

Smart Lives

Making smart smart



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Foreword

Smart technologies can help householders understand and manage their energy use, but our own trials show that just presenting data on its own achieves very little. The data needs to be made interesting to consumers and it should be supported by energy efficiency advice so people can be more informed and learn how to change their behaviour. It's not just about the data being interesting – the research uncovers how different people respond in different ways to the technology which in turn affects how they use it and how manufacturers should take account of this in their marketing.

We need citizens to engage with their energy use in a new, deeper way, but this means giving them greater encouragement to consider upfront financial investment in technologies. We know that more and more consumers are taking an interest and we commissioned this piece of research from Goldsmiths to better understand the detail around what constitutes a smarter future.

Simply giving someone a smart device won't necessarily mean that they engage with it. It will depend on how they relate with the information they get from it. And whilst the future of smart technology is headed toward remote automation, consumer trust in the technology and how companies use data is still a long way off.

Concepts of smart homes and consequently smart lives have been around since the 1970s, but it is only in the last few years since these technologies have become a reality that consumers have expressed a desire to know more about their energy use so they can save money and energy.

We commissioned this research to uncover how people engage with smart technologies. The answers in this report show that we must better understand how people feel and react to them before attempting to predict the implications for our smart future.

Philip Sellwood
Chief Executive
Energy Saving Trust

Smart Lives – The Story

Envisioning the challenges and opportunities for consumers



The following report presents the findings of an investigative research process, coding and triangulating data from

- a co-creation process with research participants
- insight from subject matter experts
- extensive desk research

Co-Creation

Working with a diverse group of 12 participants in workshops and simulations, experimenting with smart home energy technologies and providing 'live' insights into their experiences.

Subject Matter Experts

Extensive interviews with eight subject matter experts providing insights on energy, data, regulation, innovation and invention, energy products and supply, and digital disruption.

Desk Research

Extensive data gathering and analysis of academic, media, industry, Government and NGO literature, reports, commentary and interviews.

Summary

Smart technologies have the potential to transform our everyday lives. We must address the inevitable data, domestic, technical, behavioural and regulatory disorder. Our research suggests three pathways to living 'smart lives'.

Shift in Cultural Consciousness to Collective Consumption

The service-based UK economy continues to shift from a society built around ownership to one built on access to assets and services. Behavioural change in the energy sector – whatever the aims – requires a renewed social contract and a sophisticated suite of nudges. Specifically efforts to reduce energy consumption must look beyond the individual and focus on enabling collective consumption and collaboration behaviour. Promoting a shift in cultural consciousness towards energy must address three contemporary social trends - facilitating flow and the synched lifestyle of consumers engaging with smart home technologies in everyday household practices, meaningful benchmarking of nodes in the network (like the equivalent of a BMI measure for energy consumption), and trust in strangers.

Emergence of Federated Market and Trust

The energy marketplace is at an exciting stage. A 'broken' market characterised by hierarchical monopoly provision and a lack of trust and accountability is challenged by new entrants and digital innovation. Crucial to the 'fix' is a reinvention of market behaviours for the emergent peer-to-peer, sharing, and lateral networks of the collaborative economy. Founded on transparency, authenticity, and integrity and fuelled by smart technologies and principles of value exchange, the energy marketplace should be decentralised and largely self-regulating.

Automation for Augmentation

Empowering consumers with smart home technologies requires recognising that consumers already operate by 'automaticity' particularly in the form of habits of energy consumption that occur outside of goals and intentions. Just making data visible isn't helpful. We must embrace automation and artificial-intelligence as means for augmenting decision-making. Consumers want to give up control of energy logistics to take control of the impact on their lives.

The research findings revealed three paradigms of a Smart Life, the tensions, balancing acts and risks in concert with smart technologies:

Tensions

Expectations/Reality The gap between marketing and the lived experiences of consumers.

Whole/Part How do individual smart technologies work in the context of the whole home; how do individual households relate to their community.

Transparency/Opacity How will data be collected and used for citizens' benefit; are there hidden motives behind the smart roll-out?

Balancing Acts

Automation/Augmentation Is 'smart' about supporting and informing human decision-making and/or automating technologies to operate on our behalf?

Open and vulnerable / Closed and secure Getting the balance right around sharing data; moving beyond perceptions that "open" always means vulnerable and "closed" always means secure.

Rational/Irrational Challenges combining rational and irrational behavioural change.

Loss/Gain The losses and disadvantages of not engaging with emerging smart technologies in the home are as important as the potential benefits and gains of committed participation.

Risks

Capabilities/Abilities Barriers to entry include both financial capabilities and skill-sets.

Isolation/Inclusion Those most in need of smart technologies often can't benefit from them.

Economics/Consumption Avoiding rebound effects whereby more efficient technologies and behaviours leads to no overall reduction in energy use. Sustainability is a cultural product.

The research findings revealed six personas in the personalities and social groups of human engagement with smart technologies:

Personas

The Human Machine - Early adopter 'energy geeks'.

Passive - Trusting in technologies until something goes wrong.

Smarter than Smart - Hyper-critical of technologies but early adopting if they can afford it.

System Thinkers - Big picture thinkers capable of granular operations.

Precarious - Unaware or confused about the potential losses and gains of smart technologies.

Gamers - Interested in "How am I doing relative to my neighbour?".

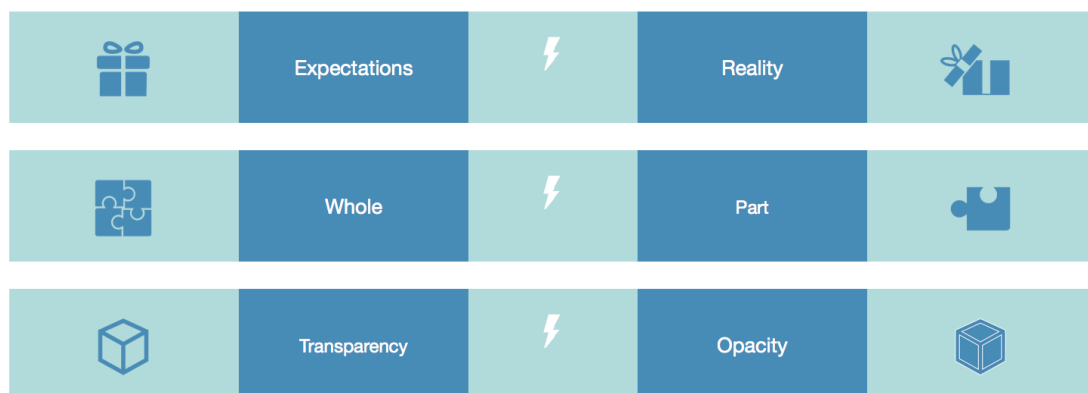
“I think one of the things that I personally worry about is that there will come a time – and it’s already happening now – that I’ll be left out. Technology is going so fast and I just don’t have the capability or intelligence to keep up with it and this worries me.”

B. (workshop)

Tensions



Our findings reveal three areas where tensions exist in the industry rollout and consumer engagement with smart and connected home technologies. Recognising they exist and engaging with them will allow us to manage expectations, think holistically and increase transparency.



Expectations / Reality



“The conscious home of the future can engage people and call them to action.”
- Andy Baynes, Director Business Development, Nest Labs

The tensions between Expectations & Reality

There is a tension between the expectations raised by stakeholders in the smart home revolution and the reality of user experiences.

There is a lot of hype about smart homes but consumers are conscious of hype cycles in emerging technologies and want more focus on substance and tangible benefits. The over-inflation of expectations by industry and Government threatens to undermine even the experience of enthusiastic early adopters and their subsequent appetite for experimenting with new opportunities as the technologies evolve.

Consumers experience tension from their expectations that ‘smart’ marketing often translates to emphasising the intelligence and sophistication of devices instead of their simplicity.

Expectations

The ‘conscious home’ will learn about the people that live in it. ‘Smart’ here means our homes will learn from people’s behaviour, make changes, and give people an instant sense of feedback and reward.

This future promise has created current expectations. People expect smart technologies to learn from their behaviour, and make their lives easier. This learning does not stay within the confines of the home but extends outside of it, connecting home life with work, travel and leisure.

The adoption curve is still early for energy-related smart home technologies so vendors are pursuing aggressive articulations and metrics of value propositions for the ideal case, not the reality of everyday homes. The smart energy marketplace in particular is fluid and evolving so vendors use bolder and bolder claims in an effort to be the dominant supplier. Energy is a non-emotive product often clumsily framed as if it is in a passionate consumer relationship.



“All we really want from smart home technologies is that they are simple, have a clear purpose, and require no great effort to set-up.” - C. (responding via WhatsApp)

Reality

Smart devices promise easier living for people, seamless user experiences and big savings. Crucially, they also promise to engage consumers and teach them about their energy use. At the moment, most of the devices do not meet these promises, and there is a large gap between the expectations set in the industry and the realities. There is almost no context. The risk is that people will not feel engaged in learning about their energy use and consumption not just now, but in the future when the technologies mature but the memories of the dysfunctional early experiences remain. There are issues around how information is displayed and what it means, which makes it complicated to users. Clumsy behavioural change strategies that assume a caricature of a hyper-engaged or lazy consumer only exacerbate the problem.

“When I look at these figures it is meaningless to me, I mean it tells me what I’m spending but it doesn’t tell me if that is a good spend or a bad spend or how it compares to my usual habits or the consumption of others in similar circumstances,” said M. (workshop).

Managing Expectations and Reality in Smart Lives

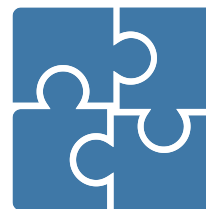
Simplify and Evaluate

First impressions are critical. Smart technology suppliers seek to bring the future into the now by engaging consumer imaginations. First seek out simple initial smart energy solutions with immediate and very clear benefits like LED lights or heating controls. Pick the low-hanging-fruit and build from there and the benefits can accompany the engagement.

Seek out dialogical learning

Technology learns about people and people learn about technology: “You have to get to the point where you understand what are the successful triggers and equally what have been the negative triggers that either cause people to walk away or ignore technology once they’ve got it,” said Dennis Palmer, Smart Energy GB.

Whole / Part



“Actually some of the humans care, while other humans don’t care in the slightest. So they carry on their normal life without any actionable insight. We need to get to a broader church of people, and collectively, automate a lot of things and do it for them.” Dr Andy Stanford-Clark, Master Inventor, IBM

The tensions between the Whole & Parts.

Smart home technologies aim to educate consumers and make energy use more transparent and accurate, thereby saving money. The reach of smart technologies extends beyond the individual person and the individual home; they also seek to engage people beyond the everyday and to think collectively. Herein lies the tension: promoting collective responsibility and action whilst using technologies that are individual and personalised.

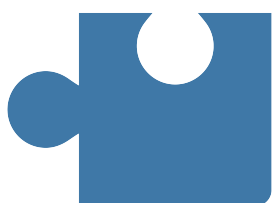
The home operating system remains an elusive if promising potential mainstream reality. In the meantime, consumers are being asked to simultaneously consider the benefits of particular technologies and the broader context and relationships to other technologies and everyday practices in the

Whole

Community groups are rolling out innovative and renewable energy related projects across the UK. Pilot applications allow people to compare their energy use with households in their area. Either through direct competition or by encouraging togetherness, smart energy requires the efforts of many in order to be effective. It is in thinking about the whole that smart energy will become more effective: “When you see it on a big scale [...] putting in that kind of technology saves huge amounts of money,” said C. (workshop).

It is about connecting people, households and devices in a way that is more efficient for everyone.

“If you take a step further, go beyond smart meters, smart homes, so people talk of the fridge, the connected fridge [...] would I want my fridge to order me food when I’m going low?” asks Craig Hollingworth, Founder, Concirrus. “No, I actually like shopping [but] look deeper than the fridge. So what if my fridge is connected to an intelligent power supply that is also connected to my kettle. So when I turn my kettle on, this turns a few things off at the same time [...] then my home is balancing itself on the grid.”



“Consumer-wise you’re driven to just think about yourselves and that’s a problem and technology actually drives you this way as well.” - D. (responding via WhatsApp)

Part

Systems thinking asks us to understand the parts in relation to the whole. Meaning emerges in the relationships between parts and with other systems. In smart home connectivity this can apply in the relationships in the home - reducing gas consumption involves a complex integration of data visibility, behavioural change and fabric efficiency - or in the relationship of the home to other homes, the community, cities or the globe.

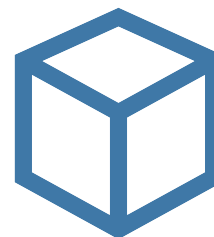
It is very challenging for consumers to understand not only the capabilities and potential impact of a particular smart technology but also how this technology relates to other capabilities or potential smart applications in the home. Equally, vendors typically offer only part of the whole smart solution and tend to overstate the value of their component in relation to the other pieces of the puzzle. To what extent are people willing to change their everyday lives to affect others? When people do not see an ‘immediate’ response, they are less likely to feel engaged into acting beyond their own lives. Individuals feel pressured to act both in their own interest and in the interests of others.

Addressing the Whole and Parts of Smart Lives

Smart lives are self-reliant and able to independently address contingencies while capable of coordinating with others. It is a similar phenomenon to how each member of a school of fish need only respond to a few near neighbours and if all individual fish participate in this way, it can organise the entire school of fish in its movements. Community energy projects promoting this kind of nexus agency are going to be critical in rolling out smart technologies and adoption.

Inside your home, envision your sense of ‘whole’ at a level that makes sense for you, like approaching the concept of ‘heating’ in your home as a starting point and holistically accounting for your insulation and windows alongside smart meters and thermostat possibilities.

Transparency / Opacity



“The use of the smart meter data becomes interesting. Companies can only use that data as directed in their licenses, for billing purposes. For anything else they must come back to the users and get your express permission for that data for a given purpose only.” - Dennis Palmer, Smart Energy GB

The tensions between Transparency & Opacity

Consumers indicate that there is a sense of apprehension around issues of surveillance, privacy, data collection and transparency in smart technologies.

Opaque practices promote cynicism and a sense of underlying maleficence.

Smart technologies are often presented as tools to aid in transparency, yet for some users this seems more like a measure of control: “It’s another door into your home and your private life as well,” said De.W (workshop). “So I can imagine some people using loads of energy, so then the police go and say we want to monitor because we want to find out if you’re growing cannabis or something like that [...] and there are always going to be multiple agendas at work with more or less relative transparency.”

Transparency

“For me it’s more about transparency rather than trust because trust is quite personal [...] if they are transparent and I know what they are doing then I go well ok I don’t agree with that but at least I know that’s what they are doing and I have signed onto that.” said N. (workshop).

The smart meter rollout in the UK has instigated a broader consumer focus on the smart energy industry. Central to transparency are questions regarding who will be collecting data, how it will be used, and who will be monitoring it; and there is a sense that energy providers will have conflicts of interest: “The providers of the utility companies are not always the best people to be doing this because there’s a built in incentive to actually consume more because it feeds into their profit margins,” said J.C (email). “There needs to be a user trust/user advisory group that would need to guarantee that it’s an advocacy group for consumers and won’t necessarily act as a bridge between consumers and providers.”

“There’s no point having a completely ‘trustworthy’ but incompetent organisation facilitating rollout of smart technologies,” said De.W (responding via WhatsApp). “I think transparency is more key. I think it’s a real change of cultural consciousness that is needed.”



“We need organisations facilitating between energy companies, the Government and users. They should be a genuine source of real and honest information. Particularly product-wise and with regards to what works sensibly in people’s own situations.” - D (responding via WhatsApp)

Opacity

Our study suggests many people do not trust energy companies’ motivations for installing smart meters. More broadly, consumers feel apprehensive about smart technologies and have raised questions regarding surveillance and control: “They’re not giving us smart meters to save money, it’s Big Brother isn’t it.” Da. W. (contextual interviews). For some, smart technologies are perceived as another method to track and monitor people in their everyday lives, and so will resist adopting smart meters or anything else. Much of this relates not to distrust but to cynicism towards Government and corporate interests. There is a strong sense that the real motivations for a smart revolution are blurred by spin and veneers: it isn’t about improving people’s lives, it’s about increased profitability or political capital.

This is further fuelled by partnerships between companies and big brands. Consumers feel that this points to the commercialisation of energy rather than sustainability: “When you start to mix smart meters with commercial products and recommending one brand over another in a ‘smart ecosystem’ or whatever, it becomes a job for the boys and no one wins but the big corporations,” said D.W (responding via WhatsApp).













Seeking Translucence in Smart Lives

There is unlikely to ever be total transparency in the technologies or markets of smart homes but consumers can demand translucence from suppliers and regulators. In data terms this might equate to progressive data policies that share non-personal data in aggregate to build smarter community services while preserving the anonymity and privacy of any individual contributor.

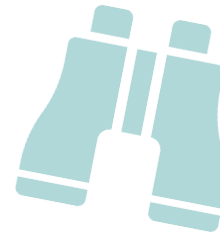
Balancing Acts



Our research reveals four key balancing acts that need to be addressed in considering the interactions of people and smart energy technologies. In each of the areas, prioritising one side of the balance comes at the expense of the other side. It is necessary to account for both sides of the balance and seek ways in which they complement instead of contradicting each other.

	Augmentation		Automation	
	Open		Secure	
	Rational		Irrational	
	Loss		Gain	

Augmentation / Automation



“Load the dishwasher after dinner and then say finish by 7am, choose the right moment to run and don’t wake us up. That’s an awesome thing but having a dashboard say you emitted this many kilos of carbon like some megawatt Fitbit for your house is of no use to anybody.” – Ben Hammersley, Applied Futurist

The Balancing Act of Augmentation and Automation

Some vendors of smart homes expect consumers to be simultaneously hyper-engaged with incoming energy data augmenting decision making and disinterested and keen for home automation. This apparent paradox is resolved by envisioning context-aware homes leveraging automation and motivating incremental and iterative behavioural change aligned with the burdens of domestic routines and values in the home. [This needs clarification!]

In smart energy conversations the discussion is often framed as an inevitable progression from augmentation to automation. Consumers don’t make this kind of distinction and see automation technologies as just another form of more sophisticated and often simpler form of augmentation.

Augmentation

We have been augmenting our experience with technologies since we first used stone hammers and hand axes. In smart homes this augmentation typically takes the form of devices making data visible for people to act on or make decisions. As Google CEO Eric Schmidt says, “the computer and the human each does something better because the other is helping”.

In seeking to augment our capabilities, smart home technologies often require extensive human help, patience and perseverance typically involving complexity and unrefined user experiences. These technologies also require that we care enough about their capabilities to invest our resources to help shape our augmentation. These contemporary requirements hint at smarter future augmentations while surfacing deeply-held concerns about the dehumanising effects of technology.

“I don’t know, so much of it is about what can I do to make my life easier, everything being easier, and I don’t know, it just seems to be levelling in the wrong way, like everyone’s trying to get to that neutral.” - D (workshop)



Also, instead of people becoming “energy geeks” (unlikely) I think smart living technology should run on Artificial Intelligence. Not sure if it does this already or not. That way you could get ultimate optimisation. Obviously with overrides in case. - De.W (responding via WhatsApp)

Automation

Just remotely accessing a home to turn devices on and off is only the beginning. Nor is ‘smart’ just programming technologies so they can perform some kind of action automatically, like your washer/dryer turning on at an optimised time to take advantage of demand response pricing or your fridge turning off while you run your washing machine.

Smart beyond augmentation needs to adapt autonomously to inhabitants in sophisticated ways like using machine learning algorithms to predict home occupancy and control the heating system. Where augmentation seeks to empower the human through decision-support, automation demands human-home collaboration and humans empowering machines with discretion.

Crucial to this collaboration is that people should always feel in control, even if they have delegated trust and responsibilities to the technologies.

“I’m not really comfortable yet with the idea of configuring things for me. I want to see what is the result of that behaviour, how this makes me feel.” - Demi (workshop)

Experiencing Augmentation and Automation in Smart Lives

Iteratively and incrementally integrating new technologies while developing confidence and trust through augmentation in the automation possibilities: “Probably some sort of human interaction with meters/education/understanding technologies and then automated ‘action’ technologies would be best,” said De.W (responding via WhatsApp). “That way you could be more certain on engagement and understanding leading to long-term behavioural change.”

The measure of success is: does the smart home enhance the experience of inhabitants in things they already do and/or enable desirable new capabilities in the home not previously possible?

Open / Secure



“Sensitive data is only going to be collected if it has value to someone, and of course the agenda or intent of that person or organisation is quite important because information is power and so sharing that power or giving up some of that power is an issue.” - J.C (email)

The Balancing Act of Open & Secure.

A balance between both physical and virtual security concepts of open and vulnerable and closed and secure has to be struck. It adds complexity that Internet of Things devices currently run on multiple communication standards from ZigBee to Bluetooth, Z-Wave, and Wi-Fi.

Interconnectivity is a foundational element of smart home architectures with nearly all devices connected to the home network enabling remote monitoring and controls. Open means more attack vectors and points of entry for hacking a connected home. Closed ensures a smart home is not intra or inter connected.

“Too many companies gathering and sharing too much data too early is a risk and will generate confusion and distrust,” says Tim Cantle-Jones, CEO, FutureEnergy.

Open

Services like ‘If This Then That’ (IFTTT) allow for triggers in one device to enable an action in another. The benefits of open standards, connectivity and platforms to the future evolution of smarter technologies in the home are obvious to consumers but the risks are less clear and therefore menacing. It isn’t clear if vendors are only collecting data that is explicitly required for the service or other additional personal data that can be used for selling products.

Since most products are connected to the Internet and send data to cloud services, consumers are confused whether being open inside the home equates to opening up outside the home and to third parties. Media coverage of hacking episodes of smart technologies overshadows technical innovations in cryptography and security as products evolve and address risks. Available safeguards and assurances are not well understood: “If you are careful with data and if you give it to somebody, that doesn’t always mean it will appear on WikiLeaks,” says Dr Andy Stanford-Clark, Master Inventor, IBM. “The Data Protection Act is actually quite strong. It has teeth and can be used against companies.”



“Companies need to understand and be transparent in how they use data, the services they provide and the options they give people. Get out of the habit of secretly saying ‘give us your data, we can do whatever we want with it or tick ‘opt out.’” – Dr Andy Stanford-Clark, Master Inventor, IBM

Secure

Consumer experiences with digital services on the Internet and mobile devices have informed and matured perceptions of the nuances of securing personal privacy and consent. The default approach of consumers to securing personal privacy and empowering consent is not to allow the smart technology into the home. Privacy and data analysis are conflated in the consumer mindset: “Big Data and Big Brothers are slightly different,” says Francine Bennett, CEO of Mastodon C. “There is a lot of confusion about it. It’s right to be careful about how data is shared. It’s a mistake to focus only on details about people related to privacy. Vast amounts of user data contains no personal data at all but can be used to predict and optimise things really well.”

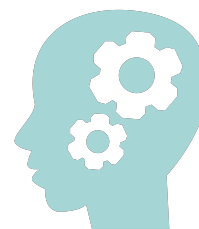
There is a desire for more fine-grained mechanisms for sharing data but also a recognition that this demands an unnatural level of awareness and engagement with energy products.

“It makes sense that you might share data with your neighbor so you can control certain aspects of each other’s homes with permission. A bit like giving them a key for emergencies,” said De.W (responding via WhatsApp)

Finding a balance between Open and Secure in Smart Lives

Seek out smart technologies that adopt privacy assurance as a default mode of operation. Smart Lives engage with products with absolute transparency and various tiers of privacy measures commensurate with the sensitivity of the data. Privacy is the default setting and consumers choose the terms by which they open up: “A lot depends on what data and what they are doing with my data,” said De.W (responding via WhatsApp). “If the data stayed internal or if I had options as to who it was shared with or how or why it was shared then it would be a different matter.”

Rational / Irrational



“In my experience smart technologies are more about understanding rather than action (or with the onus on me to take action). I think that people would respond to more carrot and less stick.” De.W (responding via WhatsApp)

The Balancing Act of Rational & Irrational

Smart energy initially appeals to people's rationality: it offers to save money and at the same time save energy. Devices and tools in many ways are designed to mirror this rationality. But people are not rational beings. Whilst some decisions are based on rationality, emotional decisions can be powerful. Smart technologies must be balanced in negotiating the rational and irrational aspects of people and technology.

Behavioural change strategies, whether rooted in assumptions of rationality or irrationality, need interfaces - between people and technologies, suppliers and customers, regulators and data or homes and communities. These interfaces are never under control. Michelle Serres compares the realities of interfaces to the Northwest Passage, with shores, islands, and fractal ice floes.

Rational

The idea of smart meters points attention towards data. Information and data visibility are the mechanisms through which people can learn about energy use, devices can display usage in 'near real-time', changing the way people think about and use energy. The idea is that with all this valuable information available rational consumers will use smart technologies to make smart and rational decisions to save money, reduce consumption and reduce environmental impact.

There are reasons why consumers may adopt smart technologies that are driven through mindful decision-making processes: “If there is someone on a budget, yeah, they would be using these smart things to monitor how much they are using because they are on a budget and it can make a meaningful difference.” (D.W, workshop). It is not only financial situations that motivate people, but other factors as well, such as distance, the ultimate impact of one's actions, or health considerations.

Assuming consumers as hyper-rational is problematic in that it focuses on a small subset of the 'energy-geek' market that is data-driven, technology-focused, and logically engaged with making efficient resource-management decisions.



“Consumers aren’t perfectly rational and what is rational for you as an individual in the short term is often not rational for humanity in the long term” - Ben Hammersley, Applied Futurist

Irrational

Many smart technologies have focused their attention on educating people about their energy use. This is underpinned by an assumption that people are rational consumers. Yet, people are – more or less – emotional consumers.

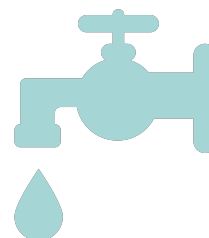
“I hadn’t realised till doing this project how everyday usage, the way we connect with and use appliances, how it makes our life easy, difficult, whatever it is, how it serves us, is not just a technical and rational thing, it truly is a very emotional thing as well,” said J.C (email).

Employing behavioural economics suggests many of our decisions are not residing in us. They are residing in the form or strategy of engagement from principles like priming, framing, loss aversion, reciprocity, scarcity or social proof. As an alternative or complement to automation, behavioural change strategies in energy are well suited to promoting the mental and physical availability of consumers to influence decision making: “Certainly I wouldn’t change my habits just through data visibility,” said D.W (responding via WhatsApp). “That only acts as a nagging reminder. If devices facilitated change that would be a different matter.”

Activating the hearts and minds of Smart Lives

Focus on everyday activities in the home and what might make them more efficient, affordable or enjoyable. Smart Lives don’t start with metrics of £s, kWhs, or greenhouse gases but with our everyday practices of doing laundry, chilling a bottle of wine, or watering the plants. Rational behavioural changes will work for things you care about. Accessing, motivating, or triggering our irrational decision-making processes requires our mental and physical availability. We all experience energy every day. Focus on re-imagining these everyday practices and making them smarter.

Loss / Gain



“Having a small daughter means that I often just do things like run the dishwasher and washing machine together when I get a moment. I’d hate to lose that flexibility. In any case we’d need to get a new dishwasher (or timer on our existing one) to manage any scheduling.” - N. (responding via WhatsApp)

The Balancing Act of Loss & Gain

The loss/gain relationship is strongly linked to nearly all of the dynamics illustrated in the research findings.

Engaging with smart technologies is a delicate balancing act between immediate investment in valuable financial and personal resources and often projected or less well-defined and future-focused gains.

Poor experiences with early stage smart technologies can lead to a rapid escalation of commitment and that leave a bad taste all around.

This is partly the result of the relatively early stage of these technologies and partly the nature of the typically distant relationship between people and energy topics and technologies.

Loss

Studies by behavioural economists like Daniel Kahneman and Amos Tversky have demonstrated that losses are twice as powerful a motivator, psychologically, as gains. We like to win but we hate to lose.

Every consumer engagement with smart technologies involves a dynamic of loss - loss of time, loss of habit, loss of data, loss of calm, loss of expectation.

“People don’t see how a lot of smart tech can fit in with their everyday lives,” said De.W (responding via WhatsApp). “And if they can’t see the benefit there is no reason for them to make a proactive change. At the moment we are asking them to make a positive choice with no incentives.”

Loss aversion bias can often lead to procrastination and inertia so even when the potentially right smart technology for a particular consumer comes along there is a reluctance to adopt it and leave behind the status quo for the relatively unknown. Consumers adopting almost any smart technology are quick to see the losses as they struggle with relatively unrefined user experiences and daily demands but the potential gains are often pitched much further in the future, like £150 annual savings, reducing their psychological value.



“A true smart system in a home that knew what was plugged in, and what it could turn off, and it knew how long it could turn them off for. Would that world be an amazing place? How much energy would we conserve! That would be a better planet and a truly smart home.” - Craig Hollingworth, Founder, Concirrus

Gain

“The benefits of why consumers should invest money and time needs to be more creatively addressed in the market,” said Tim Cattle-Jones, CEO, FutureEnergy.

While consumers are loss-averse they also tend to favour immediate payoffs rather than those cast further into the future: “Eventually most smart technologies will make life a bit easier so just as the dishwasher improved washing dishes, the smart dishwasher will improve organisation in the home,” said M. (responding via WhatsApp). “By making it easier it will improve life.”

Short-term bias is not limited to the consumers. Traditional energy suppliers investing in smart technologies have a lot to lose as the markets inevitably open up to more competition. Many of the new competitors will have more experience of running digital data-intensive businesses. Potential early gains are primarily limited to consumers and regulators recognising their innovative turn. Longer term the gain may be their continued survival and avoidance of inevitable decay in market share and value proposition as they are increasingly isolated in resistance to the smart revolution.

Balancing out Loss and Gain in Smart Lives

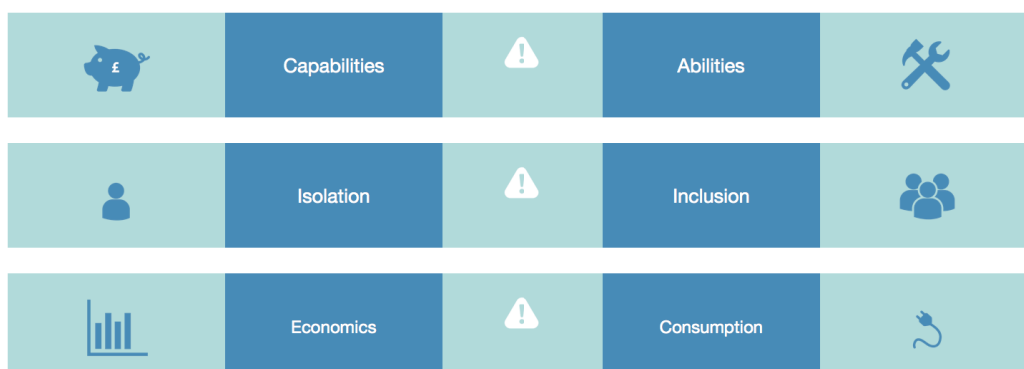
We are increasingly bombarded by demands on our time and resources. Home automation can lose tedious tasks in the household while gaining family time or conversation. It is similar to how successfully losing weight requires patience and perseverance with long term gains of greater health, happiness, and confidence.

“I think part of the point about using less and being more efficient is that you can actually have the same lifestyle (if not better) on less.” said De.W (whatsapp).

Risks



Our findings reveal three key risks that need to be openly and constructively addressed in tackling the human experience and realities of engaging with smart home technologies: the barriers to entry of financial capabilities and literacies/skills; the risk of emerging technologies leading to greater social isolation; and the risks of both seeking to save consumers money and see them reduce consumption in the process. These risks are not strictly compliance issues that can be easily mitigated or prevented through traditional rules-based approaches.



Capabilities / Abilities



“Old houses are not very well equipped to handle lots of the aspects of smart tech. Even our wifi gets stressed just from the light controls. So it’s a curve.” D. (responding via WhatsApp)

The Risks of Capabilities & Abilities

The potential smart home divide not only relates to the financial capabilities for the provision of technologies in the home but also individual skills and literacies. Risk mitigation calls for new social organisations that transcend territorial boundaries and focus on inclusive approaches to the provision and use of emerging smart home technologies in the activities of citizens.

According to Moore's Law, in 18 months the computing power of smart devices will have doubled. Metcalf's Law tells us that interconnected networks increase in value as they add members. These underlying laws are propelling an accelerating future of smart and connected homes, communities and cities fuelled by technology. It is necessary to tackle the tough challenges of barriers to entry at the relatively early stage of this evolution.

Capabilities

Techno-economic upheaval is a feature of every market sector and aspect of contemporary socio-economic life. Emerging digital technologies are propelling what venture capitalist Marc Andreessen calls “software eats the world”. From taxi cabs to movies, real estate, agriculture and health care software-defined businesses are disrupting markets and business models. So what happens when software inevitably “eats” the home?

The advent of computer diagnostics in vehicles has completely transformed the way owners use their cars, and mechanics can access sensor data and no longer need to employ trial-and-error strategies to solve problems. The digitisation of the smart home, and specifically the digitisation of energy consumption in the home, promises a similar dynamic of helping inhabitants to solve problems before any damage is done. In the current early adopter phase this comes at a considerable cost. Just as with any emerging technology, sector price as a barrier to entry is most pronounced in the early days and tends to mitigate over time. Plummeting prices for smart phones has virtually erased household income as a differentiator of smartphone ownership.



“I think the people who will really find this a useful gadget are those that have to carefully budget themselves and they probably won't have all the right tools to set it all up. It will only work if it is done for them.” – M. (responding via WhatsApp)

Abilities

Harnessing the power of smart home technologies for meaningful impact and meaning in individual lives is about more than just being able to afford the technologies. Alongside economic barriers there are learning and socialisation gaps across socio-economic status, race and gender caused by unequal access to smart home technologies, or potentially more importantly the desire to access smart home technologies. Other considerations include desire, a willingness to experiment, and the luxury of time to invest in engagement.

Networked society also features divides between connected communities focused on collective action and members of disconnected groups [I don't understand this sentence]. Engaged and empowered communities of interest, both geographically and ideologically, can have broad impact on the engagement ability of individual members with smart technologies just as new build smart cities often engineer sustainability into residents' lives. Usability and accessibility need to be designed into devices and technologies. If the Government is targeting 2020 for a smart meter in every UK home the technology rollout needs to be complemented by a campaign to explain, inform and educate.

Enabling Capabilities and Abilities in Smart Lives

Smart Lives cannot be moulded from the basic raw materials of human and home. Consumers must have the mental and physical availability for new products and the financial resources to invest in acquisition, installation and operation. Most importantly, consumers must have the skills and tools necessary to make sense of the data for augmented decision making. Each household should have the collective willingness, skill-set and resources to engage with smart technologies at a level that makes sense for them. While 'smart' engagement requires both capabilities and abilities this is a progressive curve influenced by the technical and social evolution of the technologies.

Isolation / Inclusion



“I’m very conscious about technology it’s so crucial for our lives as well [...] I’ve spoken to you about my younger brother,” said JC (workshop). “He’s bipolar, he’s sort of sectioned he’s come out the hospital, he’s been out for 3 months and I spend a lot of my time sorting out all his debts.”

The Risks of Isolation & Inclusion

As the speed of technological changes continues to advance exponentially, there is a risk for certain parts of the population to become isolated or for this process to exacerbate already existing isolation. These sectors lack the financial or technological resources to keep up with different innovations.

Efforts at inclusivity need to involve people with a wide-range of capabilities and abilities. Most importantly, inclusive approaches need to include a wide range of desires for engagement. It is not enough to open up opportunities for people to engage as those that are least likely to take up these offers are also often those with the greatest need. If a revolution in smart home technologies includes only a portion of the population it risks exacerbating issues of social and technological isolation.

Isolation

Smart home systems aim to empower people to control anything and everything in their home. At the moment, however, many of the smart technologies on the market don’t directly address people who are in a precarious position – whether to do with age, language difficulties, financial constraints, technological knowledge or disability. Many of the people who would benefit from smart homes do not currently have the financial or technological resources to be able to use these systems: “What access we have to what technologies is often not our decision,” said J.C. (workshop).

Whilst there is potential for home automation systems and the emergence of smarter pay-as-you-go energy models to include many people in precarious positions, the quick pace of technological advancements is creating big gaps in knowledge to the point that it is isolating large parts of the population. These gaps also make it more difficult for people to integrate ‘smart’ into their daily lives.

“I’m not really interested in knowing something for the sake of knowing it,” said JB (responding via WhatsApp). “But I do know of people to whom this will make a huge difference but they are pensioners who don’t own mobile phones or laptops! So no access.”



“You have to engage users as well, probably not in a sense of messaging people more heavily about saving energy but in a sense of how do you integrate into their behaviour, into their daily lives and make that life easier and more enjoyable.” - Francine Bennett, CEO Mastodon C

Inclusion

Home automation systems have the ability to include segments of the population which might otherwise remain excluded. Some systems could allow individuals who live away from friends or family to remain connected in other ways. For people in vulnerable or precarious situations, home automation systems allow others to fill in gaps, whether these are financial or technical. Home automation systems can assist friends and relatives in helping individuals who are in difficult situations as a result of illness or disability.

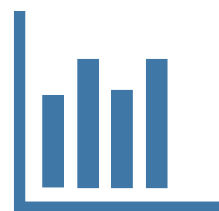
“That’s the thing I suffer with at the moment, I don’t see enough people, and also people I do see are all in their mid-ages, so the technology thing I would share, I can’t share with them, because they’re not up to speed with it and I’ve tried to bring them online as it were but it’s difficult, they just don’t get it, so the only chance’s been swept away (...) because nobody’s got an iPad but it’s just past their ages” - P. (workshop)

The ability to manage not just one’s energy use but also others around – whether in the same home, or at a distance – creates a sense of inclusion, and in doing so it has the potential to affect the behaviour of others as well.

Rethinking vulnerability and isolation in Smart Lives

It is important not to conflate or mix up vulnerability and ability. Isolation can be made worse through unequal access or lack of education around smart technologies but just because individuals meet traditional definitions of vulnerability doesn’t mean they are vulnerable in relation to smart technologies or incapable of pursuing Smart Lives. Many people across socioeconomic demographics do not easily adopt new technologies or have support networks through the transition processes. This isolates certain groups from the benefits of smart technologies, and also from connecting with other people.

Economics / Consumption



“The main motivator of smart adoption will be money.” - Andy Stanford-Clark, Master Inventor, IBM

The Risks of Economics & Consumption

In economics the Jevons Paradox suggests that more technologically-fueled efficiency leads to more consumption. If technology introduces efficiencies then the system will seek to explore new activities and expand functionality instead of doing the same while consuming less.

In smart homes this suggests that any improvements or efficiencies leading to reductions in energy consumption through smart technological interventions in the home will be offset by the insatiable need for these same technologies to promote an expansion of the expressions or functionalities available to the inhabitant.

The risk is that like gamblers at a card table the option to play more is often more enticing than walking away with your winnings.

Economics

Smart energy systems at the moment offer to save people money. This is something that appeals to certain people who experience high energy costs, and the stress that goes with it: “Today, I am constantly afraid of how much I will pay. I prefer to have a sweater, socks and a blanket than turn on the heating for an hour,” said L (responding via WhatsApp). “Also, I think it’s ridiculous that I have to spend three months waiting for what I will really pay.”

Behavioural-change strategies routed around financial motivations will work for the portion of the market motivated by the financial bottom line, particularly those in precarious situations or already quite knowledgeable about energy pricing: “I had ‘off peak’ electric contracts in the past [...] Currently I do not have this type of contract as I find paying 10p per kWh 24 hours a day financially more viable and easier to ‘live’ with,” said P. (responding via WhatsApp).

For the majority of the market, financial motivations will be secondary to lifestyle considerations. Consumers will value the time and engagement required in exchange for the potential cost savings in assessing value: “Everyone wants to save money,” says Tim Cattle-Jones, CEO, FutureEnergy. “The question is at what cost, and is it worth it?”



“I believe (almost) everyone would like to save money on their bills [...] of course the affluence of each individual impacts the tipping point of this decision, but do I lose ‘convenience’. This then becomes a battle of the financial vs the emotional!” - J.B. (workshop)

Consumption

Smart home technologies have the potential to teach people about their consumption habits. This can help people better understand the financial and environmental impact of their energy consumption. For some users, saving money becomes the main reason for adopting smart technologies; for others it is a question of what forms of control they are willing to give up to save money.

In macro-energy discussions there is a well understood ‘rebound effect’ paradox between states pursuing a low-carbon footprint and economic growth. Consumption and economic growth tend to run in parallel making it very difficult to reduce carbon consumption while experiencing fast or explosive economic growth. These agendas need to be decoupled.

Similar phenomenas are experienced by consumers seeking to reduce energy consumption and bills: “If they can afford to do it and energy is cheaper or more efficiently managed through technology, consumers consume more,” said Tim Cante-Jones, CEO, FutureEnergy.







Decoupling Economics and Consumption in Smart Lives

Sustainability does not emerge as a passive consequence of reducing consumption or practicing conservation. It can only emerge as a by-product of imagination, social innovation, and shifts in collective cultural consciousness. Don't seek to do what you already do more efficiently. Seek to re-imagine your low-energy, cost-saving future.

Consumers are driven by different factors when consuming energy. Consumers must decide whether to pocket economic savings gained through smart technological efficiencies and/or behavioural changes or reinvest them in greater consumption.

Personas

Our research reveals snapshots of some of the personas emergent in Smart Lives. These archetypes demonstrate features and attributes of social groups through common experiences and engagements with smart home and energy technologies. They are stimulated through ideas observed or documented throughout the co-creation research process with our research participants.

					
The Human Machine	Passive	Smarter Than Smart	System Thinkers	Precarious	Gamers

The Human Machine (Beaver)



These early adopter 'energy geeks' follow, test, and use all smart data.

- Sees human progress and social action as inevitably mediated through data and technology.
- Lead heavily scheduled, very busy lives, with obsessive-compulsive tendencies.
- Prefers augmentation and is resistant to home automation unless the underlying processes are transparent and visible.
- Ideal 'Energy Champions' or community advocates for energy data tools or projects.

The Passive (Koala)

"The evolution of smart technologies is from augmentation to automation as that suits consumers better. When you enact rational behavioural change and engage with people in the immediacy they get it. But shortly they revert to previous habits." - Tim Cattle-Jones, CEO, FutureEnergy



Lets the machine do the work but won't do very much to make it work. Trusting in technology until something goes wrong.

- Keen on interconnectivity in the home. Embraces economies of scale and automation.
- Assesses if the ends justify the means, not the other way around.
- Keen on operational, not entrepreneurial tasks. Always hires the install with the technology.
- Open to sharing data inside and outside of home if it improves services.
- Ideal pilot audience for emerging Home Operating Systems or new build automated homes.

Smarter Than Smart (Fox)

“The device works well but is limited. It confirms what I thought already.” - D.W. (whatsapp)



Hyper-critical of new technologies but constantly early-adopting if they can afford it.

- Like a music blogger that will buy an album they know they are going to hate, just so they can savage it.
- Often through existing needs, typically economic, they have already developed strategies for saving money or hacking existing devices or processes for personal gain.
- Highly skeptical of information from energy suppliers, having studied all the different tariffs and programs and with long memory of previous iterations of energy concepts.
- Ideal test bed customers for new technologies. Keep your friends close and your enemies closer.

System Thinkers (Goose)



Simultaneously a whole (social) and a part (agency). Puts other people's needs ahead of their own.

- Selfless users that don't rush in life.
- Excited by technologies and what it offers but keen to strike a lifestyle balance all the time.
- Can be incentivised to change behaviour if it suits the needs of others.
- Updates insulation, ventilation, windows, low energy lighting as enablers for the lower impact margin but more exciting smart technologies.
- Ideal for demonstrating impact of smart energy solutions implemented thoroughly and properly.

Precarious (Field Mouse)

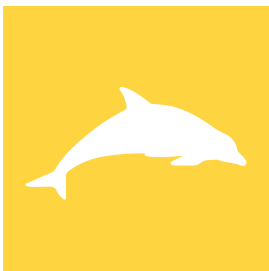


Isolated from knowledge of both the potential losses and gains of smart technologies.

- As likely to be a wealthy homeowner with all the latest smart home gadgets but no idea how to use them as someone in a typically precarious position.
- Either blindly trusting and desperate to be 'on the grid' or blindly fearful of 'control' by Government or energy companies and desperate to stay 'off the grid' at all costs.
- Typically sees technology as an instrument of power to be threatened with or wielded.
- Ideal initial target for new product rollouts.

Gamers (Dolphin)

"My husband was like, 'oh you see, we're using more than the neighbours. Right, I need to do something about this!'"
- S (responding via WhatsApp)



Inspired by competition and understands their own situation in relation to the position of others.

- Usually young professionals.
- Likes technology and devices, but more focused on design than data. Prefers good graphics to raw outputs.
- Highly likely to join programs that publicly measure performance and offer rewards/benefits.
- Needs granular comparative tools. How am I doing relative to my neighbour? Street? City? World?
- Ideal for developing customer loyalty and engaging with rewards programmes.

Methodology

Co-creation ethnography envisioning what it means to live 'Smart Lives' engaging with and helping shape emerging smart home technologies. Led by researchers at Goldsmiths, University of London.

Sample

Twelve participants were involved in an ethnographic co-creation project from 10 January to 8 February 2015 envisioning what it means to live a 'Smart Life' as a UK resident engaging with and helping shape emerging smart home technologies. Participants were sampled from the general population and form a diverse group. Participants were involved in workshops, supplied with technologies and visited and observed in their homes. In addition, four contextual interviews were carried out with traditionally defined vulnerable (in fuel poverty, migrants, having disabilities) people in their homes. Nine subject matter expert interviews were carried out with specialists from a variety of related fields.

Methodology

Researching the future in the now requires innovation in both methodology and methods. The research team was immersed for six weeks in online and offline social spaces (digital ethnography) while using mixed methods to acquire data. Our innovative approach seeks to gather data in real time, to understand people's lived experience as it happens. As a method of ethnography, ethnographic experiments were run to help participants imagine future smart worlds. Alongside this, the research team ran a set of experience sampling exercises to provide the participants with experiences of technologies potentially unknown to them, and to explore potential future situations that participants may not have otherwise considered. Throughout the fieldwork, interviews were conducted with subject matter experts, and four contextual interviews were conducted with traditionally defined vulnerable (fuel poverty, migrants, illegal, disabilities) adults in their homes. The field research concluded with a storytelling workshop, a co-design method that allowed participants to envision dream situations, without necessarily relating to their own experiences. This methodology is iterative, all different elements inform each other, and together inform new understandings.

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Technology Vendors

GEO: www.greenenergyoptions.co.uk/
Passiv Systems: www.passivsystems.com
Photonstar: www.photonstarlighting.co.uk/
Wattson: www.smarthomeenergy.co.uk/wattson-energy-monitoring
Loop: www.your-loop.com/

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