, feature in his Doors of Perception workshops. He once drove a London bus (routes 73 and 134).

Solana Larsen edits Mozilla's Internet Health Report. Formerly she was managing editor of Global Voices, a community of bloggers that translate and report on citizen media worldwide. She once founded PuertoDansk, a Danish-Puerto Rican society.

ThingsCon (Max Krüger, Peter Bihr and Simon Höher) is a global community of practitioners around Internet of Things (IoT) and connected products that foster the creation of a human-centric & responsible IoT.

Gillian Crampton Smith is one of the world's leading academics in interaction design. She founded the Computer Related Design department at the Royal College of Art (RCA) and co-founded the Design Institute Ivrea. She currently teaches at H-Farm Education.

Vladan Joler directs the Share Foundation and is a professor at the New Media department at University of Novi Sad. He investigates invisible aspects of technology and recently researched Facebook's algorithms.

Jayne Wallace is a craft and design professor at Northumbria University. She explores digital jewellery and the act of making to support sense of self. She focuses on how contemporary craft and the digital can support living with dementia and bereavement.

Andrew Prescott researches Digital Humanities at the University of Glasgow. He is a medieval historian who previously worked in the Department of Manuscripts at the British Library, where he coordinated a number of digital projects, including most notably Electronic Beowulf.

Quicksand (Babitha George and Romit Raj) is an interdisciplinary consultancy in India that reflects on how a craft approach enables more thoughtful and long-lasting products. The studio also curates the UnBox Festival.

Justin Marshall is an associate professor at Northumbria University. He is a practice-based researcher focusing on the role and value of craft in interdisciplinary digitally orientated research projects, as such he is interested in both digital craft and crafting the digital.

Images

Eleni Kalorkoti graduated from Edinburgh College of Art in 2007, before training in screenprinting at Edinburgh Printmakers. She can now be found drawing pictures and making things in south London.

Alun Callender is a photographer with a passion for portraiture. He is fascinated by other people, their stories and what inspires them.

Sean Dooley is a mathematician turned photographer who likes to spend his time exploring the regions where human life meets its habitat.

Giulia Garbin is a London based Art Director, Graphic Designer and Illustrator. She is passionate about traditional print processes and believes in the importance of craftsmanship in design.

Editors

Jon Rogers is an academic at the University of Dundee and is a Senior Fellow with Mozilla's Open IoT Studio. His work explores the human intersection between digital technologies and the design of physical of things.

Pete Thomas is a designer and researcher at the University of Dundee. He co-founded the creative studio Tom Pigeon and the design and innovation agency Uniform.

Michelle Thorne leads the Mozilla Open IoT Studio, a research network for practitioners investigating and advocating for a healthier Internet of Things. She previously directed Mozilla's web literacy programs and produced the Mozilla Festival.

Letter from the Editor

Welcome to the first issue of DING, a magazine about the Internet and things. We founded this magazine because we saw a gap in the practice of slow, considered making and the breakneck speed of technology. We wanted to anthologize the sprawling online conversations and provide a place of reflection for people interested in crafting technology in more responsible ways. It is our place of refuge to discuss internet health and emerging technologies - slowly, sustainably and in print.

Our inaugural issue focuses on craft. We interview Gillian Crampton Smith, one of the founders of interaction design. She describes the practice of designing the right thing - and designing the thing right. As virtual and physical worlds converge, Gillian argues that we need craft to inform how we interact with connected objects.

John Thackara, renowned author and critic, writes that the Internet of Things is missing a value benchmark. "We've created a global infrastructure that is brilliant on means, but unambitious when it comes to ends," he laments. How might we build technology that considers the true cost of production while respecting human dignity and repairing the Earth?

Craft considers the materiality of an object throughout the object's lifecycle. Researcher Vladan Joler investigates the death and afterlife of things. From the graveyards of the cargo ships that carry our electronics to the cartels that shorten the lifespan of everyday objects, we begin to see the invisible forces that are making IoT a costly endeavor.

Ever since humans began making objects, we had to consider the materials available and the knowledge of how to shape them. Justin Marshall recounts how tools evolve and adapt based on local needs. Historian Andrew Prescott illustrates how constructing medieval cathedrals required sharing skills and even early computational thinking.

We also hear from the ThingsCon community, who curated a map of local solutions for local needs. The design studio Quicksand in Bangalore reflects on how they use a craft approach to build more thoughtful and long-lasting products. The digital jeweler Jayne Wallace describes how the Eames' India Report, written over fifty years ago, provides a template for how to think about craft and the internet today.

Today we live with digital technology that's primarily manufactured in Shenzhen and designed in Silicon Valley. Centralization of production means that there is less choice and less inclusion. We need decentralized ecosystems, where craft thrives so that people can deploy the materials around them to make local solutions that last a long time. We hope you enjoy this issue and that it sparks ideas for crafting technology in healthier ways.

Michelle

when we connect with living systems emotionally and not just rationally, things really begin to change...

Viewpoint John Thackara
Illustration Eleni Kalorkoti

On a recent visit to Barcelona, I was charmed by the Institute for Advanced Architecture of Catalonia's Smart Citizen platform that enables citizens to monitor levels of air or noise pollution around their home or business. The system connects data, people and knowledge based on their location; the device's low power

we lust for speed, perfection and control

consumption allows it to be placed on balconies and windowsills where power is provided by a solar panel or battery. Smart Citizen is just one among a growing array of devices and platforms that can sense everything from the health of a tomato in Brazil, to bacteria in the stomach of a cow in Perthshire - remotely. This innovation is welcome, but it leaves a difficult question unanswered: Under what circumstances will possession of this data contribute to the system transformation that we so urgently need? What's missing, so far - from the Internet of Things in general, and remote sensing in particular - is a value benchmark against which to analyze the data being generated. We've created a global infrastructure that is brilliant on means, but unambitious when it comes to ends.

A word on the background. Our whole society has been rendered cognitively blind by a metabolic rift between man and the earth. Paved surfaces, and pervasive media, shield us from direct experience of the damage we're inflicting on soils, oceans and forests. The metabolic rift explains how we're able put the health of 'the economy' above all other concerns. We lust for speed, perfection and control but, because we inhabit an abstract, digitally diminished world, we're blind to the true costs of our activities - either because they are literally invisible or, more often, because the effects are being felt somewhere else; i.e. the environmental impacts of a resource-intensive economy don't touch us directly, so we don't think about them. Just because they are out of sight and out of mind doesn't make them any less devastating. Our reliance on data underpins a concept of progress in which analogue local knowledge is usually downgraded and often disregarded. For the philosopher John Zerzan, our society-wide dissociative mental state began when we placed language, art, and numbers above other ways of knowing the world. Every representation, he argued, both simplifies and distances earthly reality.

We once knew better. For much of human history, the idea that the world around us is 'vital' was common knowledge. Greek philosophers known as hylozoists made no distinction between animate and inanimate, spirit and matter. Roman sages thought likewise. In his epic work On The Nature of Things, the poet Lucretius argued that everything is connected, deep down, in a world of matter and energy. Chinese philosophers, too, believed that the ultimate reality of the world is intrinsically connective; in the Tao, everything in the universe, whether animate or inanimate, is embedded - a stream of continuous flow and change. Buddhist texts, too, evoke a universe that's in a state of ceaseless movement and connection. In seventeenth century Europe, the Dutch philosopher Baruch Spinoza conceived of existence as a continuum, an inseparable tangle of body, mind, ideas and matter.

The belief that matter matters, so to speak, was then obscured for two intense centuries. First, by the fire and smoke of the thermo-industrial economy, and, more recently, by global communication networks. Now, as this self-devouring system unravels, the healing idea that that we are part of a world of living things, not separate from it, is resurfacing. Developments in science have done much to confirm the proposition that no organism is truly autonomous. These discoveries do much to close the metabolic rift. In diverse context, Gaia theory, systems thinking, and resilience science, have shown that our planet is a web of interdependent ecosystems. A new narrative has emerged from the study of sub-microscopic viruses, yeasts, bacteria in our gut, ants, mosses, lichen, slime moulds and mycorrhizae, trees, rivers and climate systems: These natural phenomena are not only connected; their very essence is to be in relationship with other things, including us.

we are part of a world of living things, not separate from it

On a molecular, atomic and viral level, humanity and the environment literally merge with one another, forging biological alliances as a matter of course. The importance of this new perspective is profound. The division between the

thinking self, and the natural world - a division that underpins the whole of modern thought - is beginning to dissolve. It follows that the great work of our time, and an answer to the value question that has so perplexed the Internet of Things, is to re-connect us, viscerally and emotionally, with the living systems we've lost touch with. But how?

The tools for such a project are maturing. Low-cost sensing technologies as exemplified by Barcelona's SmartCitzen allow citizens to assess the state of the environment directly. We can also measure oil contamination in our local river

we need to perceive and empathize with ecosystems as systems

with a smartphone. Thousands of people are monitoring the air they breathe using Air Quality Eggs. An ecology metrics list on Github lists an astonishing three thousand terms, from molecular phylogenetics to microrefugia, and myrmecology to ecophisiology, and scientists are developing tools to analyze, interpret and visualize this vast and growing cloud of data. Social networking enables this task to be shared. Attempts are also underway to integrate environmental monitoring, awareness enhancement, and behavioral change, within a unified framework. A European platform called Everyaware combines sensing technologies, networking applications and data-processing tools in one platform.

For Barcelona's SmartCitizen team, and others in the fast-expanding field of citizen science, connecting people with their environment creates "more effective and optimized relationships." Well, maybe. As I have argued elsewhere, we are still trapped at a system level in a "desert of the real". There's no indication, as yet, that possession of this data, on its own, will contribute to the system transformation that we so urgently need.

Is this the question to which the Internet of Things is an answer? When we first posed that foundational question at our third Doors of Perception conference, in 1995, ecological monitoring and remote sensing were the most popular suggestions. Twenty two years later, the proliferation of tools and platforms

to implement those ideas is glorious. Yet our journey is only half complete. Remote sensing and monitoring have turned not, on their own, to be agents of system change. Going forward, our work therefore needs to focus on three things.

First, we need to perceive and empathize with ecosystems as systems, not just with their component parts. Biophysical processes, including social-ecological ones, are shaped by forces below our everyday level of perception. We need ways to perceive and empathize not just with energy and nutrient flows, but also with social-economic systems such as credit, and financialization, which drive the economy to be extractive and ecocidal.

Second, connecting the dots, revealing system-level patterns, and searching for root causes, will be most effective within a framework of bioregional stewardship. A bioregion re-connects us with living systems, and each other, through the places where we live. It acknowledges that we live among watersheds, foodsheds, fibersheds, and food systems. not just in cities, towns, or 'the countryside'. Growth, in a bioregion, is redefined as improvements to the health and carrying capacity of the land, and the resilience of communities. Its core value is stewardship, not extraction. A bioregion, therefore, frames the next economy, not the dying one we have now.

Third, in our ongoing search for new and better ways of knowing and being, we have huge amounts to learn from non-literate and indigenous cultures whose experience of the world is more direct than our own.

we have huge amounts to learn from non-literate and indigenous cultures

There are no generic solutions to our situation; the way ahead will be based on knowledge that is local, experienced directly, contextual, and embodied. Only when we connect with living systems emotionally and not just rationally, when we focus on the informal, the local and the conversational, will things really begin to change.

Desktop Search Engine Market Share

Mobile & Tablet Search Engine Market Share

Google
81.2%

Bing
6.97%

Baidu
5.82%

Yahoo
4.74%

Other
1.27%

Google
91.69%

Yahoo
5.74%

Bing
2.19%

Figure 1% of market share
Source netmarketshare.com

WHO CONTROLS THE INTERNET?

In each issue of DING, we focus on an aspect of Internet health. This issue looks at decentralization through an excerpt from Mozilla's Internet Health Report. Decentralization means the Internet is controlled by many. It's millions of devices linked together in an open network. No one actor can own it, control it, or switch it off for everyone.

Today, the Web is thriving beyond the "walled gardens" of social media. Over 1 billion websites exist as a result of the decentralized domain name system (DNS). Nevertheless, there is high centralization among social networks and messaging platforms. Facebook has the most active users: 1.7 billion worldwide. It controls most of the messaging market in almost every country except China.

Similarly, more searches happen on Google than on all other search engines combined. At the time of writing, Google's lead is largest on mobiles and tablets, with a market share of 91.69%. This centralization is also reflected in the browser market, where 62% of desktop computers use Google Chrome, followed by 15% using Mozilla Firefox. The browser is the central gateway to the Web, so it matters that there is competition and choice.

While the Internet of Things is an emerging field with numerous players still jockeying for space, the threats of centralization persist. We are heading towards a future of vertically integrated silos controlled by a few large players. To change this direction, we must foster decentralization and the benefits it brings.

internethealthreport.org

DISPATCHES

We invited ThingsCon, a global community of practitioners advancing responsible IoT, to curate this issue's dispatches. Their correspondents share how technology is being used recently in ethical ways around the world.

NETHERLANDS

A PhD project by Gabriel Ionut Zlamparet re-uses health equipment in an effort to reduce the environmental impact of manufacturing

Iskander Smit

UNITED KINGDOM

Hold is a series of touch-driven prototypes that aim to improve how dementia patients interact with each other

Ben Eaton

GERMANY

The State of Responsible IoT collects essays from experts around the world who illuminate the latest insights and challenges facing the field today

Peter Bihr

SERBIA

Facebook's Algorithmic Factory investigates the invisible ways that the social network extracts value from users

Vladan Joler

CHINA

View Source documents manufacturing IoT in the unique city of Shenzhen, which produces the majority of the world's electronics

Peter Bihr

SENEGAL

SolarPak is a backpack equipped with a solar panel that collects energy during the day and enables children to study at night by the light of small LED lamp

Dodji Honou

NIGERIA

A mesh wifi box enables street vendors to track their inventory and manage stock without the internet

David Li

INDIA

#breathe created a suite of low-cost devices to measure air quality in major cities and partnered with Twitter to make the measurements more accessible

Rahma Mian

SINGAPORE

Outernet is a low-cost, low-power device that listens to data broadcasts anywhere on the planet, no internet required.

Saad Chinoy

BRAZIL

Operação Serenata de Amor is an anticorruption bot that analyzes the probability of illegality in the reimbursement requests from parliament members

Gabi Agustini

"In the past, we interacted with machines which explained themselves through their form and the affordances they offered"

Gillian Crampton Smith

Interview by Jon Rogers

Photographs by Alun Callender

I want to pick up the conversation we had recently about craft when you said that even after many years of teaching, researching and practicing interaction design, it remains difficult to explain what design is and the importance of its craft. Could you say what you mean by "craft" in the design of digital products?

"Design" has many meanings: it can mean planning, as in designing a workflow; or engineering, like designing a PCB or a database architecture. But the kind of design I practice is design that brings together both practical function and culture.

Architecture is an obvious example. Buildings are complex artifacts. They must stay up, keep the rain out, and keep people warm in winter and cool in summer. But they are also artifacts that have social meanings. The ancient Roman architect, Vitruvius, said that they must have "firmness, commodity and delight": they must be robust, fit their function and give aesthetic pleasure. Structural firmness is an engineering criterion, but social meaning is part of a building's function, and delight depends much on cultural preference. Similarly, as digital artifacts become commodities, while increasingly shaping everyday life, social and cultural aspects become ever more important.

Ev Williams, one of the founders of Twitter, said: "There's still a lot of difficult engineering to be done, but in many spaces, multiple companies have mastered the basics. By building great experiences... design has the opportunity to set a product apart."

I wonder whether we're reaching the end of design as we know it. The idea of what design is has changed over the last 100 or so years, and new practices in design, such as Design Thinking, have emerged. But, my worry about Design Thinking is that it ignores the materiality and the human complexity of what we design.

Interaction Design Institute Ivrea started in 2000, sponsored by Olivetti and Telecom Italia. Marc Rettig told our first students there that "interaction design is about designing the right thing and designing the thing right". I think this sums it up pretty well.

The Design Thinking movement has had an excellent effect, encouraging companies to think beyond what they know can be built, to what people actually need or desire. But it concentrates on the first of Rettig's elements of good design, designing the right thing; that is, discovering people's needs and wants and imagining what might meet them - the "ideation" phase. But there's the other half, designing the thing right, the "realization" phase, deciding what form the product should take: what should it look feel and sound like? how do the pieces fit together? how can it be built? how could it become economically viable? and - in digital products - how can the interaction flow make the artifact understandable and pleasurable?

As I say, Design Thinking addresses the first ideation phase, where people with many kinds of background can contribute. But the realization phase draws on a range of specialized crafts: visual design, interaction design, information design, animation, software and hardware engineering, user research, business planning—all of which have important contributions to make to a product's success. I use "craft" to mean that combination of explicit and tacit knowledge, based on a person's extended experience, that allows them to make artifacts of the highest quality. I taught myself to program and wrote programs in several languages, but that doesn't make me a craftsperson in coding. Craft comes through long practice.

When I started working with engineers, I realized they had a different approach to design. I came to distinguish "engineer-designers", who concentrate on technical problem-solving, from "artist-designers", who focus first on problem-setting, identifying the right cultural, aesthetic and technical frame to approach the problem. At about this time an IBM engineer at the Media Lab told me that "working with artists I have come to realize that there is more than one way of knowing".

I started talking about craft because the word "design" has such broad connotations that people in the teams I was working with became offended when they felt their "design" expertise was not valued, when in fact they were talking about different types of approach and expertise. So I distinguished between the ideation phase, when all kinds of designers and non-designers could contribute, and the realization phase, when you need other kinds of expertise. Most people have one primary expertise, but they need to understand and appreciate those of their colleagues.

In working with craftspeople, I've observed that they have a sensitivity to the materiality of artifacts. Design, in its current form, seems to be moving away from materiality and we are therefore losing something important. Are we getting further removed from understanding an object, how it is engineered, and how it functions in the world?

In the early days of digital technology, we were designing virtual worlds, virtual tools, and mostly people interacted with them alone, in their heads. This was reinforced by the Western, Cartesian view: "I think therefore I am". But philosophers like Merleau-Ponty and new discoveries in neuropsychology show that we think with our bodies as well as our minds. If devices require us to use only our eyes and finger swipes, we are indeed losing something. In the past, we interacted with machines which explained themselves through their form and the affordances they offered. It is obvious how you use a bicycle pump or a radio with a dial to click through the channels. But the workings of digital devices are hidden and must be made clear through the design of perceptual clues - visual, physical, sonic - that may be very different from how the system actually works.

The form of a digital/physical artifact must resolve all the constraints - it must work well, be manufacturable, communicate what it is and how to use it, and be beautiful and significant. That's the craft of the artist-designer.

We need to think about the effect of digital technology, and the way it is being designed, on society. To take the parallel of architecture again, experience has shown us that there are forms of housing that encourage socializing between neighbours and others that discourage it, forms that allow criminality to flourish, others that make it difficult. What is it, for instance, that encourages people to be much more aggressive on social media than in real life? What is the implication of Alexa having a woman's voice, rather than a man's?

I find your architectural parallel fascinating because digital is coming into our homes and workplaces right now without much thought of what this might mean. We're at the convergence of the virtual and the physical world, What are your thoughts on crafting the next wave of the internet, the internet of things?

We've been lucky that for over thirty years we have had just one dominant metaphor for managing stuff on our computer - the desktop - and that Xerox was prepared to put together a team of such talented people and give them the space and time to work out how to design it well. The desktop is like driving. If you learn how

to drive one car you can be pretty sure you could get into another and drive it away without too much thought. Most people, similarly, once they get the hang of the desktop metaphor, can "drive" a computer.

Now people are designing all kinds of new things with digital technology that haven't been seen before, such conventions don't exist, or only partially. Bill Buxton predicted that the whole tech market will crash because the number of different digital systems people are expected to use is leading to a level of complexity too great to handle. There are thousands of applications, with different ways of interacting with them that people must learn and remember.

At first, the app world seemed wonderful, a great opportunity to design new applications for technology and new interaction experiences but few applications are so intuitive to use that you need not think about it. This takes a really good designer, or team of designers, with the experience and imagination to make something that fits the way people think - and a company that thinks it's important. In his book Simplicity Shift, Scott Jenson wrote that "Simplicity isn't about removing features - it's about prioritizing them. Find the core and make it wonderful. Then gently layer on the additional features, but make sure they don't compromise the core design".

Donald Norman underlined the importance of constructing a mental model in the mind of the user that allows them to understand what the application is, and how to reason about it if it doesn't work in the way they expect. Too many applications seem like a bundle of functions with no overarching model of what the system is or how it works. It's interesting that with many new applications there's no manual, just an infuriating automated helpdesk. Nowhere does it say, "This is what this is, these are

the things you can do with it, and here's how you do it". Generally the help and support only tells you how to do things. But you must know what you can do before you can ask how to do it.

To design the next phase of digital technology we need a palette of mental models for different types of interactive object, and a new language of interaction, enabling us to carry what we have learnt from one thing to another. The work of Durrell Bishop explored how our instinctive knowledge of the physical world - which way is up, how you move or hold an object - could allow us to interact with computation without having to learn how to do it. A layer of interaction which we need not learn could form the basis for a new language of interaction with physical/digital things.

Voice control makes the problem worse because you have only a single time-based channel of information. Once the system has said something, it has gone. A visual interface or a physical one persists and can show more than one thing at a time. It's assumed that voice interfaces are "natural", but when we speak to a person in the flesh, there is a backdrop of implicit shared understanding which today's computer systems don't have.

The big problem with connected objects is to understand what, behind the scenes, is connected to what and what is interacting with what. I've just come up against an example: my Misfit step tracker that's connected to the Apple Health app, my Withings scale and its app, and, via If This Then That, the Misfit app. Between the four of them something is wrong as my weight in the Misfit app comes out at 400 pounds! It's obviously something to do with translation from pounds to kilograms, but I can't figure out exactly where the problem is. Add in artificial intelligence, and you are going to get an unholy mess. Maybe a dangerous one.

LIFE & DEATH

The materiality of networks and connected devices
Vladan Joler
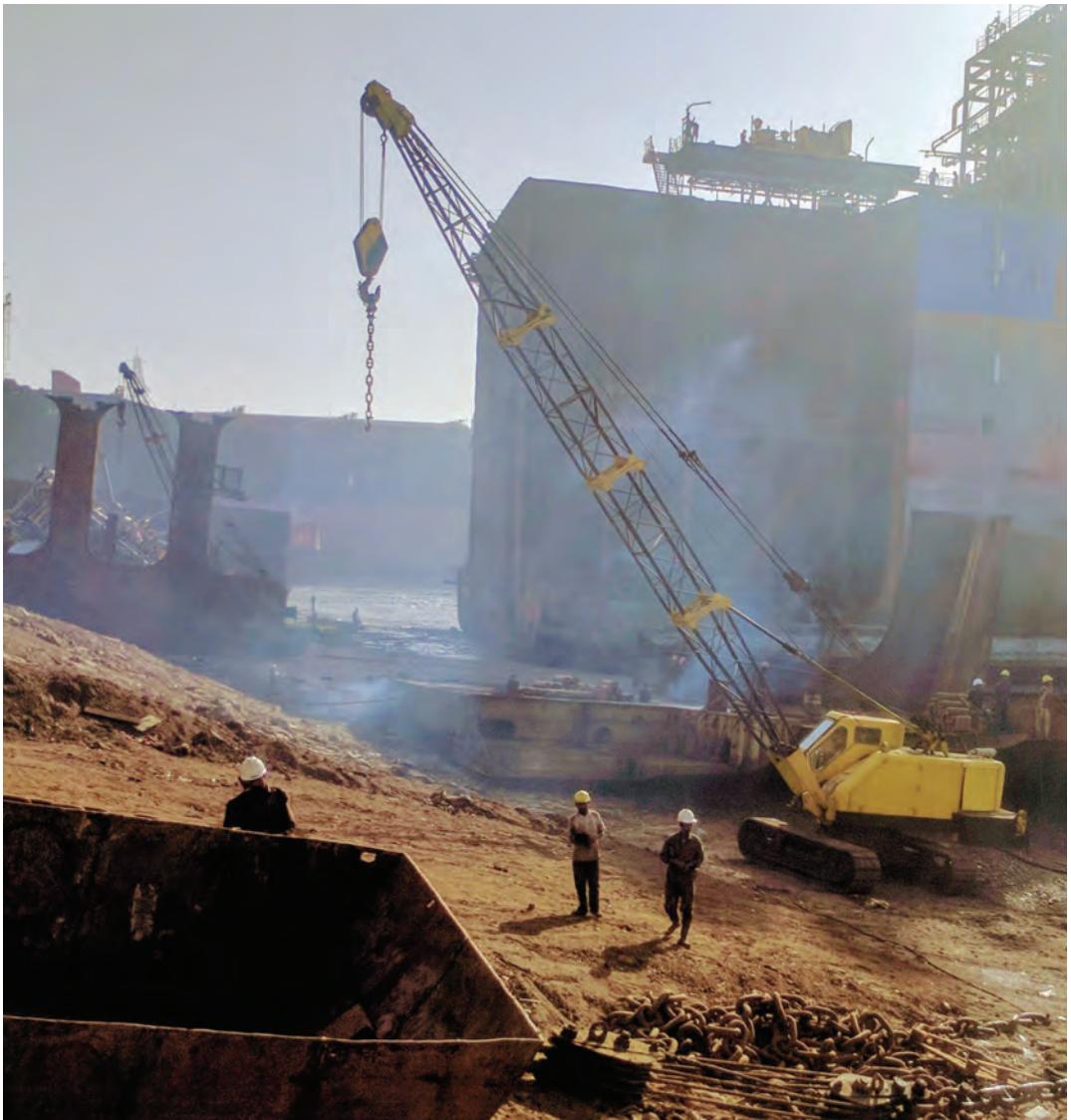
Fig 1. Alang beach

The Graveyard

In 1995 an art group named Apsolutno investigated the death of two cargo ships in a shipyard of Novi Sad in former Yugoslavia. Two rusted ocean ships were landlocked more than 1000km from the nearest sea. The artists' forensic study concluded that the ships died under suspicious circumstances: international sanctions, a collapsed economy, war and corruption.

Over twenty years later, we are standing on the shores of the Indian Ocean peering through a camera's telelens. Three National Institute of Design students approach the Alang Ship Recycling Yard, the largest ship graveyard in the world. Here thousands of massive ocean vessels are dismantled under labor-intensive and hazardous conditions. The ships' valuable materials are extracted, and the parts resold. Perhaps even the Yugoslav ships are decomposing here.

When it comes to the Internet and many things digital, we have a habit of neglecting materiality. The Internet's infrastructure is hidden from view, buried or behind barbed wire. The same holds true for the shipping industry. This phenomenon even has a name: sea blindness.

As Share Lab, we conduct investigations into the invisible aspects of the Internet. The mining pits, the metal refining factories, the assembly lines, the data centers, the submarine cable landing points, the algorithmic factories or the shipping graveyards are not meant to be seen by us. This physical infrastructure is supposed to be invisible. It should not disturb the cleanness and joy of the Silicon Valley utopia and its immaterial cloud. Nevertheless, the shipping industry plays a crucial role in our connected devices. That's why we begin our story with the death of a cargo ship.

Global production was made possible with the invention of one simple object, the cargo container. Marc Levinson explains in his book, The Box, that the shipping container standardized the transportation of goods and led to an explosion of production. 90% of what we consume today is transported by ship. Every Apple device, for example, contains components gathered from 743 locations across six continents. Whilst submarine cables underpin our information society, marine transportation underpins our consumption.

Explosion in slow motion

Along the edges of the ship graveyard are hundreds of shops, junkyards and workshops dismantling, sorting and finally selling each piece of the ship. They are conducting a kind of live exploded view. The ship, a complex three dimensional object, is transformed into two dimensional projection of its parts.

   Millions of sorted, flat pieces are resold. Everything, from the lifeboats to the ceramics, to the engines and even the cleaning supplies and bed sheets are redistributed. An informal settlement nearby houses tens of thousands of migrant workers. Their homes are made out of available materials - in this case, the parts of huge container ships. A local restaurant serves food on a former ship's ceramic plates, and a neighbor is laying on a bed once used by a sailor on the North Sea. From the graveyard, these components will continue their new life. What was once furniture on a luxury cruise ship will now become furniture in a hostel, school, or restaurant in India.

   Why are these parts being reused? According to one seller from Alang market, "The quality of wood, steel and other base metals used in the ship's products is supreme. These products are manufactured in developed nations. Moreover products used in ships are of superior quality as they have to sustain for longer period." This afterlife of things is somewhat unusual in our age of obsolescence. We live in a time when reuse, modification and repair is not encouraged, and in some cases, it is illegal. Many of the consumer products we buy are designed to have an artificially limited life. They become obsolete (that is, unfashionable or no longer functional) before it's necessary.
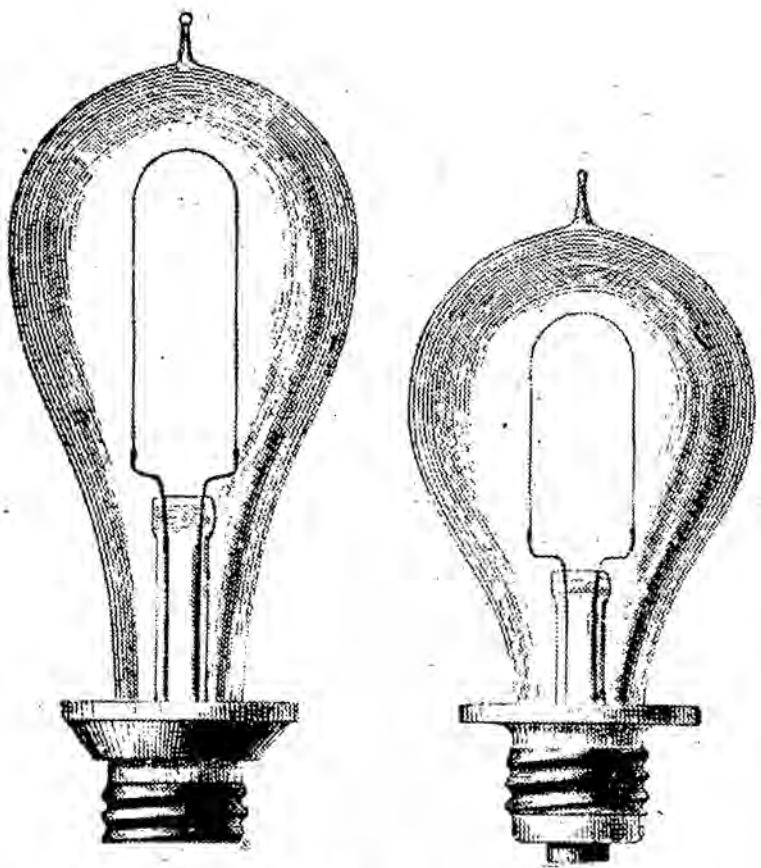
Fig 2.   E-Waste from cargo ship at Alang beach

Planned obsolescence

Planned obsolescence aims to generate long-term sales volume by shortening the replacement cycle of product. It was pioneered by a particularly notorious cartel in the 1920s. The Phoebus cartel represented the largest producers of light bulbs at the time, among them Osram, Philips, and General Electric. The main mission of the cartel was to control the manufacture and sale of light bulbs. They intentionally shortened the lifespan of their light bulbs to ensure that none of them lasted more than 1,000 hours, which led to more purchases. The strategy took off and was even encouraged as a method to stimulate the economy after the Great Depression. Aldous Huxley satirized this approach in Brave New World, published in 1932, "Every man, woman and child (is) compelled to consume so much a year in the interest of industry".

Nowadays, planned obsolescence is the norm in many industries, especially in consumer electronics. The famous Moore's Law states that computer capacity will double every 18 months. In turn, the software industry plans program upgrades that require this increased capacity. This dynamic often forces our devices to break early or become unfashionable long before they might otherwise be decommissioned. The US Environmental Protection Agency estimates that two-thirds of all discarded consumer electronics still work. As David S. Abraham points out in his book, The Elements of Power, "We are now on a global trajectory to toss out over a billion computers annually. This is not just because we have more of these devices but because we use them so briefly. The average lifecycle of a smartphone is about 21 months. Likewise, laptops, tablets and many of our high-tech gadgets have life spans of less than three years"

Edison's Bamboo Carbon Filament Incandescent Lamps, 1881 — 1882 type. (See page 158.)

Fig 3. Early types of electric lighting

Government-endorsed afterlife

Cuba, a country preserved by isolation and run by the same regime for almost six decades, is conducting a long social experiment against planned obsolescence. Since the 1960s, the Committees of Spare Parts (Comités de Piezas de Repuesto) advocated that workers should not just own their own tools of production, but they should also be able to fix and even create new ones. "Worker, build your own machinery!" declared Ernesto "Che" Guevara. Sixty years later, many objects in Cuba are pushing the boundaries of their original lifespan.

The repairing spirit is part of everyday life on the island. Similar to the extended afterlife of things from the Alang scrapyard, in Cuba we find many tools, appliances, and parts living on in new, reinvented ways. In the 1990s, while the rest of the world furiously consumed short-term trends, the Cuban government institutionalized the act of repairing. With publications like El Libro de la Familia (1991), the government open sourced the appliances imported from the Eastern Block. They provided repair guides and DIY tips—with the goal of delaying the disposal of scarce items. Cuban designer and artist Ernesto Oroza curated a collection of these hacks. He called these innovations technological disobedience. He notes, "It is as if when you have enough broken fans you start to see them as a collection of usable structures, joints, motors and cables laid bare. This liberation makes us rethink our understanding of raw materials."

Fig 5. Household fan made from telephone components and vinyl LP records.
Photo by : Ernesto Oroza
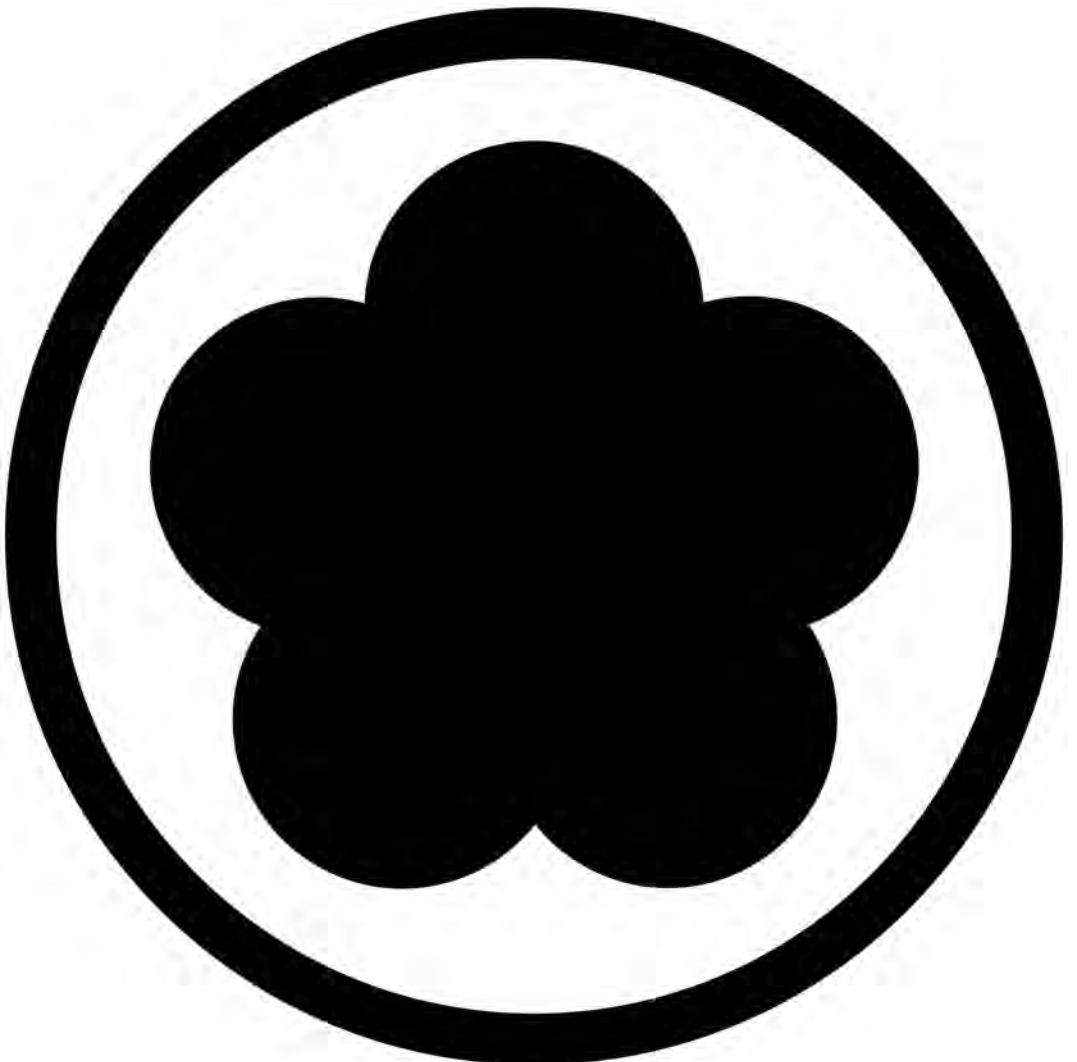
Fig 6.   Outline of a Pentalobe screw

Right to cure devices

Design, whether seen through a socialist or capitalist lens, is always in dialog with economics and material reality. Even the smallest screw can represent the ideology of its manufacturer. Apple deploys a specially designed pentalobe screw in its products since 2009. It is an unequivocal barrier against the owners of the devices; they cannot open, examine or ultimately fix their things.

For Apple and many other technology companies, the idea of ownership clearly deviates from the one depicted by makers, "If you can't open it, you don't own it." Increasingly, we don't even buy our devices. Instead, we lease them, such as with two year phone contracts or IoT devices maintained by monthly payments. Companies introduced restrictive licensing agreements that bar users from fixing hardware or software themselves. In these situations, the real owner is the company. They do their best to ensure that customer can't do anything else other than consume.The principle of 'access over ownership' is often heralded as a paradigm of efficient consumption and good for society. However, it is potentially achieving the opposite. Society is increasingly wrapped in leases, debt and precarious working and living conditions. Gig-based work performance affects the quality of services we can access.

To conclude, I would like to draw the line from the death of objects and planned obsolescence to a possible future called the digital dark age. Much of our data today is hosted by Fortune 500 companies. And these companies have their own lifecycles. Using a statistical technique called survival analysis, a group of researchers discovered a company's mortality rate. A company's risk of dying has nothing to do with how long it had already been in business or what kinds of products it produced. Regardless of what industry the company is in, the team estimated that the typical company lasts about ten years before it's bought out, merges, or gets liquidated.

One should not be under the illusion that information available today will still be available in ten years. This is why open software, hardware and data is needed. And we also need digital libraries and archives such as Internet Archive to structure and store new knowledge. Similarly, as the Internet moves into more physical forms, we must preserve and extend the lives of material things. Else it will all too quickly end up in a landfill graveyard.

zilla

The Internet is sometimes compared to the printing press developed by Johannes Gutenberg in the fifteenth century. These inventions shared in common the capacity to enable the production, dissemination and democratization of information, creating new platforms for mass communication.

The invention of movable metal type was a key part of the successful application of Gutenberg's press and the principles that governed the use of such type shaped much of how we think of digital typography. The language we use today still owes much to the language of those early printers and the companies that create today's webfonts still think of themselves as foundries, even though they no longer cast metal type. One such foundry, Typotheque, pioneered the use of high-quality, commercial webfonts and it was them that Mozilla approached to develop a new, freely available, open-source font as part of the development of a new brand identity by design agency Johnson Banks.

The agency followed an open design process, sharing their development on a blog and inviting feedback. One of their early concepts drew on ideas around programming protocol and the visual influence of the font 'Courier'. This non-proprietary, monospaced slab serif font was developed by IBM in the 1950s, becoming one of the most popular typewriter fonts of the time and later, with the development of computing, synonymous with code.
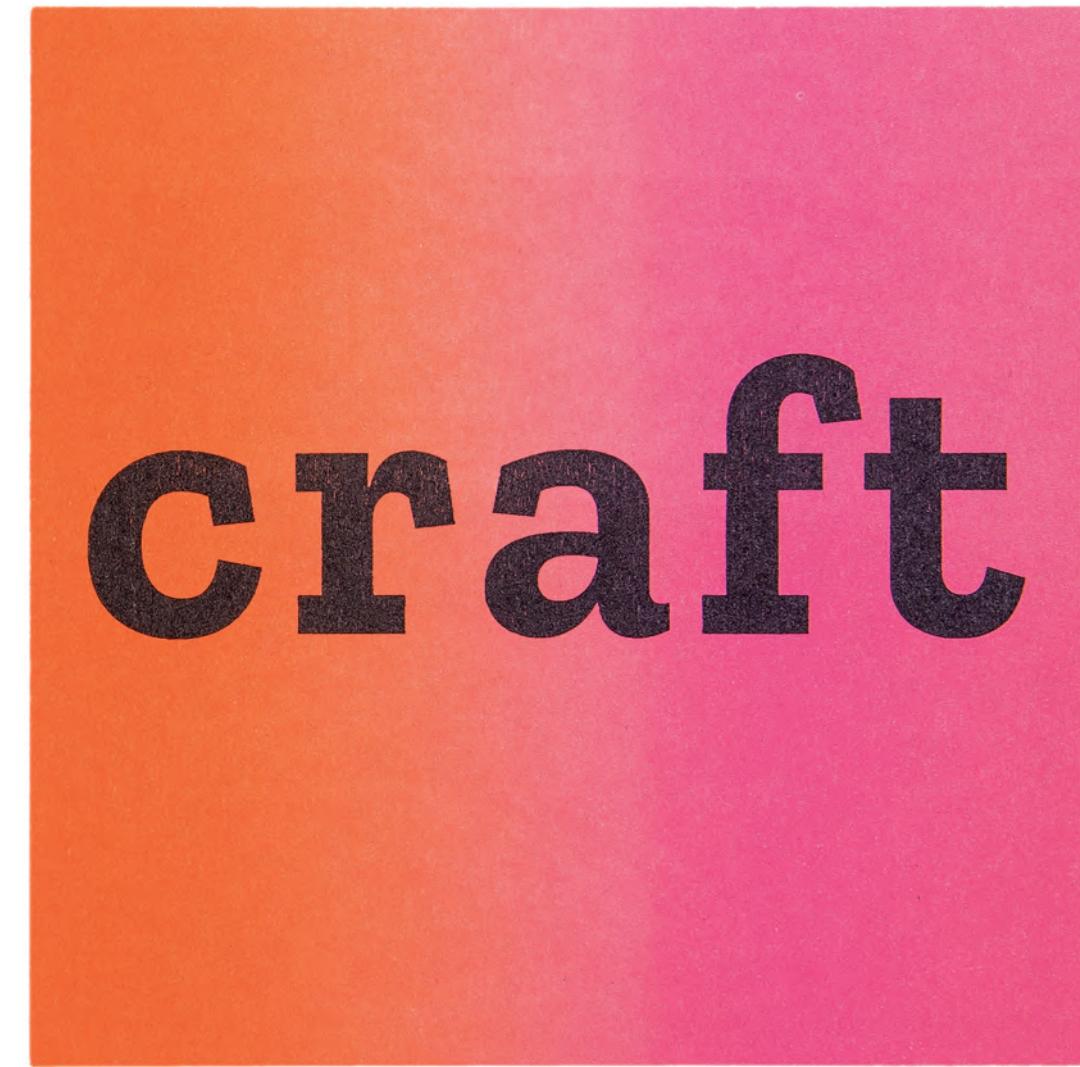
This route became the preferred option. Peter Biľak of Typotheque worked closely with Yuliya Gorlovetsky, Mozilla's Associate Creative Director, to develop the new font in parallel with the development of the wordmark, exploring how changes to its design could impact on characters across the font. After thirty-five rounds of review, the design team had found a compromise, balancing the needs of the logotype with those of the font they affectionately called Zilla Slab. As Yuliya recalls: "It's amazing how many people will ask if they can stop coming to meetings when you talk through 10 different 'a' options."

According to Peter, the exploration of the lowercase 'a' informed much of the development of the rest of the font: "The lowercase 'a' is a more complex letter that provides clues to how other letters may look in a full exploration of the logotype. We wanted to bring an angled stroke to the top of the 'a', mimicking the slashes of the internet protocol. The other letters would then need to follow the same construction principles."

We wanted to explore how this, principally digital, font could be explored through analog craft, so we invited our friend, printmaker Thomas Mayo, to collaborate with us on a new print. In between helping some of the UK's leading designers to realize their ideas in letterpress, Thomas also produces his own beautiful prints and wooden printing blocks. For our print, Thomas created a bespoke set of wood type from the Zilla font; selecting pieces of side-grain maple from his workshop and laser engraving them before cutting and finishing them by hand. The type was then printed on a 1960's Heidelberg platen press.

Now that we live in a society that consumes much of its type through screens, I asked him what he thought about advances in technology and whether the craft of Letterpress was still relevant.

"Letterpress is still important today, whether in teaching graphic design students about typesetting and typography or just reminding us that we can still use our hands to create prints. It's much more orientated towards craft as the process of letterpress is used mostly on small batch print production but it's a printing process that's hard to match with any modern technique. New technologies such as laser cutting have actually been extremely helpful within the craft of letterpress. It's enabled me to create my own movable wooden type and printing blocks, which makes the process a lot more accessible. It's allowed me to take digital designs that were never intended to leave the computer screen and turn them into physical objects and then analogue prints."
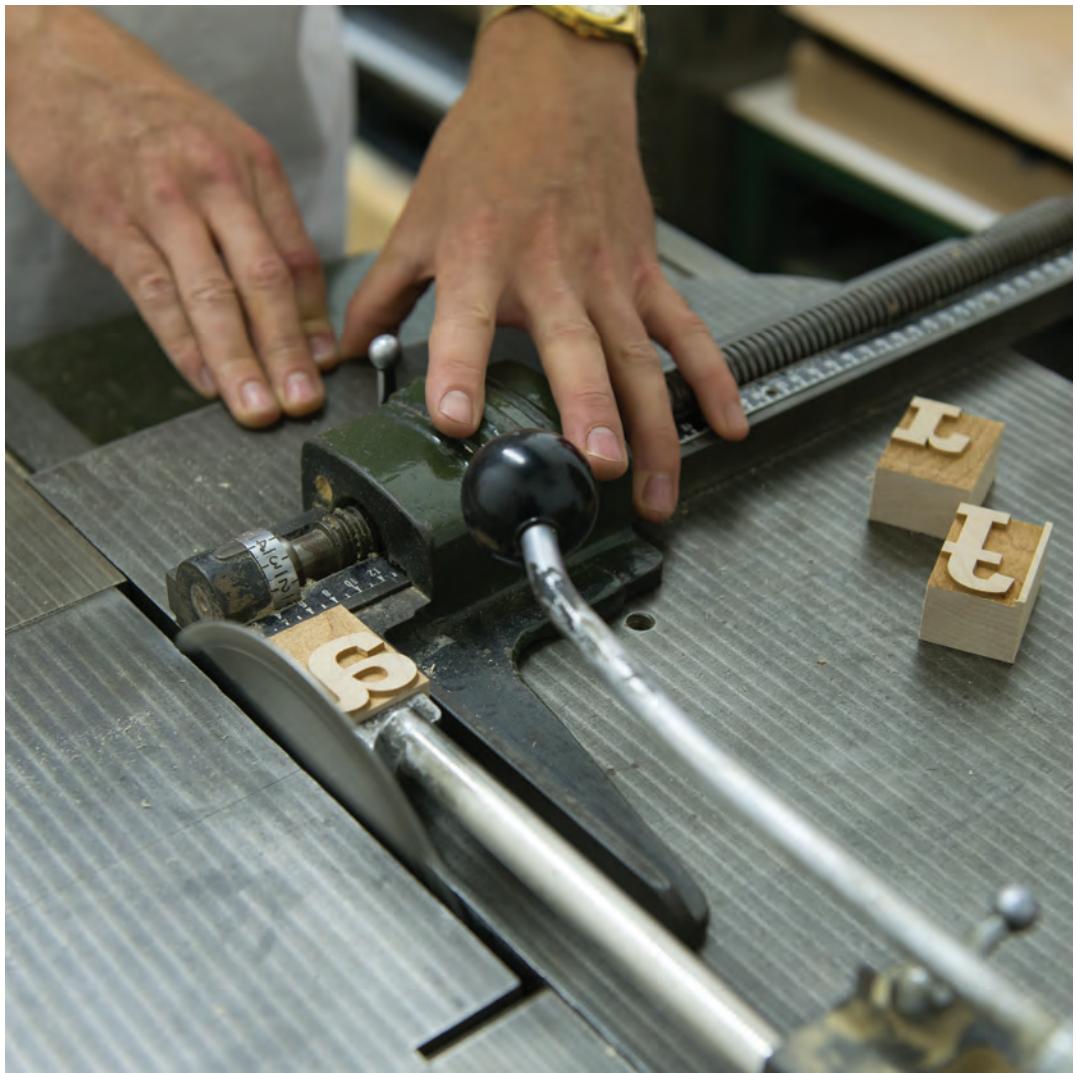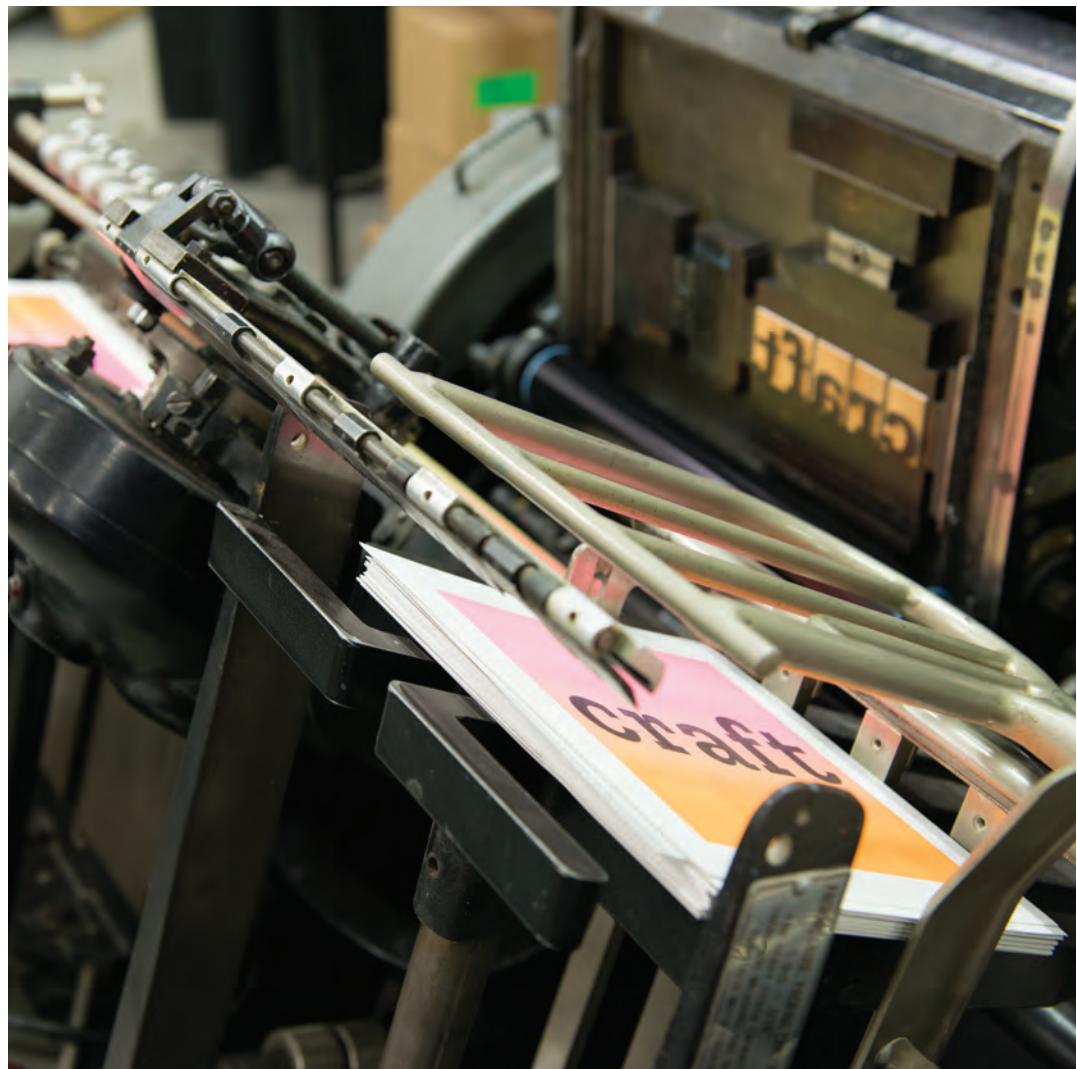
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Essays

Eames, C. and Eames, R., 1958.
The India Report. National
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The Internet as a Lota
Jayne Wallace

While recently on the campus of the National Institute of Design (NID) in India, I had the opportunity to revisit The India Report written by the American designers Charles and Ray Eames in 1958. They wrote the report for the Government of India after spending months in the country, primarily with craft communities. The report also resulted in the founding of NID.

Their words are as valid now as when they were written. The report resonates acutely both with contemporary craft and digital cultures globally. If we want to think about how craft could apply to a healthy internet, then this is a perfect place to start.

"The change India is undergoing is a change in kind not a change of degree. The medium that is producing this change is communication; not some influence of the West on the East. The phenomenon of communication is something that affects a world not a country.

The advanced complexities of communication were perhaps felt first in Europe, then West to America which was a fertile traditionless field. They then moved East and West gathering momentum and striking India with terrific impact - an impact that was made more violent because of India's own complex of isolation, barriers of language, deep-rooted tradition.

The decisions that are made in a tradition-oriented society are apt to be unconscious decisions - in that each situation or action automatically calls for a specified reaction. Behaviour patterns are pre-programmed, pre-set. It is in this climate that handicrafts flourish - changes take place by degrees - there are moments of violence but the security is in the status quo. The nature of a communication - oriented society is different by kind - not by degree."

These incremental "changes by degree" feel particularly relevant for a craft approach to developing and using the internet. With a craft methodology, changes are made through tentative adjustments. Each step is guided by testing the resulting outcomes for "fit" and by seeing each situation as something unique in its texture, requiring special consideration.

This tweaking, adjusting, refining is accompanied by what the Eames' call "moments of violence." I imagine these moments as creative actions, such as striking metal with force to form a desired shape, after which follow more gentle actions such as planishing with a hammer, filing or polishing adjust the form into the final outcome.

North Indian Brass Lota,
Image © Victoria and Albert Museum.

North Indian Brass Lota,
Image © Victoria and Albert Museum.

To give their abstractions solidity, the Eames used an example of the Indian lota: a small, usually spherical water vessel used for personal hygiene. I believe you could see the Internet as a lota pot. It is something that has been crafted and designed over a generation by the billions of people using it. By following the Eames' observations further, I'll explain my rationale for the Internet as a lota.

"A simple vessel of everyday use, stands out as perhaps the greatest, the most beautiful. (...) But how would one go about designing a lota? First, one would have to shut out all preconceived ideas on the subject and then begin to consider factor after factor:

- The optimum amount of liquid to be fetched, carried, poured and stored in a prescribed set of circumstances.
- The size and strength and gender of the hands (if hands) that would manipulate it.
- The way it is to be transported: head, hip, hand, basket or cart.
- The balance, the center of gravity, when empty, when full, its balance when rotated for pouring.
- The fluid dynamics of the problem not only when pouring but when filling and cleaning, and under the complicated motions of head carrying - slow and fast.
- Its sculpture as it fits the palm of the hand, the curve of the hip.
- Its sculpture as complement to the rhythmic motion of walking or a static post at the well.
- The relation of opening to volume in terms of storage uses - and objects other than liquid.
- The size of the opening and inner contour in terms of cleaning.
- The texture inside and out in terms of cleaning and feeling.
- Heat transfer - can it be grasped if the liquid is hot?
- How pleasant does it feel, eyes closed, eyes open?
- How pleasant does it sound, when it strikes another vessel, is set down on ground or stone, empty or full - or being poured into?
- What is the possible material?
- What is its cost in terms of working?
- What is its cost in terms of ultimate service?
- What kind of an investment does the material provide as product, as salvage?

Eames, C. and Eames, R., 1958. The India Report. National Institute of Design P. 4&5.

Of course, no one man could have possibly designed the lota. The number of combinations of factors to be considered gets to be astronomical—no one man designed the lota, but rather many men over many generations. Many individuals represented in their own way through something they may have added or may have removed or through some quality of which they were particularly aware."

The Eames describe both craft as a process and as a methodology. They also detail the way things evolve and emerge through decentralized means. The lota, like the Internet, is not specific to one individual. Instead, it is a shared form. Many individuals have refined, tweaked and developed the lota over time because they observed, through using it, changes that would improve it. Craft thinking is always tethered to lived experience and the insights gained through the physical engagement with something. It is an ethos of living with things at the center of an inquiry and discovering incremental changes.

How might we apply craft thinking to a healthy Internet? It may be about understanding and valuing the voice of the individual. It may be about appreciating that all things can be altered to better fit the purpose in which they are used. This is the antithesis of an ascribed perfection. It is also counter to the notion of something being "finished" as well as merely consumed passively.

The craft ethos instead is one in which an individual's attunement of a thing is a welcomed part of life. It acknowledges that in living with and importantly, through things, we not only adjust them but mould them around ourselves. If we subscribe to this craft lens to the Internet, we see that there is no perfect "thing", since all things can change, and nothing is ever really 'finished'. Craft, as a separate process from design, is in a constant state of "becoming." This is greatly liberating and useful to humans, since we are also dynamic, constantly changing entities.

Whilst the "big five" (Apple, Google, Microsoft, Amazon, and Facebook) may claim to be the Internet, in reality they are part of a vessel that has been tweaked and hammered into existence by billions of people. These companies can, of course, sell a version of a lota pot, but they can't deny the existence of others. One of the biggest problems we currently face is that these big companies now have the financial and political power to stop us from crafting our own lota pots, our own web. They can prevent us from tweaking, adapting and creating an Internet that "fits" us. Instead, they can confine us to a standardized Internet space and materiality where only facsimiles of their vision can co-exist. This is a form of passive consumption that not only stifles and controls people who use it, but it also denies an evolution of digital communication that is analogous to being human. Let's change that. Let's foster more craft thinking with and on the Internet.

A Medieval Crash
Andrew Prescott

Beauvais Cathedral in northern France was one of the most ambitious and highly decorated Gothic buildings of the middle ages. The vaulted roofs of the choir were over forty meters high, making it the highest vaulted cathedral in Europe. However, in 1284, only twelve years after its completion, the choir dramatically collapsed, apparently because some intermediate buttresses were not strong enough.[1]

The choir at Beauvais was rebuilt with much stronger buttresses, but an attempt in the sixteenth century to crown the building with a 153 meter tower, which would have made the cathedral the tallest structure in the world, resulted in further disaster when the tower fell down. Beauvais Cathedral remains admired as a great achievement of Gothic architecture, but it is also a reminder of the challenges confronted by medieval architects. These challenges and their solutions give us insights into what a craft approach might look like for the Internet of Things.

Medieval architects and masons had limited engineering and mathematical knowledge and used simple instruments. The enormous scale of medieval cathedrals was achieved by the repetition of simple geometric forms using such basic tools as a 45° square and dividers. The pattern of the ribs and shafts in vaults for example might have been calculated by simple rotation of a 45° square.[2] The size of the buttresses were calculated by rules such as that given the fifteenth-century German master mason Lorenz Lechler:[3]

"Divide the space between the buttresses into five equal parts: give three parts to the window, and two parts to the wall on either side of the window."

Medieval cathedrals are triumphs of pragmatic craftsmanship. They show how imposing and inspiring buildings can be created using simple tools, basic geometrical patterns, repetition and a "rule of thumb'"method. Sometimes as at Beauvais there were disasters, but generally this craft approach was very successful and resulted in some of the greatest buildings in the world.

The triumphs of the medieval stonemasons may seem a very long way from the modern digital world. But in every computer system there are surprising parallels between computer software and medieval cathedrals. Just as cathedrals were created from the linking together and repetition of certain basic geometrical patterns, so computer programs are derived from certain basic elements: arrays, strings, variables, conditionals, loops, etc. The variable and the loop are as simple and as powerful as the 45° square and the dividers were in the hands of the medieval mason.

1. Stephen Murray, 'Beauvais Cathedral: Architecture of Transcendence', Princeton, NJ: Princeton University Press, 1989.

2. Lon Shelby, 'The Geometrical Knowledge of Medieval Master Masons', Speculum 47, 1972, 395-421, reprinted in Lynn Courtney, The Engineering of Medieval Cathedrals, Aldershot: Ashgate, 1997.

3. Lon Shelby and Robert Mark, 'Late Gothic Structural Design in the "Instructions" of Lorenz Lechler', Architectura 9:2, 1979, 113-31, reprinted in Courtney, Engineering of Medieval Cathedrals.

Medieval masons relied on repeating simple geometrical concepts, likewise, as Eric Raymond has pointed out: [4]

"A programmer could easily hold the entire logical structure of C in his head (unlike most other languages before or since) rather than needing to refer constantly to manuals; and Unix was structured as a flexible toolkit of simple programs designed to combine with each other in useful ways. "

The way in which computer programs consist of many different modules likewise resembles the organic way in which cathedrals gradually grew and developed. Just as a cathedral might have a thirteenth-century choir and a sixteenth-century tower, so a large program might contain one component which dates back thirty or forty years, cheek by jowl with a more recent piece of coding.

The Credit Suisse global banking system dates back to the 1970s, and contains over 100 million lines of code written mainly in Java, C#, C++ and PL/1. Even a simple task like the introduction of the International Bank Account Number requires the rewriting of thousands of lines of code, with a risk that the vast edifice could come crashing down. Hundreds of projects updating the system are underway at any time, in just the same way as the medieval stonework of a cathedral is constantly undergoing a program of repair and replacement.[5] The distinguished computer scientist and 'software archaeologist' Grady Booch has emphasised how software has evolved organically, declaring that:
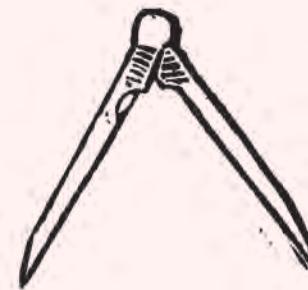
"All software-intensive systems have an architecture, but most of the time it's accidental, not intentional. This has led to the condition of most software programming knowledge being tribal and existing more in the heads of its programmers than in some reference manual or publicly available resource." [6]

Booch's comments suggest striking parallels between software architecture and the way in which medieval cathedrals were built. For example, the master masons who designed medieval cathedrals often carried the overall design in their head, working out details with fellow masons with plans scratched on the floor of lodge buildings on the site. If the master mason suffered an accident, as when William of Sens fell from scaffolding while working on Canterbury Cathedral, this was disastrous for progress on the building. Similarly, the loss of key personnel who understand the history and structure of a complex software system can be disastrous for a business.

How do these parallels between complex software systems and the procedures of medieval masons help us in thinking about the problems that confront us in today's digital world? Some of the lessons are apparent in Eric Raymond's remarkable book, The Cathedral and the Bazaar,[4] Raymond draws a contrast between the carefully planned and managed environments of commercial software development, which Raymond compares to the medieval cathedral built with precision by a small group of experts, and the more ad hoc and organic approach associated with open source developments such as Linux, which Raymond suggests is like a crowded and bustling bazaar. Raymond's book is an important one for Mozilla, since it helped inspire the act that created Mozilla, the release of the source for Netscape Communicator in 1998.

Some of Eric Raymond's historical parallels don't quite work. As we have seen, the approach to the creation of medieval cathedrals was much more organic and evolutionary than he suggests. On the other hand, markets in medieval Europe were much more strictly controlled than the idea of a bazaar suggests. But Eric Raymond's fundamental point about how large structures can grow more effectively by communal and cooperative effort, working from the ground up, is one that is borne out by the medieval cathedral.

The moral of the building of the medieval cathedrals is about cultures of cooperation and shared effort. The most important point to emerge from contemplating the cathedrals concerns craft ways of thinking. Discussions about the role of craft in technology frequently focus on the way in which technology can be a material which the craftsman shapes and uses. But there are other aspects to craft thinking as well. One of these is the development of large structures organically through patterns of pragmatic development and repetition.

4. Eric S. Raymond, 'The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary', Revised edn., Sebastopol, CA: O'Reilly Media, 2001.

5. Stephan Murer, Bruno Bonati and Frank Furrer, 'Managed Evolution: A Strategy for Very Large Information Systems', Heidelberg: Springer, 2011.

6. Larry Greememeier, 'Software's Dirty Little Secret', Scientific American 17 June 2008: https://www.scientificamerican.com/article/softwares-dirty-little-secret/

The World Wide Web could be considered one of the largest examples of such organic craft development. And in thinking about the health of the internet, perhaps we also need to think about how craft structures like medieval cathedrals have been preserved and developed over the centuries. One central feature of this has been the social institutions which sustain and support craft structures like cathedrals: the guilds of craftsmen, cathedral chapters, the fraternities of laymen. Perhaps we need to build similar sustaining social structures to ensure the future health of the web and to maintain its craft character in the face of commercial industrialisation.

These craft characteristics are particularly evident with legacy code. Few projects are greenfield sites. You will probably inherit some code and other materials from earlier parts of the project. In the case of large systems, this code may be lenghty and may relate to a no longer supported operating system or computing technology. Michael Feathers calculates that in many development efforts the amount of legacy code may overwhelm the new code by factors of as much as 100:1 and even 1000:1. [7]

Yet the legacy code still works. An immediate instinct may be to just rewrite it. Yet often this legacy code works perfectly well, and rewriting it runs the risk of breaking interdependencies elsewhere. The programmer is faced with exactly the same dilemma as the medieval mason. Do you change one bit of the building and risk another part of it falling down? For the medieval architect Lorenz Lechler, the test of any method was a pragmatic one: will it stand up and stay up? In programming, the "WTF" factor (how much swearing will a change to a program cause?) represents a similar pragmatic response.
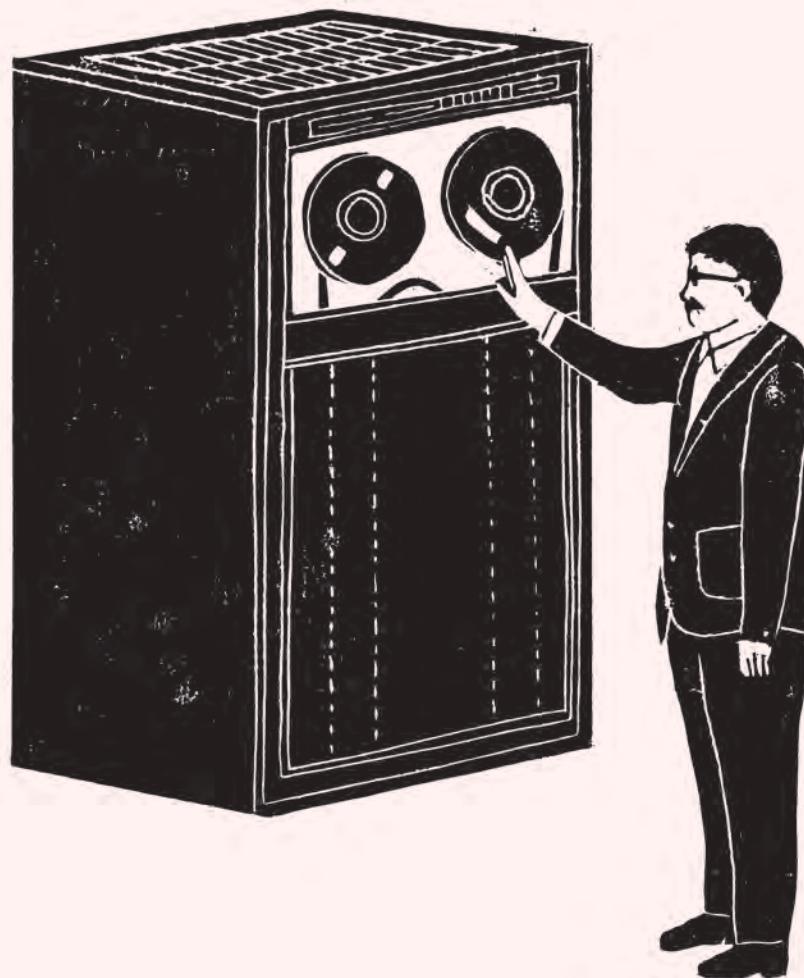
These craft perspectives will become increasingly important as the Internet of Things gains more traction. The way in which objects will become connected to the network in the home and elsewhere will be just as piecemeal and haphazard as a medieval cathedral. When we hook up our networked mirror, we will find it knocks out the networked scales. And login issues will mean that the scales will only show my sister's weight and not mine. The risk of the tower of devices tumbling down will be very high.

Medieval cathedrals suggest, however, that this does not mean we need a managed and heavily regulated approach to using the Internet of Things. The experience of the medieval masons shows how, by keeping things simple and interconnecting design in an open way, large networks can be built up organically. Sometimes the choir will come crashing down, but generally the organic craft-based effect will be spectacular.

The simple techniques developed by medieval masons could be used to create huge edifices because masons had strong social networks to share their knowledge. The guilds and lodges of the medieval masons were like huge idea factories. Maybe, to assure the future health of the Internet of Things, we need a new form of guild.

7. Michael Feathers, 'Working Effectively With Legacy Code', Upper Saddle River, NJ: Prentice Hall, 2013.

Illustrations by Giulia Garbin.

A Gandhian Dream
Babitha George & Romit Raj

For the past thirteen years, Quicksand has been working in India and other emerging markets as a hybrid between a consultancy, a design studio and a collaborative art and craft practice. We are comfortable seeing ourselves as a collection of individuals who are trying to derive meaning out of our own practice and its place within the world at large. Our belief is that interdisciplinary, creative practices hold out a promise for a more purposeful pursuit of growth: one that adequately balances the professional and creative needs of the people that make up the studio with the need to make meaning and affect change at a business, societal and individual level.

Quicksand's projects have evolved through the years and a lot of them have taken us to interesting places where we have had the chance to delve into myriad contexts, and deeply embed ourselves - listening, observing and making - with humility and openness. I think it was a basic curiosity and our love for stories and travel that spurred our foray into human-centered design which is, at its core, about empathy and deep understanding of people's needs and designing for those needs.

Human-centered design is about assuming a beginner's mindset, recognizing that complex problems do not have simple, straightforward solutions, but often require sustained engagement and iterative approaches. However, we too often fall into the trap of latching onto new methods expecting them to give us "clean" solutions quickly, no matter the context. The contexts and their related complex problems though are unforgiving to this naivety. If you are in the business of solving difficult problems, you quickly realize that there is no master key, no single set of tools that can make your life easy. Tools and methods need to be constantly revisited and adapted for each unique context and even then, there is no guarantee for success. But this uniqueness is what we are after and what keeps us excited through so many engagements year after year. We want to understand a context by immersing ourselves into it and in our experience, as may be expected, every context is a singularity - unwilling to fit into any kind of pattern.

A great example of this has been our recent work with the Open IoT Studio where we explored decentralized practices of farming, craft and tribal communities in India, in an attempt to alter and augment the current discourse on IoT, which is dominated by large multinational corporations. The narrative of the IoT is deeply entangled with that of big data and centralized processing & analysis of data from a diverse and vast set of objects that interface with people and communities. Decentralizing this narrative, we think, not only will de-risk IoT but will also allow this key piece of technology to be shaped by diverse voices from all over the world.

One of the contexts we visited was Melkote, a village about three hours away from Bangalore, where we met with the Janapada Seva trust, a Gandhian organization that works in rural welfare through efforts in education, industry, environment and agriculture. The trust runs a Khadi production facility that is seeking to revive the lost tradition of handloom weaving in the Melkote area. The Khadi movement in India was framed as a non-violent protest against foreign control of the economic, cultural and artistic lives of the people. Gandhi insisted that the state empower villages to remain independent economic entities, with local production aligned with local consumption. It promoted a view of the Indian village (historically the truth of this view is disputed but mythically it still holds sway) that existed almost outside of history - as entities that were eternal and unchanging - that were generally left alone by political machinations that were concentrated in cities and frontier areas.

In its small but spacious facility, the trust is seeking to educate young people of villages, around the area to operate handlooms and produce high quality Khadi fabric and garments. The Khadi process is done completely by hand, from spinning and weaving to dyeing. Santosh Koulagi (son of the founder of the trust, Surendra Koulagi), who handles the day to day operations of the trust told us that the original context in which the local craft of Khadi developed in this area has long disappeared. The Khadi handloom industry was systematically compromised by state bodies tasked with its preservation. Rampant corruption and red-tapism from state bodies and the lack of social recognition combined to suffocate ambition and pride from the artisans. High skill and adeptness only seemed to be rewarded with poverty and extreme loss of pride. Thus, there are no more traditional weavers who are engaged with the craft, requiring training of a new group of individuals. Nevertheless, the trust has seen significant success in producing a modest line of garments for sale to urban audiences in neighboring Bangalore, Chennai and other cities. As with most discourses on revival, it is urban markets that are being counted upon as sources of revenue.

We were told that the trust has received criticism for betraying the Gandhian ideal of local production feeding local consumption. We talked about how what the village economy is now producing is too expensive to be consumed in the villages and how what gets consumed in the villages are invariably the cheap industrial produce of the modern economy. Mr. Koulagi however sees no other way. The village as a sustainable economy, community and social entity has been systematically undermined through decades of development and progress focused on urban areas and reflecting urban values and ambitions. This has meant that the only way young people in villages can be persuaded to stay back is to give them a sustainable income and that income cannot be derived from local consumption. Therefore, urban markets and elite consumers must be targeted. While the trust has garnered criticism for betraying the Gandhian ideal of a self-sufficient economy, we found the trust's perspective of focusing on the producers rather than the consumers, particularly interesting.

Previous page:
We found a portrait of Gandhi at the Trust office. He seemed to appear forlorn in the portrait and had his eyes shut as if in silent contemplation.

Left:
While the default option would have been to move to the city in search of a livelihood, this young man from a neighbouring village works at the weaving facility and is able to lead a comfortable life of dignity.

It is a counterintuitive way of thinking for those of us who are familiar with the modern economy. The concern of the trust is not primarily consumer satisfaction or product excellence but providing the young people of the villages an acceptable standard of living. This is not to say that the Khadi produce lacks in quality. The Khadi fabric and garments available for sale in the trust's small shop were of high quality and the hand-spun Khadi, even after decades of progress in industrial garment production, has a certain crafted charm that is unique to it. What is also unique about this production ecosystem is the absence of the profit motive. When organizations don't seek to maximize revenue, it allows them space to pursue other concerns. The trust is acutely aware of the consumerism that plagues the modern mindset and is keen to avoid deep association with it by adapting to overtly cater to an urban market need. Instead the trust seeks to thoughtfully create sustainable livelihoods for the locals by building on existing market trends that are beginning to recognize and value handmade products for their worth.

Mr. Koulagi, feels a deep sense of loss over what has now disappeared. The Gandhian dream of a vibrant, independent and sustainable village is now all but lost. As we discussed the future of the Indian village with him, we sensed a helplessness that emerged from the understanding of the true power of the modern forces of progress. All efforts of the trust and others like them in preserving the traditions and values of the Indian village come up against this inescapable force. We also met with the founder, Surendra Koulagi. It was with curiosity and bemusement that he asked us what we were hoping to learn from their 'small initiative' that had not reached any massive scale of success. His question to us, in our attempt to learn from these experiments (often manifested through lifetimes of struggles), was if we had the courage and the resilience to swim against the tide that was swiftly washing away any sort of decentralized agency and sustenance.

By the time we were preparing to leave Melkote we were grasping for a silver lining in this overwhelming gloom. We found it in the story of a young weaver in the trust's production unit. She had lost her husband recently but had also found a job at the weaving facility. She had saved up money and had recently bought a scooter, giving her a new sense of confidence and setting an example for other women and young people in her village. Unlike so many young people in this area, she had chosen not to go to a city but had found gainful employment within the rural setting as a weaver.

Urban India has had a severely negative impact on the rural, sucking away pride, hope and expectation from the rural environment and pulling the best minds to cities and towns. If this trend is to be stopped then more organizations like the Janapada trust are needed to firstly provide sustainable employment to people in rural India within village economies and secondly remind young people of the benefits of a rural lifestyle. Above all a sense of pride needs to return to the Indian village if the Gandhian dream is to survive in some form.

Khadi in many ways is a manifestation of simple beauty. It represents the things that the modern world has now lost but yearns for - minimalism, sustainability, community based production.

India has a rich tradition of decentralised practices that range from the political to the cultural. These practices, though under pressure now from centralizing market and political forces, are resilient and storehouses of rich traditional knowledge and expertise. Our effort was to learn from these communities, that on the surface are completely disconnected from the IoT discourse, but are in fact storehouses of thousands of years of knowledge and expertise around crafted methods that are embedded in their lives and communities as well as building decentralized means of production and livelihoods. A regular human-centered design brief would have attempted to uncover problems and co-create solutions for these. Instead, being able to approach these communities in a slow and considered manner, without the need to 'design' immediate solutions allowed us to learn about traditions and un-codified patterns that build trust without hierarchy, share information and expertise in decentralized systems, develop effective and sustainable production practices and build awareness around the impact of technologies on people.

Our work with the Open IoT Studio over the past year is a great example of how patience and trust are both key to true collaboration. While thinking of issues such as the future of a healthy IoT ecosystem, grounding new thought and work in deep research and allowing for openness in the research brief gives us an incredible opportunity to learn from and celebrate aspects of the world around us that are well-crafted and resilient, but often do not find space in the mainstream narratives. However, these alternative narratives are more important than ever, especially if we want our work and practice to build on the ideas of curiosity, honesty, and empathy with an extended community of partners and communities.
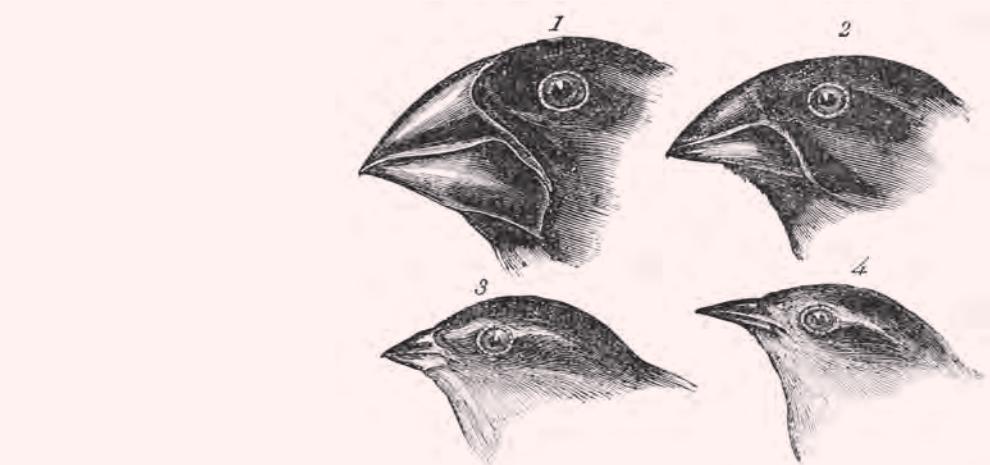
Workmen at Clonbrock Estate,
Ahascragh, County Galway,
Ireland 1870s.

Evolutionary Craft
Justin Marshall

During a recent event with Mozilla's Open IoT Studio, we focused on the topic of decentralization. It got me thinking about the manifestation, and consequence, of pre-centralization. In particular, what did the 18th and 19th century pre-industrial landscape in the United Kingdom look like in terms of production, making, and craft? Obviously agriculture and its associated activities played a far larger role in the UK economy at the time, and it employed a larger labor force than it does in today. But agriculture is still significant in many countries' economies, and therefore I thought it is an appropriate place from which to start. Don't despair: this piece doesn't eulogize a pre-mechanized world of rural idylls, undivided labour and the happy artisan. Instead, I am interested in how decentralized production enabled an object's common form to proliferate into numerous varieties, each one responding to local contexts.
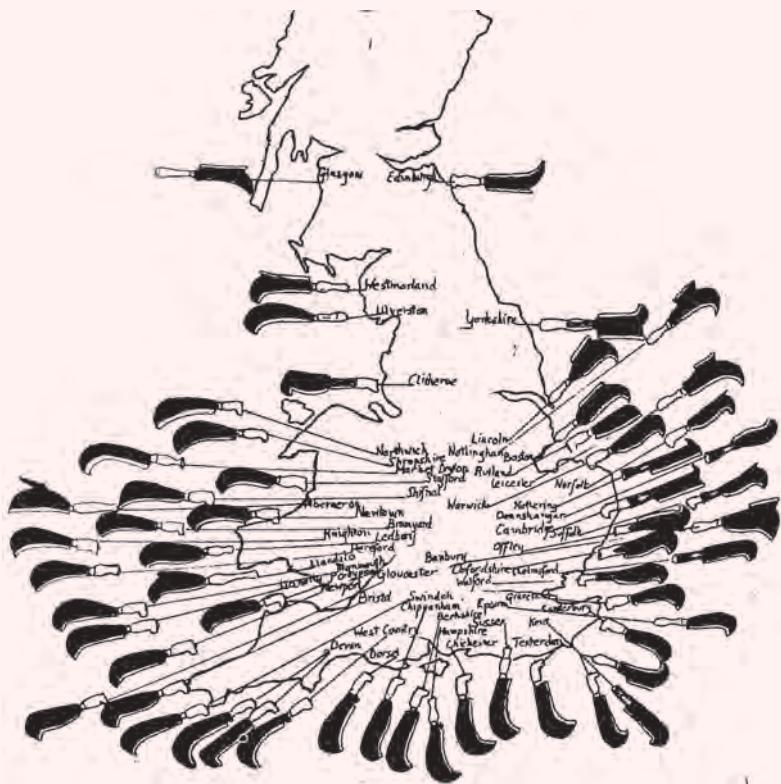
The billhook is a seemingly simple one-handed cutting tool used for a range of pruning, hedging and coppicing activities. Its history can be traced as far back as 1000 BCE, and it has close relatives all around the globe such as the Indian akkuruval. Like the lota discussed by Wallace in "The Internet as a Lota", the billhook is an artifact that found various forms over the course of thousands of iterations. These forms were not so much designed but rather evolved. Similar to Darwin's finches in the Galapagos, this evolution resulted in species of billhooks with a huge variety of specialist adaptations across geographical regions in the UK.

Darwin's finches by John Gould.
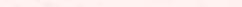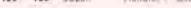
The range of English billhooks by Jack Wilson.

The shapes vary from county to county, and differences have also been identified from town to town, with a unique billhook even found in a village of only 50 people. Historically, these tools were produced by the local makerspace, i.e. the smithy. The regional differences found in blade length, beek shape, hooks size, etc. are rooted in specific local use that's driven by the particular environments of the region. So, even across a small country such as the UK, the differing climates and geologies privilege particular indigenous and crop species to flourish more than others. In turn, these crops require slightly differing approaches to management. This variation drives changes to make the most optimal tool for the job at hand.

Spear and Jackson, Catalogue, 1955.

Interestingly, this is not a design innovation process. Rather than radically "rethinking" the production process or resulting solution, this system incrementally accrues the knowledge and skill to create hand-thought, not just handmade, artifacts. It empowers multiple communities of makers, not just a single designer, and it emphasizes the importance of local learning and knowledge. Arguably, this craft approach improves local resilience to change. For example, if the regional agricultural practices change slightly, there are the resources and knowledge to tweak the local tools accordingly. The power of this evolutionary craft approach, rather than design innovation, appears to have been recognized by the centralized, urban industrial manufacturers in the first half of the 20th century as they took over most of the UK's agricultural tool production. Even sales catalogues in the 1970's still list tens of billhook designs, often in multiple sizes, and still named after their regional heritage.

In conclusion, is this model of decentralized vernacular making of any relevance when considering the challenges of the 21st century internet and burgeoning field of IoT? Echoing Wallace's call to recognize the complexities of individual lived experience, we are seeing how centralized Internet platforms are restricting and limiting the individual's power to control and change the shape of their online lives. Major internet companies dominate our imagination for how we might interact online. What if, instead, there were more nuanced and poetic approaches?

I would promote similar aspirations for local communities being able to control their online lives. The billhook story provides a useful example of local production being independent of centralized systems. It is truly grounded in the needs of a local community and therefore facilitates the crafted evolution of artifacts and technologies that fit the specific needs of the context out of which they were born. There are significant challenges in developing this craft approach and grounding its ethos in real-world IoT projects, such as:

Skills: like the blacksmith, the skills of the technologist are not quickly acquired or easily won. Nurturing local competency and skill capacity is a long term mission, as is its continual development and sustenance.

People & Roles: if the ethos of this approach is grounded in local community knowledge and skills, what roles do external people, such as designers, technologists and researchers, play in facilitating and supporting the instigation of such activities?

Materials & Logistics: the nature of digital hardware, in its material composition and micro-scale complexity, makes it impossible to produce locally from scratch. But, like the raw materials imported into local blacksmith shops, the components should be efficiently sourced and delivered.

Time: the craft approach is slow, iterative and incremental, not rapid and disruptive. How can testing be carried out in a funding environment that wants and expects rapid results, and may promote impact, but rarely funds projects over a long enough period to support it?

I argue that there is value in a craft approach for the Internet of Things. Especially given their physical embodiment, Internet connected devices should be adapted to their local contexts. Local digital craft, that draws on local knowledge and needs, could create a healthier, more inclusive, more resilient way of working and connecting today.