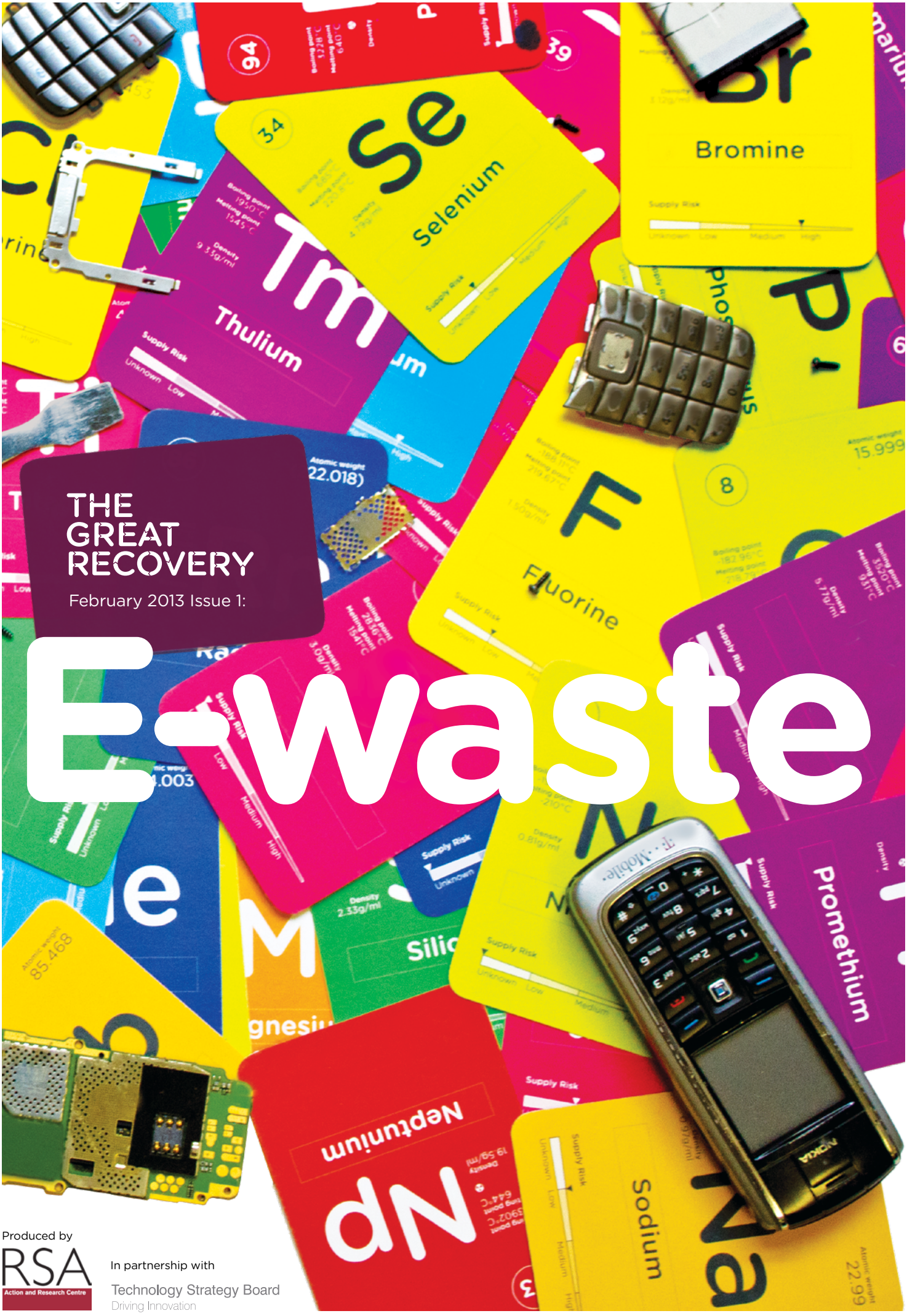

THE GREAT RECOVERY

February 2013 Issue 1:

E-waste

Produced by

RSA Action and Research Centre

In partnership with

Technology Strategy Board
Driving Innovation

THE GREAT RECOVERY
REDESIGNING THE FUTURE

February 2013
Edition 1: E-waste

The Great Recovery is exploring the role of design within a new circular economic model by building informed and networked communities and investigating through a programme of workshops and events. In this first newspaper issue we focus on electronic waste (E-waste).

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The story so far... p.3-4,7-8
Leonora Oppenheim reflects back on the last four months of the Great Recovery.

Deconstruction:
Mobile Phone p.9-12
Take apart a mobile phone and find out what resource we are hoarding in our homes.

Circular Network:
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Who could be trail blazing in the circular economy? We dissect our network diagram to find out.

Guest Feature:
Your Christmas Laptop p.16-17
Workshop facilitator, Mark Shayler explores the material flow of a laptop from deep in the ground to shopfloor.

Designing for a Circular Economy p.18-20
Project director, Sophie Thomas looks at the different routes design can take within a closed loop system and shares some insights of the investigations so far.

The Great Recovery programme is run by the RSA with support from the Technology Strategy Board. For more information visit:

greatrecovery.org.uk

youtube.com/greatrecovery

The Great Recovery:
The Story So Far...

Leonora Oppenheim reflects back on the Great Recovery's first months: What is the project all about, what have we learned and what are the problems we are continuing to face?

How many RDIs does it take to disassemble a power drill?
It's 3 o'clock in the afternoon in a fluorescently lit room on a grey industrial estate in deepest Kent. The space is vibrating with the noise of destruction as thirty people intently hammer away at various defunct electric gadgets trying to break them apart. This industrious mayhem is what's known as a teardown session. Expletives can be heard echoing around the room as our workshop attendees try, and try again, to crack into electronic appliances to retrieve the valuable materials trapped inside.

The space is vibrating with the noise of destruction as thirty people intently hammer away at various gadgets trying to break them apart.

Amongst the melee, Royal Designers for Industry (RDIs) Kenneth Grange and Terence Woodgate are hunched over what remains of a power drill. Neatly laid out beside them, are all the cogs, springs and other components they have successfully reclaimed from the tool so far. However, the motor of the power drill is proving impenetrable and it's driving them nuts. Terence is jamming a screwdriver vigorously into the object, trying to prise open the motor housing while Kenneth looks on with words of encouragement.
The setting of this Great Recovery scene is the recycling facility SWEEEP (Specialist Waste Electrical and Electronic Equipment Processor) in Sittingbourne, Kent. This plant reprocesses 1400 tonnes of electrical waste (e-waste) every month. A lot of it is broken down by massive industrial rock crushers once used in the Irish mining industry. The effort and frustration felt by Woodgate and Grange in trying to disassemble a power drill by hand is noticeable by comparison.

This is just one of many similar moments that played out in all four of the Great Recovery workshops over the last three months of 2012. But let's go back to the beginning. Where, how and why did The Great Recovery project start?

What was the inspiration for The Great Recovery?
Communications designer Sophie Thomas, of Thomas Matthews and the Useful Simple Group, has been a respected pioneer in sustainable design for many years. Thomas' interest in how we can design products, services and systems to create positive, not negative, environmental impacts is matched by the user experience designer Nat Hunter, founder of the acclaimed design agency Airside. Together, in their roles as co-directors of design at the RSA, they started The Great Recovery project.
With the support of the Technology Strategy Board and an expert steering group Sophie Thomas and Nat Hunter have set out to answer several questions. How can we bring designers, manufacturers and policy makers together to redesign our manufacturing industry in the UK? How can we work together to move from our current linear system, where 90% of things we buy end up in landfill in 6 months – giving new meaning to fast moving consumer goods, to a circular economy where products are continuously repaired, reused or recycled?
The myth that our single planet can provide the human race with unlimited natural resources has been well and truly busted. It is widely understood that many of the materials that go into the products we use everyday are dwindling in supply. We're at the point of peak everything: oil, gas, coal, water, metal, and minerals. The race for resources is also playing a pivotal role in ongoing geo political conflicts around the world.
With all this information, surely landfill can no longer be the acceptable grave for our consumer waste? And yet, millions of tonnes of valuable materials are being thrown "away" daily when they could be so easily be reused.

What does the future of design and manufacturing look like?
How will we make products in a resource scarce future? Or, more precisely, what will we make them with? The Great Recovery has set out on a journey to investigate these questions with the clear understanding that it's not one group of people who can find the answer. If we want to take our current linear process and make it circular, to close the loop, then true co-creation needs to be facilitated. To do that we first need to understand what barriers are preventing this vital collaboration.
In the design and manufacturing world there are many siloed roles that are not properly networked together. The client who sets the brief, the designer who chooses the materials and aesthetics, the policy makers that dictate the value of the materials, and the manufacturers who make the designs a

90% of things we buy end up in landfill in 6 months

reality. Now, more recently, we can add to this line up the end of life recycling role taken up by facilities like SWEEEP in Kent, S2S in Rotherham and Closed Loop in Dagenham. These are all sites that were visited for The Great Recovery workshops.
Of course, the whole manufacturing process starts way before the brief is written and the designers chosen. It begins in the places where the raw materials for our modern gadgets are taken out of the ground. That is where The Great Recovery programme also began, at the Geevor tin mine in Cornwall. As with each workshop the attendees were given a tour of the industrial facility to learn how it operates. Or in the case of this disused mine how it used to operate and why it is now a monument to industrial history.

It all has to do with the once falling and now rising prices of metal on the global markets. As resources dwindle in high-risk conflict zones the security issues attached to sourcing raw materials makes the relative expense of mining in the South West of England seem viable again. So how would rebuilding these UK industries ensure a healthy economic future?

Is recycling a type of modern day mining?
Well, first of all, we would need our own materials. Back at SWEEEP the workshop attendees are beginning to see how a facility like this, which has an impressive 97% recovery rate of materials, is in fact a kind of modern day mine. It's an industrial site that's not only recycling materials, but also producing new ones.
The grey glass melted down by SWEEEP's specially designed CRT (cathode ray tube)

We are beginning to see how a facility like SWEEEP, which has an impressive 97% recovery rate of materials, is in fact a kind of modern day mine.

furnace, is one great example. The machine, the only one in the world, safely separates the potentially hazardous lead content in old TV and monitor screens from the glass, enabling SWEEEP to reclaim pure lead from up 60 tonnes of televisions a day.
This is one seriously profitable piece of kit. Apparently 1kg of lead can be extracted from each screen and, with its increasing value, the London metal exchange currently price lead at about £1300 a tonne. At some point, when there are no CRT screens left to recycle, this specialist technology will become defunct. But, with approximately 1.9 billion still in use globally, there is a guaranteed waste stream and revenue stream for several years to come.

continues on page 7...

Computers are stacked high before they're sorted at the SWEEEP facility in Kent

Since it's launch in September 2012, The Great Recovery has been touring the country, hosting workshops at different resource recovery sites, including e-waste sites in Kent and Rotherham. We also visited a disused tin mine in Cornwall, and a food grade plastic recycling plant in Dagenham. Our second series of free workshops throughout February:

Tuesday 12th February 2013
Caterpillar Remanufacturing, Shrewsbury

Thursday 14th February 2013
LMB Textile Recycling, London E16

Wednesday 20th February 2013
Sheffield Hallam University

We will be running additional networking events around the UK. Join the mailing list or visit the events page for up-to-date information:

greatrecovery.org.uk/events

Nat Hunter & Sophie Thomas, directors of design, RSA, launch the Great Recovery

Copper being separated

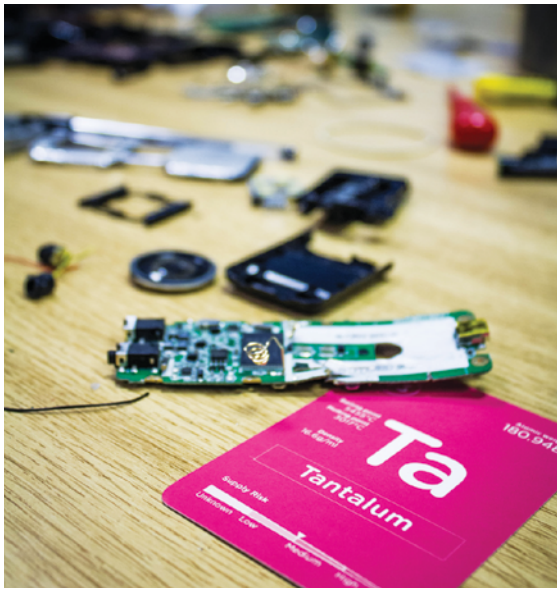
Sorted plastic from electronic casing

'Hard hats at the ready'. The workshop participants take a tour of Geevor Tin Mine, Cornwall

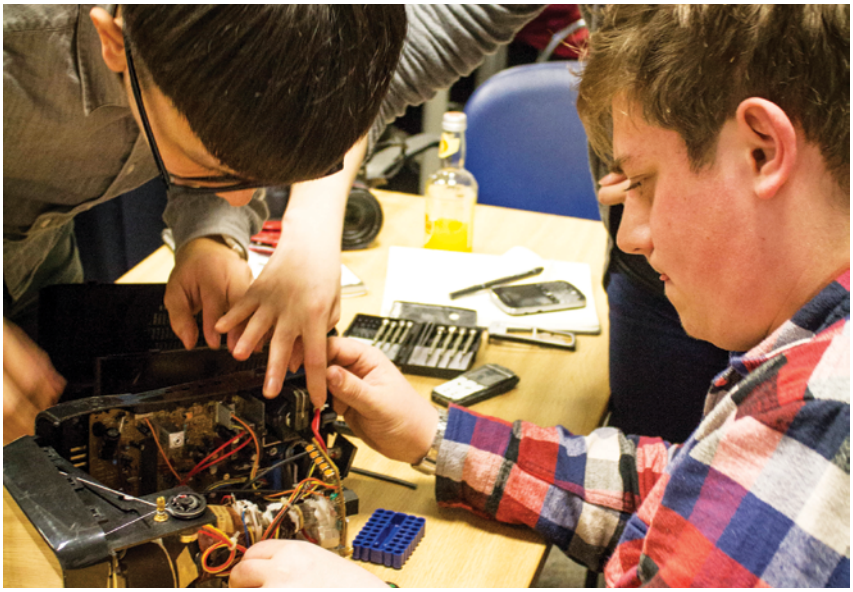
The Great Recovery film crew have been capturing all the action for our youtube channel. Watch the launch event, guest speaker day at 100% Design, key interviews with experts, trips down deserted mineshafts and leaded glass furnaces in action.

Find **greatrecovery** on: YouTube

Royal Designers Sir Kenneth Grange and Terence Woodgate investigating a drill

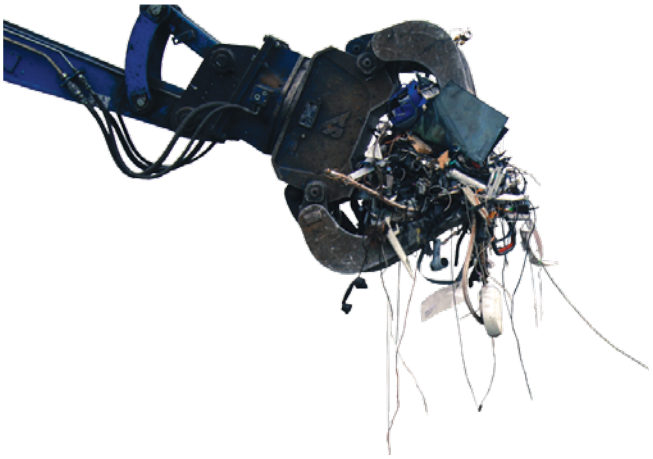


Deconstructed mobile phones



Deconstructing a portable TV

Workshop participants take a tour of the facilities



continued from page 4...

Now SWEEEP have this new glass material as a bi-product they are wondering what to do with it. The quickest and easiest solution was to make marbles for garden design, known as FAT balls. That's FAT as in, "Formerly a television." But the results are lacklustre. This is a good example of the need for co-creation. If SWEEEP got some good designers and craftsmen on board they might begin to see some real value-added potential in their grey glass.
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Who are the Great Recovery Workshops for?
As workshop leader Mark Shayler says, "Designers are excellent problem solvers, but we're just giving them the wrong problems to solve." There is a whole tranche of industrial designers that are using their considerable skills everyday to produce more electrical goods that quickly end up as waste.

The UK design industry is a mixed bunch of talented folk. About 70% of designers in the UK are in communications. Who is talking to these groups about how they can use their skills more constructively in our consumer economy? The job of The Great Recovery is to involve these designers and demonstrate how we can design products differently in the circular economy. The purpose of the workshops is to encourage high quality entries into the Technology Strategy Board's competition, "New Designs for a Circular Economy" which offers winners £25,000 for a feasibility study to test their ideas.

Back in the teardown workshop at SWEEEP the destruction continues. Andrew Raingold, the director of policy think tank The Aldersgate Group takes a break from his ongoing battle against an old coffee machine. He explains why, as well as designers and manufacturers, it's important to have policy makers involved in The Great Recovery.

"The policy world is such a driver, in terms

Our country leads the world in many design and manufacturing skills. However, the threat of that knowledge being lost is all too real

of the value certain metals have, in terms of recycling, and in terms of redesign. It provides the framework for plants like SWEEEP, that have been driven by the WEEE directive." So why did Andrew come to this Great Recovery workshop? "My focus for being here is how do we accelerate the transition to the circular economy? How do we keep the value of all these high-risk metals in the UK economy and the benefits that will have in terms of jobs and export potential."

1kg of lead can be extracted from every CRT screen. The London metal exchange currently price lead at about £1300 a tonne.

Why do we love making things so much?

The phrase "Made in England" holds much nostalgia for people. Whether that's repairing a cherished belonging at home, buying local produce from a market, or even owning a piece of beautifully engineered design such as a Brompton bicycle.

Our country leads the world in many design and manufacturing skills. However, the threat of that knowledge being lost is all too real, because we are failing to skill up our future generations as the experts move towards retirement. The Great Recovery has set out to celebrate our creative thinking, our technical expertise, and demonstrate the urgency and challenge of developing a circular economy for a sustainable future. Terence Woodgate has the final word on why he got involved.

"Because I'm a designer and I'm often in angst over these questions. A lot of things come down to economics, but I wonder when it will tip, when we have to do things because there are other environmental issues at stake, not just money. It's great to see the RSA doing this, because it's meant to be an institute for the encouragement of arts, manufacturing and commerce. We do want to make our own things and I think this project is making that more recognisable. It's fascinating."

The Great Recovery is working with the ESKTN to help build new partnerships and collaborations around concepts of closed loop design. Find out more here:

www.innovateuk.org/sustainabilityktn

The UK discards half a million tonnes of small electrical appliances (toasters, hairdryers etc) every year, but only about 70,000 tonnes are being recovered – that's a tiny 13%.
SWEEEP

The production of new aluminium from recycled materials is said to save as much as 95% of the energy that it would take to make it from virgin mineral ore.
http://goo.gl/b8ZrR

The concentration of platinum in the dust on the streets of Birmingham is higher than in the ore it came from.
http://goo.gl/86XHT

For every tonne of household waste we throw away, there is a further 5 tonnes of materials that have been used in the manufacturing of the products consumed.
http://goo.gl/JlQ21

Deconstruction:
Mobile Phone

The Mobile Phone

There is no doubt that mobile phones have revolutionised our lives. Most of us have one; there are now over 6 billion subscribers in the world. And we all love them, well, most of the time. We have palpitations at the mere prospect of leaving it at home for a day. Technology helps us keep our whole lives in our pockets, and with the leaps and bounds it has made over the last few years, we replace our mobile phones more and more regularly. We fondly laugh about 'the old brick' that everyone had, and its easy to forget that it was only a few years ago when we began to check our emails on the move and pin point our exact location using GPS signals.

On average, each UK household has two unused or old mobile phones stored away somewhere. This equates to an estimated **85 million** handsets that are simply sitting in our homes. So what actually are we storing in our cupboards apart from a few text messages from an ex and some out of focus photos of the cat? We have taken apart a classic handset to find out just what is inside.

The case for re-use?

For all the mobile phones in the world today, the metal in them would have required 450 million tonnes of rock to be dug up, smashed and processed. This is equivalent to 12 x the weight of all the cars on UK roads.

Prof S. Kingman,
Nottingham University

Each mobile phone typically contains:
13.7g of copper
0.028g of gold
0.189g of silver
0.014g of palladium

50% Plastic

Typically found in:

- Circuit Boards
- Case
- Screen
- Batteries

http://goo.gl/GHwWk

15% Copper

15% Glass, & Ceramic

20% Other Elements

4.0 Cobalt and Lithium
4.0 Carbon
3.0 Other
3.0 Ferrous Metal
2.0 Nickel
1.0 Tin
0.5 Zink
0.5 Silver
0.5 Chromium
0.5 Tantalum
0.5 Cadmium
0.5 Lead

It's estimated that the iPhone 4 contains raw materials worth about **$1.25**. The main raw material costs are in the battery, $0.62, circuit board, $0.37 (the cost is mainly gold) and stainless steel used in the case itself, $0.15.

Green Alliance

However you can currently re-sell an iPhone 4 for **$50-$170**

http://goo.gl/ZKeFu

Around 50% of a phone like this one is made from plastic. The casing is made up of polycarbonate or acrylonitrile butadiene styrene – or a combination of the two. They often contain brominated flame retardants, which makes them difficult to recycle through a regular mixed plastic process.

This EU directive was created to prevent the generation of electrical and electronic waste (WEEE) and promote reuse, recycling and other forms of recovery in order to reduce waste to landfill and encourage responsible handling. Included in its extensive scope is the responsibility of producers to finance systems or partnerships for the recovery of WEEE. Targets for collection rates are set and UK households must now have access to information on how to dispose of this waste. It encourages the design and production of electrical equipment which takes into account and facilitates dismantling and recovery. Revisions to the WEEE directive later this year are expected to put greater emphasis on producer responsibility further down the supply chain.

Take a closer look at some of the problems that can arise when recycling plastic. Nick Cliffe from Closed Loop in Dagenham talks us through the process.

Find **greatrecovery** on: YouTube

Liquid crystal displays can contain substrates which make it difficult to recycle.

A mobile phone contains circuit boards covered in hundreds of tiny components and tracks of metal, all made up of an estimated 35-40 elements, including copper, tin, cobalt and gold. One tonne of ore from a gold mine produces just 5 grams of gold on average, whereas a tonne of discarded mobile phones can yield a massive 280 grams.

http://goo.gl/EA40N

What is a Spudger?

Essential to any e-waste teardown exercise is a spudger. The thin tool can be used to prise open plastic casing and snap apart electronic parts. To see more stuff being taken apart watch the films on the youtube channel.

YouTube **greatrecovery**

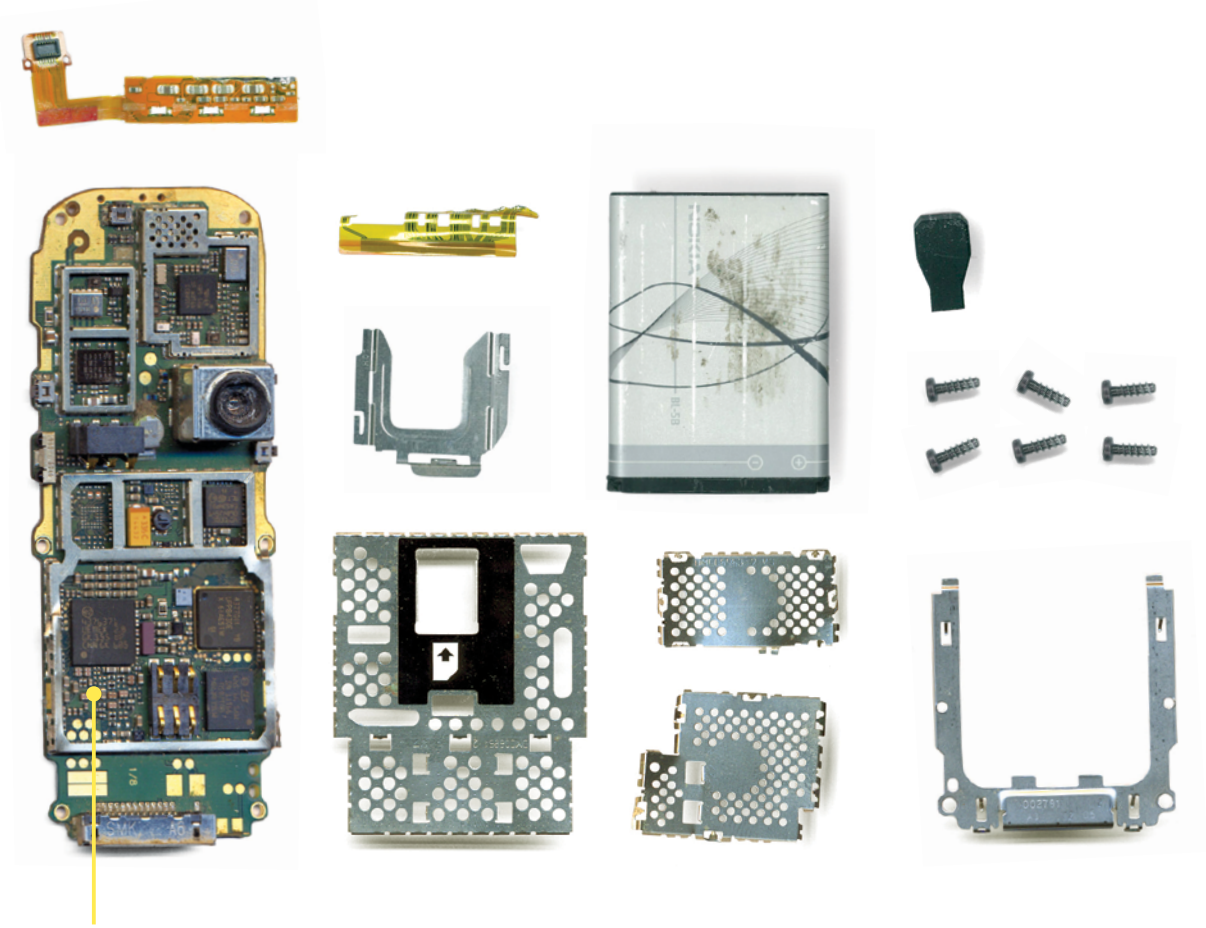
BBC2's documentary series 'Welcome to India' looked at the after dark industry of gold recovery from goldsmith's dust. The refinement process involved the addition of mercury to attract the gold then a rub with nitric acid, usually in the palm of the hand to leave a pure nugget. Read more on the blog.

greatrecovery.org.uk/blog

Batteries & Charger

O2 have calculated that there are 100 million chargers lying around our homes. Together, these chargers use 18,700 tonnes of components and 124,274 miles of copper wire and plastic covering.

http://goo.gl/xn8kb



Tantalum Capacators

Tantalum can be found in nearly all of our electrical goods; mobile phones, laptops,

hard drives, PlayStations... the list goes on. It is mostly derived from the metallic ore Coltan, which is mainly mined in the Democratic Republic of Congo. Its rising value and increased scarcity risk has led to an increase illegal mining; a huge catalyst in the on-going Congo war.

Printed circuit boards contain toxic metals including lead, nickel, and beryllium.

images-of-elements.com/tantalum.php

See page 16 to find out more about Tantalum Capacators and where they come from.

The Circular Network:
Mobile Phones

The design shift needed to help create successful circular systems requires new partnerships and collaborations. People from all stages of the process from material sourcing to product or service manufacturing need to be part of the design team. The first questions will therefore need to be – who do you need to talk to, where do they sit in the supply chain and how can you access them.

The Great Recovery has begun to map out the macro network for closed loop design, focusing on 8 groups and their sub-sections. Using a mobile phone as focus we have highlighted some organisations that are already working in collaboration and coming up with interesting ideas. You can see more on our resources page.

greatrecovery.org.uk/resources

Many of the people we connect with are part of the RSA's global network of 27,000 fellows. To find out more and see how you can become a fellow visit:www.rsa.org.uk

Resource Management: Recycling Lives

A commercial recycler with over forty years experience in the recycling and waste management industry, Recycling Lives manually disassembles or refurbishes e-waste including LCD TVs, which can have up to 300 screws in each model, each with different screw heads thus needing a specialist with a specialist tool kit to take it apart. These TVs do however need to be disassembled because of the hazardous mercury in the back lighting. Profits go to their social welfare charity.
www.recyclinglives.com

Policy Makers: Green Alliance

"The increasing environmental impacts of resource extraction are driving raw material price volatility. Upstream environmental impacts are also a major reputational risk for business."
Dustin Benton, Senior Policy Adviser

Green Alliance has set up the Circular Economy Task Force to see how circular systems can reduce resource risks, how businesses can operate them, and what government can do to help. This group is working closely with Defra and BIS to help inform Government thinking on resource security. Members of the task force include BASF, Boots, Interface, Kyocera, Unilever, Veolia and Viridor. **www.goo.gl/egxL0**

Investors: Technology Strategy Board

"The move towards the 'circular economy' is a significant opportunity for UK business"

The TSB have launched their "Resource Efficiency: New designs for a circular economy" competition, investing up to £1.25m in feasibility studies into the re-design of products, components and systems to retain material within the economy over several cycles of use. See more about the competition and key dates on page 12.
www.innovateuk.org

Education: Autodesk

"The topics taught and explored through our Sustainability Workshops include: whole systems and lifecycle thinking, improving product lifetime, reducing material use (lightweighting), green materials selection, energy efficient design and net zero energy buildings." Angela Simoes, Autodesk

The Autodesk Sustainability Workshop is a free online resource for design and engineering students that teaches the principles and practice of sustainable design. It uses real-world examples to illustrate how to put sustainability strategies into practice. Since its launch in 2010, more than 350,000 people have experienced what the workshop offers. **goo.gl/Pel8U**

Making & Fixing: The ReStart Project

"Our activities empower participants to extend the lifespan and functionality of the electronics they own, actively reduce e-waste and collectively understand the central role of repairability in designing future products."
Janet Gunter and Ugo Vallauri, Founders

While recycling has an important place, The ReStart Project intervenes before disposal – diverting and delaying electronics from 'end of life'. **www.therestartproject.org**

Consumers: iFixit

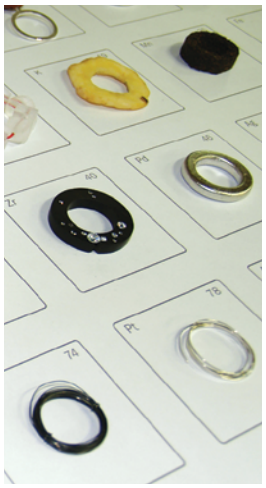
"iFixit is a global community of tinkerers who help each other fix things by sharing online repair instructions and know-how. With this freely available knowledge, iFixit helps thousands of people repair their devices every day. Why? Because companies don't provide repair parts and documentation to end users. iFixit believes that everyone has the right to maintain and repair their products." Miroslav Djuric, Chief Information Architect

An online bible of fixing, iFixit also offers trouble shooting from their thriving community of repair technicians, documented teardowns of all the most recent gadgets, and sells tools and parts through their website.
www.ifixit.com

Brands: FairPhone

"We believe in the everlasting nature of materials and we are taking a step-by-step approach to incorporating our values of refurbishing, reusing and recycling."
Miquel Ballester, Head of Product Strategy

FairPhone are working towards making the world's first fairly designed and produced smartphone. When producing it they will focus on creating a fairer supply chain, improving working conditions for miners and manufacturers, addressing the issue of minerals mined in conflict zones, countering e-waste, and stimulating transparent and circular business models. By buying the phone 'you can take action, make a statement and start a movement for change.' You can now sign up on their website to be one of the first FairPhone owners. **www.fairphone.com**



Material Experts: What's in my stuff?

"Using advanced analytical equipment and micro analysis data (SEM / EDX / XRF) we discover the complexity of the chemical elements contained in our everyday digital devices and through creative artefacts communicate to a broad audience."

Maria Hanson, Art and Design Research Centre, Sheffield Hallam University

What's in my Stuff? is a collaborative project between material scientists and artists at Sheffield Hallam University. Material discovery, creativity, participation, and communication are fundamental to their approach in raising public awareness of some of the key issues surrounding critical materials supply/scarcity, geopolitical conflicts, material reuse and recycling. **www.whatsinmystuff.org**

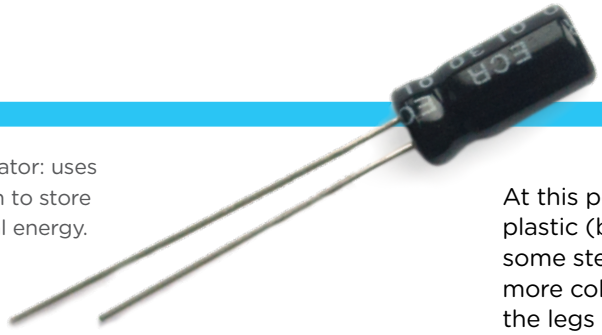
Manufacturers: 02

"Consumers are very receptive to the message that they can benefit the environment by avoiding the needless purchase of chargers. I would now like to see others taking similar steps, working with us as we aim to ensure all our handsets are sold charger-free by 2015."
Ronan Dunne, CEO

02's 'Charger Out Of The Box' pilot in October 2012 with HTC found that 82% of those who bought the charger-free handset did not buy a separate charger for it. If the results of this trial were repeated with all handsets in the UK, there would be 24 million fewer chargers consumed every year. This scheme is part of O2's 3 year sustainability strategy. **www.O2.co.uk**

Your Christmas Laptop

Great Recovery facilitator Mark Shayler of TicketyBoo takes a closer look at the laptop that we may have got for Christmas. Where has it come from and what greater price do we pay for our technology?



A capacator: uses tantalum to store electrical energy.

Laptops. What did we do without them? I remember the arrival of the VHS player, the VHS player with remote control; simply a button on the end of a lead that connected to the player. Then there was Betamax – better than VHS but not linked to a film distribution company so ultimately doomed. Then video disc 2000, then DVD, then Blue Ray, then on-demand. And now we watch TV on our laptops. Or we watch TV and use our laptops at the same time. The laptop has become a kind of pacifier for a generation – their window onto the world. Sales have gone crazy (from 109 million in 2007 to an estimated 383 million in 2015 – worldwide[1]) and even my mother-in-law has one. Many of you will have got one for Christmas. But what is the cost of these laptops? No, not the monetary costs – they're

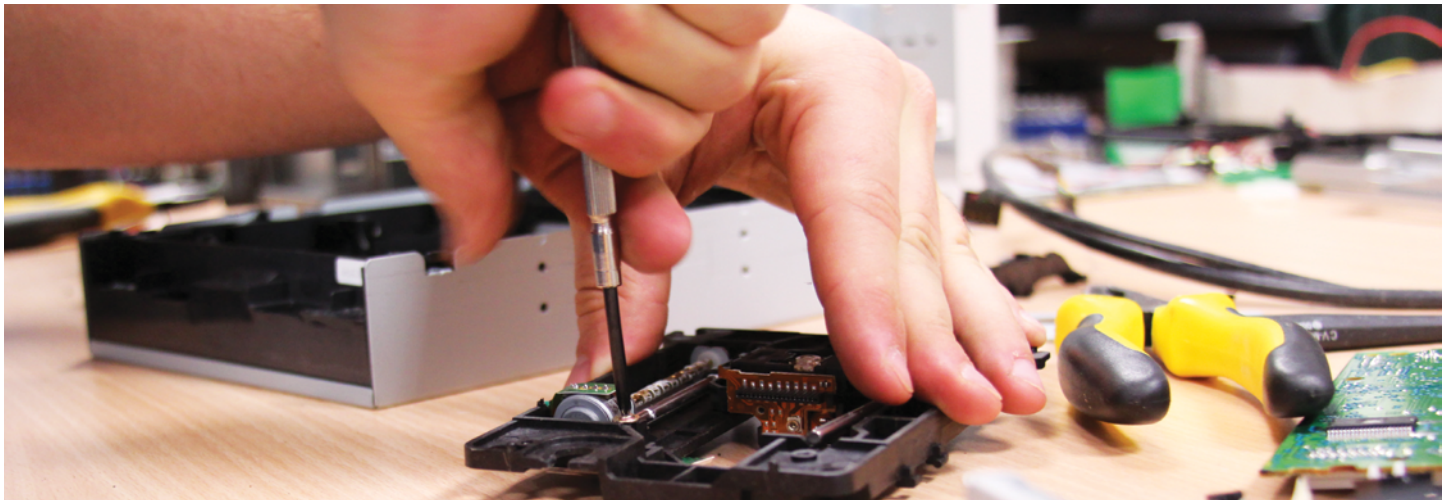
The laptop has become a kind of pacifier for a generation

cheap – from £150. But the true cost of the product. At Tickety Boo we've looked at this for The Great Recovery and have mapped the movement of its components. We started with a simple mineral – coltan (columbite tantalum). This is used to make tantalum capacitors which are super thin and super good. They are in most electronic products on the planet. One of the sources for this mineral is the Democratic Republic of the Congo (DRC)[2]. Somewhere between 14% and 64% of the world's coltan comes from the DRC[3]. Its neighbours sell coltan even though the mineral doesn't occur in those countries. The coltan then gets shipped to Japan to be processed. It then goes to Taiwan to be manufactured into capacitors.

At this point we need to add in some oil and plastic (both from oil of the Middle East), then some steel (China) for the component legs, more coltan (Australia, Brazil), then tin to plate the legs (China, Australia, or South America), then copper (Brazil, Africa, USA, Australia). After this they are shipped to China where they are assembled onto circuit boards with other components from around the world and using other rare earth, flame retardants, Teflon, copper, tin, gold, copper, acetone, nickel, platinum, chromium, and other materials. Tracking where these come from is nearly impossible. But the majority comes from Africa, South America, Russia, and Australia. And as we are getting so much better at recycling we've got recycled materials to add into the mix too. These have their own travels to undertake and some of the recycling processes used in some countries give rise to significant environmental impact[4]. Also the manufacture and processing of electronics uses a significant amount of water. It's estimated that the water used in the manufacture of a laptop is around 5,000 litres[5], although other commentators estimate the true figure could be nearly double. So when we import a laptop, we also import water. We can't forget the packaging that is wrapped around all the sub-assemblies and products that get flown around the globe as part of the supply-chain processes. So finally we have a

It's estimated that the water used in the manufacture of a laptop is around 5,000 litres

built our laptop. Oooh isn't it shiny? But it's in China and we need it in Wood Green. So it's shipped over (or at worst flown over), trucked to a shop/internet retailer and merchandised. You then wander into the shop or search on-line. You find the ideal laptop. Its got a super-fast processor, or a retina display, or a tablet on the lid, or its bigger, or smaller than your old



one. And its cheap, at least in money terms. So you order it. It makes you happy. It makes you more productive. It makes you smile. That's all good. But did you need it? Did you really need it? If so, crack on. Use it, tell everyone how great it is, recycle your old one (or more commonly cascade it down the business/family), and feel absolved of responsibility. But the shadow your laptop leaves behind it tells a story of war and conflict, resource depletion and scarcity, environmental damage, water and energy use. When making a laptop many, many

When making a laptop many, many times its weight of materials and resources are used, up to 10 tonnes

times its weight of materials and resources are used, up to 10 tonnes according to some commentators[6]. We need to remember that your laptop wasn't just for Christmas, it's a matter of life and sometimes death.
So at the moment the best thing we can do is make our technology last as long as possible before replacing it, when it finally needs replacing try and find another user for it, and if that fails take it for recycling. But the key thing is to talk to manufacturers to stress and ask them to make these products so that they can be upgraded.

1 www.redorbit.com
2 You already know this country is war torn. Watch www.fallingwhistles.com for more details.
3 goo.gl/h7wfN
4 More details at goo.gl/PGtDY
5 National Geographic's Water Conservation Tips
6 Natural Capitalism, although the data for this is quite dated. Other sources say from 0.5 to 1.5 tonnes (or the weight of a mid sized car).

Watch Mark Shayler presenting at last year's 100% Design.

YouTube greatrecovery

Do you think you might have the beginnings of a great idea?

Does it re-think a product, its components or completely re-design a system to close the loop? If so, you can apply for funding to help you.

The Technology Strategy Board is investing £1.25 million in the new competition; 'New Designs for a Circular Economy'. They aim to support 50 successful applications from business partnerships with a design component with up to £25,000 to run a feasibility study.

Key Dates:

Round opens
11 February 2013
Briefing event (webinar)
19 February 2013
Registration Deadline
20 March 2013, noon
Application Deadline
27 March 2013, noon

Download the brief at

/competitions

Technology Strategy Board
Driving Innovation

Designing in Circles

Project Director, Sophie Thomas reflects on the investigations, debates and suppositions coming out of the project so far.

If we had a fully working circular economic system what would be different? Well, apart from maybe the air being cleaner and no weekly black bin collections probably quite a lot. For starters, things would definitely need re-naming: 'waste' could become 'food' and 'consumers' could shift to 'users'. Business relationships would need re-writing, competitors would have to collaborate, companies might shift to sell service not product and everything will flow - perhaps more importantly everyone will know where it needs to flow to. This is a future built on continuous systems, logistics and abundant reusable resources. Our Great Recovery investigations have, so far, raised a number of important considerations for making the shift. You must:

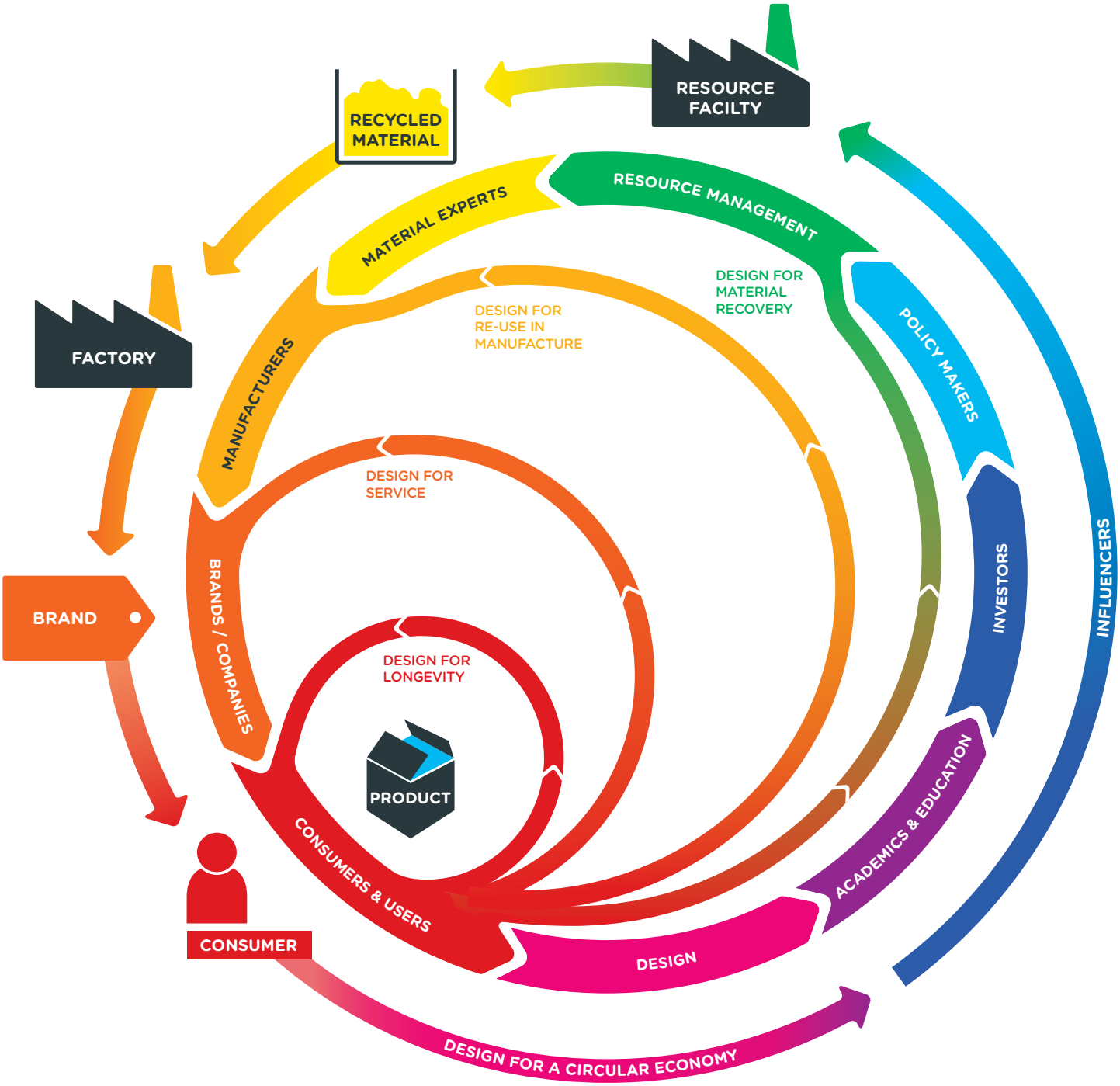
- Bring together different talent
Designing for closed loop cannot be done in isolation. If you design for recovery you need to design with a recovery expert. To capture as many resources as possible, at the recycling stage, you need to know what is valuable and why. This means you need a chemist and a material scientist next to you. You also probably need someone who understands the economics of resource security and its influence on business models. If you want to design something that a user can fix and upgrade themselves then collaborative development with the brand and insight from an anthropologist, as well as those on the factory floor, is vital. All these groups are represented on the circular network.

- Get dirt under your fingernails.
The way to start re-designing for better results is by re-examining the current products outside-in. In some of the large Japanese electronics factories new designers will cut their teeth, in their first months, on a disassembly floor where products are taken apart for recycling. Here they understand what components go where, what job they do and what the value is of each component, allowing them to see room for improvement. Sitting in an electronics recovery facility with a hammer in your hands and broken e-waste in front of you is a very creative insightful proposition.

- Think happily ever before and after
Designing for a circular system is not just sustainable design with a new woolly hat on. It is economically driven by clients and manufacturers who see incremental hikes in their 'ingredients' prices. They need help to re-design their business systems. Designers need to think beyond the design of objects on a shelf. Circular design is all about the beginning, the end and the process along the way: it's systemic re-thinking.

- Design in loops, think in circles then test the theories.
In a super-sized global system it seems crazy to think there will be one solution we will adopt to design everything. We will still be steered by the brief, the brand, the consumer and influenced by the client as we are now, but will also need to take guidance from the material processor, the fixer, the service provider and chemist depending on what is being designed. So far there are four general design systems already in existence that we have identified can fit within the larger economic circle. These can be seen in the diagram on the next page:

The Cirular Design Map



1. Design for Longevity

This is where the designer's primary concern is to create well crafted products that the user will not want, or need, to throw away. When it breaks the user can find out how to fix and upgrade it themselves. The user will own the product for life, hopefully, and build a history with it. This model encourages the now growing culture of repair and fixing. There was a time when this was normal. We didn't know we needed new and improved models and were quite happy with what we had. The biggest obstacles for creating objects built to last sits within business models that create profit from selling more units.

2. Design for service

New digital platforms and changing consumer behaviour are opening up worlds where we can share and lease products rather than own or buy. Car sharing (e.g. Zipcar) is now a common and accepted practice and this model is now rolling out to other sectors. According to the 2012 Ellen MacArthur Foundation/McKinsey report, *Towards the Circular Economy*: 'high-end washing machines would be accessible for most households if they were leased instead of sold. Customers would save roughly a third per wash cycle, and the manufacturer would earn roughly a third more in profits'. Service models require complete system re-design as well as an understanding of added value to both the business and customer.

3. Design for re-use in manufacture

The cost of remanufacturing mobile phones could be reduced by 50% per device—if the industry made phones easier to take apart and offered incentives to return them. Designers need to work more closely with the manufacturers to see where opportunities lie. Some of the current obstacles sit in legislation where a product with a re-manufactured part cannot be sold as 'new' in the UK. This also includes designing for disassembly where parts of an object can go into re-use and others can flow into material recovery. This system calls for symbiotic business relationships and good logistics.

4. Design for material recovery

The WEEE and ELV legislations as well as increased material costs have incentivised the growth in resource recovery businesses in the UK, making this outer loop the easiest to do with current systems. Even so, our designers lack of understanding on how materials are recovered can create more waste or can contaminate sellable materials. Designers need closer working relationships with material scientists.

The investigations continue...

Watch Sohpie Thomas presenting at last year's 100% Design.

YouTube greatrecovery

Our current linear model of take-make-dispose.

Design: Hilary Chittenden with Thomas.Matthews