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Touchpoints and Behavioural Mechanisms

Strengthening energy conservation in the residential sector

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Abstract

Policymakers are leveraging the use of behavioural insights (BI) to tackle a myriad of demand-side management issues among consumers, including using BI to encourage energy conservation behaviour among consumers in the residential sector (BIECR). But apart from a few large-scale policies, many BI interventions are stuck in the trial phase - because while they generate statistical evidence through small scale randomised controlled trials, they are not able to pinpoint the underlying behavioural mechanisms that help develop persistent and scalable policy measures.

One aspect of human behaviour are the touchpoints – the part of the user experience journey that is key to performing a behaviour. Touchpoints also form the necessary interface through which policymakers interact with energy consumers to encourage energy conservation behaviour. This research analyses the relationship between energy consumers and touchpoints; it then offers suggestions through which this relationship can be strengthened by developing the mechanisms that underlie persistent and scalable BI policies.

Using several case studies analyses and expert interviews, this research draws out generalisations from the relationship between human and touchpoints that are relevant to BIECR. It showcases three mechanisms that could be strongly leveraged from touchpoints by policymakers: the consumers' perception of the touchpoint, a sense of ownership, and the ability to close the cue-action-reward loop.

This research also highlights how archival research can feed practical observation back to theory; this would be key to drawing generalisations across cases, and developing strong mechanistic evidence for BI policies in specific sectors.

Key Words

Behavioural Insights, Touchpoints, Energy Conservation, Energy Policy, Residential, Mechanistic Evidence, Archival Research

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Abbreviations

BEE	Bureau of Energy Efficiency, India
BEIS	Department for Business, Energy and Industrial Strategy, United Kingdom
BI	Behavioural insights
BIE	Behavioural Insights in Energy
BIECR	Behavioural Insights for Energy Conservation in the Residential Sector
DITP	Direction interministérielle de la transformation publique, France (Translated: Inter-ministerial Directorate for Public Transformation, France)
DR	Demand Response
DSM	Demand Side Management
EC	Energy Conservation
ESRI	Economic and Social Research Institute, Ireland
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
HERs	Home Energy Reports
ICT	Information and Communications Technology
IEA	International Energy Agency
IHD	In-home Display devices
INT	Interviewee
OECD	Organisation for Economic Cooperation and Development
RCT	Randomized Controlled Trials
STS	Socio-technical Systems
SVT	Standard Variable Tariffs
TPS	Team Power Smart
UHI	Urban Heat Island

1. Introduction

Cities consume the larger chunk of energy demand today. In 2013, urban areas around the world accounted for about 64% of global primary energy use (IEA, 2016). This share will continue to rise as cities grow and urban economic activities expand (IEA, 2016). Each year, 70 million people are added to the urban population (IEA, 2019). The world is seeking to make more efficient use of its energy resources to improve energy security, energy access, curb pollution levels and many others (IEA, 2016).

Energy supply and improving energy efficiency through technical/structural means is a reasonable proposal but has its fair share of limitations. Besides, there is the seasonable variability issue, when demand for air conditioning (and hence energy) peaks during summer periods (or heating peaks in colder countries in winter). Some gas-fired power plants may meet the seasonal variability issue in some countries (IEA, 2019); but otherwise structural changes is a formidable task which takes time, and demand-side management take on a much larger role in meeting short-term flexibility needs (IEA, 2019)

Technologies are also important determinants of energy supply and demand. But people's demand for technologies they use, and how they use them (amongst others), ultimately determine energy use (IEA, 2019). Identifying ways to encourage energy conservation behaviour, therefore, is an important element in managing the demand-side response.

However, encouraging energy conservation behaviour among humans is not an easy task. Humans tend to have *biases*, which when observed from the lens of standard economic theory, can be defined as deviations from rational decision making (OECD, 2017). These biases affect our decision-making abilities and ultimately our decisions themselves.

Apart from the traditional policy instruments such as regulations, taxes, tradable permits, etc., policymakers are increasingly recognising the need to incorporate behavioural insights (BI) to implement more effective policy interventions (OECD, 2017). Behavioural insights denote knowledge acquired from behavioural sciences, including behavioural economics, psychology and neuroscience, which can then be applied to policy interventions – including those tackling energy and environmental-related issues (OECD, 2017)

The use of Bis in policy is recent. Popular books such as Nudge: Improving decisions about health, wealth, and happiness (Thaler & Sunstein, 2009) and "Thinking, fast and slow" (Kahneman, 2011), brought to light lots of the behavioural issues that humans faced in their day to day decisions, as well as some tools that could be leveraged to overcome these issues.

Over the last few years, several countries have set up specialised policymaking teams that incorporate lessons from BI within policy development and implementation processes (IEA, 2019). However, there is no platform currently that collates policymakers practical experiences applying BI *specifically for energy policy* (BIE) (IEA, 2019). Some reports have attempted to extract key lessons from some individual BIE polices (OECD 2017; OECD 2017). However, the analyses were generic, without going into depth in any particular sector (IEA, 2019). It can also be noted that many of these interventions are experimental, with no clarity on whether these were converted into/ influencing large scale policy interventions.

To move beyond experiments and into large-scale measures, the behavioural changed brought about by BI policies should be effective, robust, persistent and welfare-improving (Grüne-Yanoff, 2016). However, this is not easy to establish. Many policymakers seem content with mere difference-making evidence, i.e. the evidence that a putative causal factor makes a difference to the putative effect in a specific environment. But difference-making evidence only shows evidence for '*how-much'* difference the policy intervention has made in that particular environment – mostly through randomised controlled trials (RCTs) that demonstrate some statistical significance (Marchionni & Reijula, 2019; Grüne-Yanoff, 2016).

Studies have critiqued this approach by stating that knowing *'how-much' (*difference-making evidence) is not sufficient in determining whether the intervention can be scaled up or how long it will persist (Marchionni & Reijula, 2019). They have further suggested the need for mechanistic evidence to support difference-making (statistical) evidence, to answer the question of '*how'* (mechanistic evidence) BI interventions change human behaviour.

The arguments for mechanistic evidence are psychological and shall be discussed in more detail in the literature review. However, this paper would like to argue in defence of 'touchpoints' that are critical to any BI policy intervention, and further explore how touchpoints could offer the mechanisms for robust and persistent BI policies. Touchpoint is a concept borrowed from the field of service design; when following the journey map of a consumer, a consumer usually experiences a touchpoint that triggers a specific behaviour. But it also constitutes the interface through which policymakers wish to trigger EC behaviour among the consumers (of energy). For instance, it could be the monthly mail delivered report, through which the policy intervention is trying to encourage a change in consumer behaviour.

However, touchpoints are more than mere objects. BIE policies are introduced to encourage energy conservation behaviour, and the consumer may form a relationship with the touchpoint. This research will explore these relationships to understand the underlying mechanisms. But since this relationship may vary across different sectors (such as residential, transport, agriculture, etc), the scope of this

research has been limited to understanding BI policies that try to encourage energy conservation (EC) behaviour for the residential sector only (BIECR).

1.1. Context

As an engineer working in the field of sustainability consulting, I noticed a large gap between technology and human use. Even though efficient technologies or methods of operation existed, people acted counterintuitively, and I wished to understand why. This is what led me to research behaviour change in the context of energy.

For instance, I have seen people set a lower thermostat temperature on their air conditioning, in the hopes that the room would cool faster. But instead, I knew that the fan speed (of the air conditioner) dictates how quickly the desired room temperature is achieved. I assumed that this incorrect behaviour was because many people didn't know that the temperature and fan setting of an air conditioner serves two separate functions. But in another instance in my professional career, I noticed that consultants would deliberately prescribe a less efficient air conditioning system because the sales and after purchase warranty support was much more established for that system, as compared to a high-efficient new air conditioning system that lacked the necessary after-sales support. Both these cases brought together two contrasting views - of awareness vs non-awareness - with the same resulting behaviour that was detrimental to energy conservation and energy efficiency.

I received an opportunity to intern at the IEA from February 2020, which matched my research interests in studying behaviour and energy. The IEA is an autonomous institution within the framework of the OECD (Organisation for Economic Co-operation and Development) – an organisation that is at the forefront of researching and supporting public institutions that make use of BI in public policy (OECD, n.d.). The IEA wished to take this a step further; they claimed that a global platform for collating practical experiences (of policymakers) in the field of energy policy was missing, and hence released a proposal that wished to address this issue for each energy sector (IEA, 2019).

The IEA wishes to publish a report in line with this proposal, and I am assisting the IEA in this endeavour. My responsibilities largely included studying existing BI interventions in the residential sector, and this is what led me to frame my research in the field of BIECR. Interning at the IEA helped me gain access to various BI reports published by the OECD and helped me connect with energy policy experts and professionals from around the world.

While my work at the IEA has a much larger scope, I chose to restrict my research interest to touchpoints. I view touchpoints as 'technological interface' in the BI debate, which also tends to align with my background in engineering. This is what led me to study more about touchpoints, and frame my research aim and objectives around it.

1.2. Aim and Objectives

My research aims to analyse the touchpoints employed by policymakers in the field of BIECR and sketch out mechanisms that facilitate robust, persistent, and scalable BI policies. The main objectives of this research are as follows:

- To critically identify as many policies and program types (including tests/ trials)[1] that have leveraged the use of behavioural insights for energy conversation in residential households (BIECR).
- To summarise these 'identified' intervention types into their context, general objectives, behavioural levers used, and details of touchpoints.
- To interpret commonalities/ generalisations observed between residential consumers and touchpoints that facilitate the development of mechanistic relationships.
- To summarize key mechanistic relationship factors between consumers and touchpoints that could assist in developing more robust, persistent and scalable BI policies for energy conservation in the residential sector (BIECR).

1.3. Dissertation structure

This dissertation will be divided into the following chapters.

- This introduction chapter is to give a brief introduction to the field of behavioural insights in energy policy, to outline the research that will be pursued, and highlight the aims and objectives.
- The second chapter will explore the research topic through a literature review. A short history of why BI exists, what is its relevance to energy conservation policy, what BI exactly is, where are

[1] Note: Throughout this report, the reader will encounter several words like policy, program, tests, trials, measures, interventions or projects. However the underlying meaning behind each of these words is the same; they all refer to some BI intervention. It was not possible to replace these with a single word, as this may change the meaning. However the essence behind the word is to be considered. So for example, if through this report the reader has identified the word 'policy' has been incorrectly called a 'project', then **the reader is humbly requested to please ignore any such errors, and instead give cognizance to the essence of the message.**

the gaps in the current work, and how do touchpoints fit in. The section will conclude with how this research intends to proceed further.

- The third chapter will layout a suitable methodology that demonstrates how the work shall proceed and provide justifications for the same.
- The fourth chapter is dedicated to results. Each case study type has been summarised in line with the second objective (see 1.2).
- The fifth chapter is for discussions. Observed commonalities have been drawn from the case studies, and relevant conclusions have been suggested.
- The sixth chapter concludes with reflections on the research and future implications on both theory and policy.

2. Literature Review

2.1. Why BI?

Back in 2006, renowned psychologist Robert Cialdini talked about how policymakers designed policies that instead of having the desired effect, led to the complete opposite reaction. This statement of his had a profound impact on the room and was later on touted as Robert Cialdini's "Big Mistake" (Halpern, 2015). In the field of psychology, this is also known as the 'Boomerang' effect (N., 2013)

In other cases, standard economic principles – such financial incentives and regulatory instruments – simply fail in bringing about the desired level of behavioural change. Take for instance an example from the UK; Customers have the choice of actively shopping around each year for a one or two-year fixed tariff from the energy market; yet around 60% of British energy customers do nothing, and end up on a Standard Variable Tariff (SVT) (Tyers, Sweeney & Moon, 2019). The 'variable' element of the SVTs can rise (or fall) at any time and are nearly always more expensive. Annually, a British household can save about £300 if they actively shop for the cheapest fixed tariff; yet consumers do not take advantage of this seemingly obvious financial benefit. Moreover, vulnerable low-income groups are more likely to continue with the default SVTs, despite being less able to afford it (Tyers, Sweeney & Moon, 2019).

From the above example, it is clear that for many people, traditional economic perspectives do not suggest that customers would choose energy deals that maximise their utility or financial well-being (Tyers, Sweeney & Moon, 2019) – a phenomenon earlier introduced as biases (see 1). Understanding human behaviour is crucial to addressing these biases and addressing new and complex policy problems (OECD, 2019).

Hence the use of behavioural sciences in the field of policy exploded. BI was institutionalised around the formation of the first BI team in the UK almost a decade ago. Since then it has grown in great numbers – over 200 government units, initiatives and partnerships across the world applying BI to public policy (OECD, 2019). This has also led to the creation of many frameworks and guidelines that attempt to address these biases and incorporate BI into public policies. Some important works and their details are:

- Tools and Ethics for Applied Behavioural Insights: The BASIC Toolkit (OECD, 2019)
- MINDSPACE: Influencing behaviour through public policy (Dolan *et al.*, 2010)
- World Development Report - Mind, Society, and Behavior (World Bank, 2015)
- Changing Behavior to Improve People's Lives: A Practical Guide (Tantia, Bade, Brest & Richards, 2019)

Hence BI offers a way of overcoming these observed challenges. BI has many other advantages in policy, as it offers a much less expensive route to more sustainable societies (as compared to infrastructural technology development), and helps in encouraging consumers to adopt 'greener' products in the context of overcoming habitual behaviours (McMeekin & Southerton, 2012):

2.1.1 Biases

Certain types of biases that BI policies try addressing have been listed below:

- Loss aversion: When the cost of giving up something that exists is perceived as greater than the benefit of obtaining the same thing had it not existed (OECD, 2017)
    - Status-quo bias: Depending on the reference point, alternative options are viewed as either advantages or disadvantages relative to the current scenario, and the disadvantages of alternatives loom larger than their advantages (OECD, 2017)
- Representativeness heuristics: The degree to which person compares new information/situations to other similar information/situations (Kahneman & Tversky, 1972)
- Cognitive dissonance: Inconsistencies observed between individual beliefs and behaviours. On occasion, people would rather align their beliefs to their behaviour instead of the other way around (OECD, 2017)

2.2. How is it relevant to energy policy?

The interaction between humans and the energy systems that make up our lives today falls under the umbrella of the socio-technical system (STS). STS is argued to be the explicit intertwining of society and technology (McMeekin & Southerton, 2012), and much research is being pursued to study about STS transitions (Li, Trutnevyte & Strachan, 2015). STS transitions have become an important avenue of research due to many perceived negative effects that prevalent energy systems bring. Increasing energy consumption is associated with energy poverty, reduced energy security, increased emissions, etc.

Besides the increasing use of energy in urban areas contributes towards the urban heat island (UHI) effect. As urbanisation increases, the increasing use of energy devices pumps out more heat (obtained from energy sources elsewhere) into the nearby surrounding – contributing further to UHIs and enabling a positive feedback loop (Giridharan & Emmanuel, 2018). In such cases, energy conservation plays an important role. Having people change their peak summer demand use could lower the UHI effect. It could also consequently reduce mortality rates in cities that occur due to peak summer temperature/ heatwaves – as discovered by research into heat-related mortality rates in Japan that occurred post the

2011 Fukushima nuclear disaster (Kim *et al.*, 2017; Potera, 2017). People adopted strict energy conservation behaviours (promoted through the 'CoolBiz' policy in Japan), that shall be discussed further in the Results section of this report.

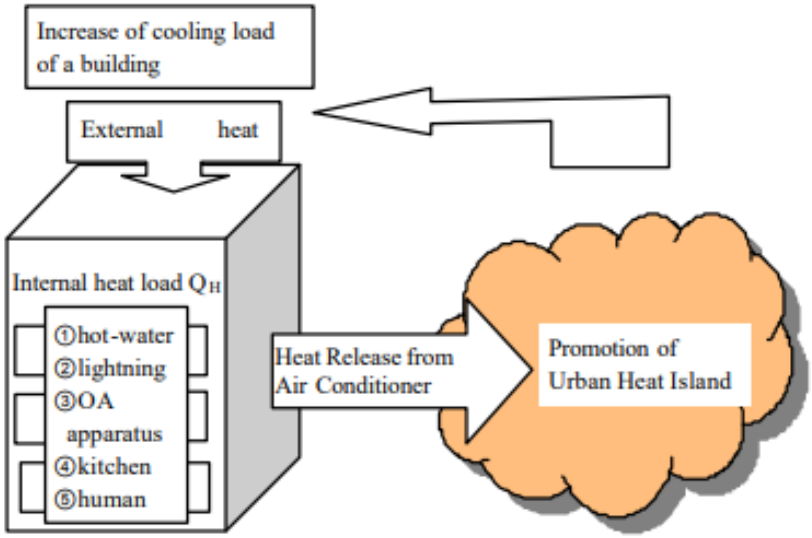

Figure 1: Systemic View of Building Energy Model (Source: Ooka, Harayama, Murakami & Kondo, 2004)

Hence human behaviours play a critical role in EC behaviour in urban areas, and STS transitions are viewed as a major interdisciplinary research challenge (Li, Trutnevyte & Strachan, 2015). As stated by Li *et al*. (2015),

- "*…transition of today's energy system to a state with dramatically lower greenhouse gas emissions is not only a technical matter. The behaviour, values and strategies of individual actors as well as policies, regulations and markets also shape energy system transitions*" (Li, Trutnevyte & Strachan, 2015),"

This is where BI takes the floor.

2.3. What is BI?

A BI report by the Joint Research Centre of the European Commission stated that

- *"Behavioural economics, BIs, and nudging are sometimes used as if they have the same meaning and reach. Although connected, they are fundamentally different. Behavioural economics is a scientific discipline that applies psychological insights into human behaviour to explain economic decision-making. BIs result from multidisciplinary research in fields such as economics,*

psychology and neuroscience, to understand how humans behave and make decisions in everyday life. The concept of nudging was originally defined by Richard Thaler and Cass Sunstein as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives." –(Lourenço, Ciriolo, Almeida & Troussard, 2016)

These distinctions are important, as many people have wrongly associated BIs with Nudges. Nudges are usually a low-cost intervention that modifies the choice architecture of situation while retaining all the other range of choice options; it may be thought of as a tool for the output process (Lourenço, Ciriolo, Almeida & Troussard, 2016). BIs, on the other hand, represents the input to the policy-making process, and can also integrate with other forms of traditional policy interventions such as regulations, information requirement, incentives, and even nudges (Lourenço, Ciriolo, Almeida & Troussard, 2016). Hence while nudges assure a change in the output architecture, BIs are an input approach that may even suggest that no intervention is probably the best solution (Lourenço, Ciriolo, Almeida & Troussard, 2016).

The OECD (2017) report states that *"Behavioural insights aim at improving the welfare of citizens and consumers through policies and regulations that are formed based on empirically-tested results, derived using sound experimental methods" (*OECD, 2017). These empirically tested results are usually observed through randomized controlled trials (RCTs) (or in some cases through other quasi-experimental studies, etc), that results in some statistically significant difference (OECD, 2019); this is generally perceived as *'evidence-based'* BI policies (OECD, 2019)

The report by the Joint Research Centre of the European Commission provides a taxonomy for BI that inform the policy process (Lourenço, Ciriolo, Almeida & Troussard, 2016; OECD, 2017). These are given in Figure 2

- ***Behaviourally tested interventions*** are "initiatives based on an ad-hoc test, or scaled out after an initial experiment";
- ***Behaviourally informed interventions*** are "initiatives designed explicitly on previously existing behavioural evidence"; and
- ***Behaviourally aligned interventions*** are "initiatives that, at least a posteriori, can be found to be aligned to behavioural evidence".

Figure 2: Taxonomy of the types of BI interventions (Source: Lourenço, Ciriolo, Almeida & Troussard, 2016; OECD, 2017)

In general, behaviourally tested initiatives are considered the gold standard for evidence-based BI policies. Policymakers generate and release reports to disseminate key findings. Apart from these initiatives, it is usually difficult to assess whether certain policies fall under behaviourally informed or behaviourally aligned, simply because distinguishing between these usually requires some formal announcement or reports (from the policymaker) claiming they have incorporated lesson from BI – which is not easily available/accessible. However, that does not mean that the policies without any report or notifications are not behaviourally tested, as it is possible that small scale behaviourally tested trials could have informed a large-scale policy. While clear communication in this regard may be lacking, my access to expert policymakers (at the IEA) suggests that many of these trials fail to become large scale policies; and that is the underlying issue that this research would like to address.

To address various biases (see 1 and 2.1), BI policies make use of policy levers (OECD, 2017). While it is interesting to know of the different biases, this research around the behavioural levers that policymakers use to address these biases, and the ***touchpoints*** through which these levers are delivered to the energy consumers. For example, to promote purchase of energy-efficient appliances, policymakers simplify and frame the information (behavioural lever) by utilising an energy label that the consumer can see on the appliance (touchpoint) before making the purchase.

2.3.1 Behavioural Levers

Most energy and environmental levers are shaped around the use of seven main types of BI levers, all taken from the OECD (2017) report and shown in Figure 3.

- ***Simplification and framing of information***: simplifying complex information can prevent information overload. Framing aims at representing information by consciously activating certain values and attitudes of individuals. The way information is framed can also affect how it is processed by its recipients. For example, energy efficiency labels can be framed to provide a sense of the relative ranking of an electric appliance with respect to the best-in-class one, and the savings that one could enjoy when switching to the latter.
- ***Changes to the physical environment***: the physical environment can substantially affect individual decision-making, especially in contexts in which choices are made spontaneously, on the basis of automated mechanisms and habits. Examples of such interventions are changes in the location and appearance (e.g. colour) of recycling bins, or the installation of automatic (sensor-based) water taps to curb water consumption.
- ***Changes to the default policy***: as individuals are prone to status-quo bias, they often postpone making decisions until or unless it becomes inevitable to do so. Defaults can, thus, have a great impact in contexts in which people are resistant to change. An example of such interventions is a change to the default setting of thermostats (i.e. to a lower baseline temperature in order to foster energy savings).
- ***Use of social norms and comparisons***: as individuals are social beings, not solely driven by their own payoffs, they are affected by the way people surrounding them behave (social norms), by how they compare to their peers (social comparison) as well as by moral injunctions. An example of this type of intervention is the comparison of a household's energy or water consumption to the consumption of a same-sized household in the same neighbourhood.
- ***Use of feedback mechanisms***: several routine behaviours, such as energy consumption or waste disposal, have considerable environmental impacts. However, these impacts are often not sufficiently salient for consumers. Providing them with timely feedback can make such contexts more transparent, increasing awareness of environmental externalities stemming from daily consumption choices. For example, real-time in-home displays connected to smart energy meters can provide real time feedback on energy consumption and costs.
- ***Reward and punishment schemes*** can be used as "carrots and sticks", associating a salient, material payoff to consumers' achievements. For example, rewarding households who have been particularly savvy with water consumption during scarcity periods may generate a positive norm for water conservation.
- ***Goal setting and commitment devices***: as individuals are bound by status-quo bias and inertia, effortful behaviour changes can be encouraged by setting specific and measurable goals and using commitment devices to regularly follow up on progress. One such example involves pinning down an objective of energy savings and following up on the objective with regular feedback and tips.

Figure 3: List of Behavioural Levers (Source: OECD, 2017)

In addition to the levers mentioned in Figure 3, it is to be noted that many policies also make use of multiple behavioural levers. An example could be an energy conservation report that simplifies information as well as makes use of social norms. The OECD (2017) report has termed these as "hybrid" interventions.

2.4. Then where are the gaps?

As stated earlier (see 2.3), the underlying issue that this research would like to address is that many small scale trials do not see their way into large scale policies; despite achieving some degree of success through the evidence-based approach (see 2.3).

Grüne-Yanoff (2016) tried to highlight this issue in a paper titled 'Why behavioural policy needs mechanistic evidence' (Grüne-Yanoff, 2016). To summarise, the author stresses that 'evidence-based' policies should be made up of two types of evidence: difference-making evidence and mechanistic evidence. Difference-making evidence is usually obtained through statistical analysis, and typically answers the question of *'how-much'* did the policy intervention change behaviour (see 1). On the contrary, mechanistic evidence answers the question of *'how'* did the policy intervention change human behaviour (see 1). The support for mechanistic evidence can be strongly given through the following statement

- *"…one of the problems with statistical trials is that they typically provide only estimates of the average treatment effect. When causal homogeneity [mechanistic evidence] with respect to the treatment cannot be assumed, such an average does not always convey useful information about individuals. In fact, in some cases individual-level causal effects might even be reversed, and this could make the planned policy ethically problematic. Is not this–the need to get past mere averages–a good reason to look for non-statistical mechanistic evidence?" (*Marchionni & Reijula, 2019)

There is a strong interconnected nature between difference-making evidence and mechanistic evidence, as one usually improves confidence levels in the other (Illari, 2011). But the argument I am trying to make, and as pointed earlier, is that of individual-level causal effects.

For instance, taking ideas of mechanistic evidence from other studies (Grüne-Yanoff, 2016); (Marchionni & Reijula, 2019), let us apply it to the tariff example given in Section 2.1. For a policy to be effective in enabling people to switch to cheaper energy tariff, we could assume that such a policy could trigger:

1. Cognitive effort avoidance, i.e. it helped reduce the effort from having to personally go and shop for cheaper energy tariffs
2. Recommendation effect, i.e. the consumer trusts the government, so much so that they would allow the government to decide on their behalf

Using ideas from the (Marchionni & Reijula, 2019), I shall further represent this in a visual form (Figure 4)

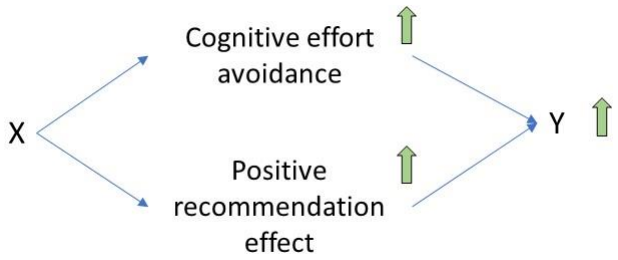

Figure 4: Assumed causal pathway mechanism function. X is the policy intervention, Y is the desired policy objective/outcome (source: Personal, adapted from (Marchionni & Reijula, 2019)

But here we have assumed that these mechanisms contribute positively to the policy intervention. What if one mechanism is negative instead? What if the individual distrusted the policy measure or the government, that the recommendation could cause a sum negative effect on the whole policy intervention by nulling the other mechanisms? (see Figure 5). Such was evident from a study in the United States, (Gromet, Kunreuther & Larrick, 2013), where it was observed that the political polarisation around environment protection caused the politically conservative types to be less in favour of energy-efficient technologies than the politically liberal, which resulted in real-world ramifications.

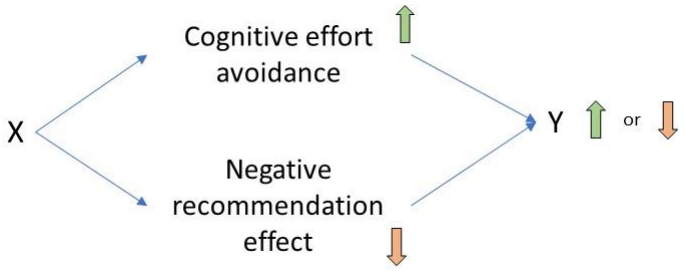

Figure 5: Assumed alternative causal pathway mechanisms function. X is the policy intervention, Y is the desired policy objective/outcome (source: Personal, adapted from (Marchionni & Reijula, 2019)

This issue can complexify in cities. The diversity of the urban population makes it difficult (logistically speaking) to understand how every individual perceives the BI intervention, how many causal

mechanisms are at play, and how would they interrelate with one another to lead to either a net-positive or net-negative statistically significant outcome. This causes BI interventions to suffer from robustness, persistence and scalability issues (Grüne-Yanoff, 2016). **In an urban population, the diversity of a population hampers the understanding of mechanistic evidence; this gives rise to the issue of 'scalability' that this research would like to address. On the other hand, and as confirmed with one of the interviewees, policymakers have a restricted timeframe in which to test BI policies – which may go up to a year but rarely beyond (see 5); this gives rise to the issue of persistence in implementing BI policies.**

2.4.1 Touchpoints and Mechanisms

The core of this research, although interpretive, leans towards pragmatism. It can be seen from the above evidence that mechanistic evidence, although necessary, can be difficult to resolve at the pragmatic level by policymakers. As explained further in this report (see 5), policymakers are subject to a shorter timeframe that causes logistical issues. It is not possible to wait for years determining what are the psychological mechanisms that play beneath the surface of every individual in a city.

On the other hand, touchpoints are the vehicles/gateways through which policymakers introduce BI levers into a consumer's life. As it shall be observed further from the results section of this report (see 4), behavioural insights for energy conservation in residential sectors (BIECR) usually happens through devices like an in-home display (IHD), paper reports, etc. **The way these are introduced into a person's life, and the mechanisms which strengthen a consumer's relationship with the touchpoint could be the key to the mechanistic evidence that facilitates persistent and scalable BIECR policies**. Ensuring a strong relationship between consumer and touchpoint may be relatively easier for policymakers – depending on how it was designed and introduced into a consumer's life, as compared to trying and testing different behavioural levers for its effectiveness (Behavioural Levers) since it takes a much longer amount of time.

Take for instance that one of the BI levers mentioned earlier (see 2.3.1) is to change the default policy. But in the case of touchpoints, a default policy which forcefully introduces an IHD (for example) into a consumer's life is analogous to intrusiveness. In a study by Evers *et al.*, (2018), it was observed that intrusiveness has a negative association for consumers (and also that consumers tend to trust experts more than policymakers in implementation)

A couple of other behavioural levers discuss the use of social norms as well as rewards schemes (see 2.3.1). Mont, Lehner & Heiskanen (2017), point out how a newsletter about waste management not only shares information; it also links the actions of the individual to the common good of society and highlights the reward to everybody from sorting out their food waste (Mont, Lehner & Heiskanen, 2017). This suggests that the touchpoint (the newsletter in this case) also illustrates the social norm while serving as a reward mechanism for individuals; where the reward could stem from either intrinsic or extrinsic motivations (OECD, 2019).

Hence touchpoints work inherently as a form of feedback mechanism (see 2.3.1). When a policymaker introduces a touchpoint into a person's life intending to change consumer behaviour, then the policymaker (taking the role of a designer) should remember that *"designers are also designing user activity, which does not occur independently of the product''* (Lockton, Harrison & Stanton, 2010). Moreover *"consumer behaviour is shaped by products as much as products are shaped by consumer behaviour."* (Lockton, Harrison & Stanton, 2010). These statements argue in favour of understanding how the touchpoint will affect human behaviour as well as how the consumer perceives and is shaped by the touchpoint itself.

Since touchpoints (and the BI lever they carry) are introduced by the policymaker, this research would strongly argue that touchpoints are much more than mere objects in a consumer's life, and some elements can be explored to further implement better policies. This research will not argue against the behavioural levers (see 2.3.1) or the characteristics of touchpoints to improve salience or constantly prompt the consumer, etc, as it agrees with the underlying principles of these methods taken from various literature sources (OECD, 2019). Instead, the focus here is to go beyond, by factoring in the mechanistic relationship between consumers and touchpoints to foster (however slightly) more robust, persistent and scalable BI interventions (see 1.2)

2.5. Chapter Conclusion

This chapter has provided a summary of the current literature in the field of BI, and has also identified the gaps when it comes to the issues that policymakers face with regard to persistence and scalability of BIECR policies in cities. To address these gaps, I will now like to guide the reader through the methodology of this research, which should help in understanding how I intend to study the relationship between touchpoints and consumers in the field of BIECR.

3. Methodology

- *"No one paradigmatic or theoretical framework is 'correct' and it is your choice to determine your own paradigmatic view and how that informs your research design to best answer the question under study*" (Kawulich, 2012)

Earlier it was discussed that the aim of this research (see 1.2) is to analyse touchpoints employed in the field of behavioural insights for energy conservation in the residential sector (BIECR), and hypothesize key factors that facilitate robust, persistent and scalable BI policy interventions. It was further argued in a later section (see 2.4) that the current BI policy interventions lack mechanistic evidence, which is why many policies are not scalable and usually are stuck in the experiment phase. Then the argument was made that the relationship a consumer has with the touchpoints that deliver the policy intervention (see 2.4.1) is probably vital, and might need more analysis as it could lead to slightly more robust, persistent and scalable policy intervention.

Connecting this overview with the research onion proposed by Saunders & Tosey (2012), I will break down the research study into its constituent elements to give the reader a better description of the process followed.

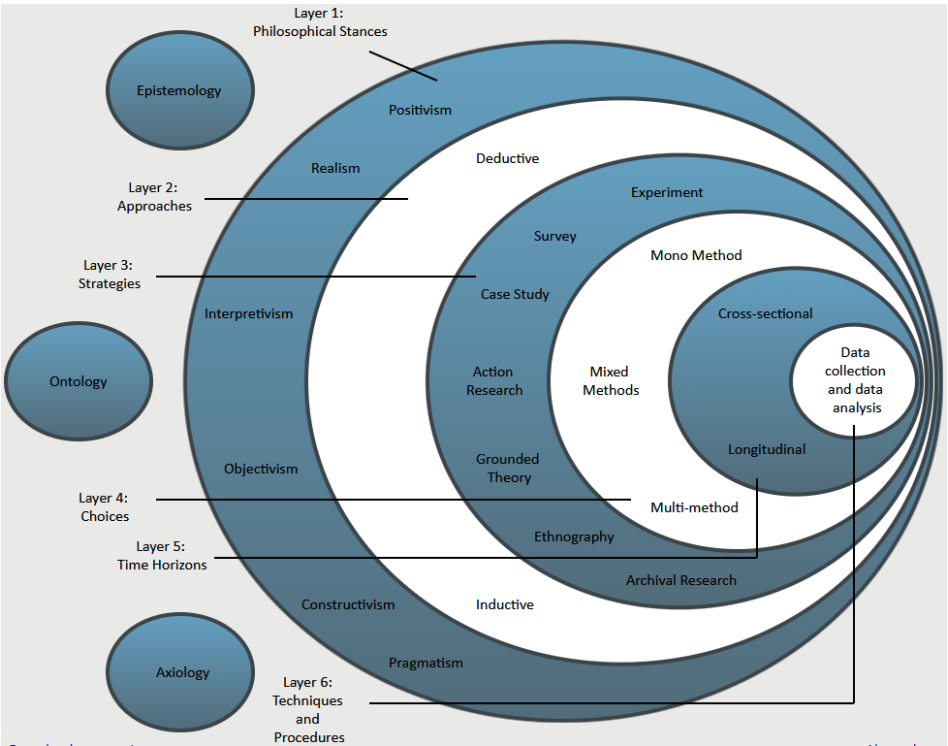

Figure 6: Research Onion (Saunders and Tosey, 2012)

3.1. Philosophical Stance

This research is interpretive but leans slightly towards pragmatism (see 2.4.1). The field of BI has substantial information and research published by several organisations like the OECD, the European Commission, World Bank Group and many others that contain a lot of BI insights. My research would like to add to this in a small way, by suggesting that touchpoints (introduced by policymakers) and the relationship they establish with consumers can be controlled to a higher degree compared to behavioural levers (see 2.3.1). The findings of my research will be based on observations that would require to be tested through RCTs to develop stronger theories – hence **interpretivism (that borders on pragmatism)** is the ideal philosophy for this study.

3.2. Approaches

The research is inductive. Based on the reasoning provided by Figure 7, this study confirms that theory will first be proposed, i.e. the relationship between consumer and touchpoint could strengthen BIECR policies. It would finally conclude with observations that confirm (or deny) this theory.

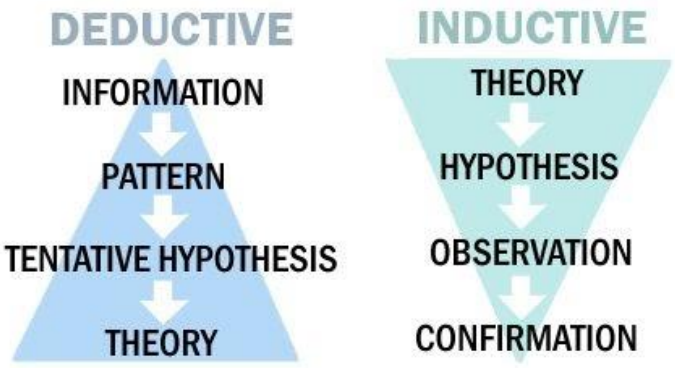

Figure 7 Deductive vs inductive research (Rylie, 2015)

3.3. Strategies

There are technically two ways of approaching this research. One is that large scale RCTs are conducted, probably in the framework of a Living Lab. As stated by Keyson *et al.*(2017), *"The living lab scenario can be viewed as a concertino of action as it unfolds, drawing on available material, cognitive, affective and social resources"*, which would the perfect scenario for studying how touchpoints and humans interact. However, such a concertino is also a longitudinal study that takes many years.

The alternative, and the chosen strategy for this research, includes **archival research** that studies secondary data published by various organisations.

- *"...archival methods are also employed by scholars engaged in non-historical investigations of documents and texts produced by and about contemporary organizations, often as tools to supplement other research strategies (field methods, survey methods, etc.) Thus, archival methods can also be applied to the analysis of digital texts including electronic databases, emails, and web pages… In sum, archival methods can be thought of as a loosely-coupled constellation of analytic endeavours that seek to gain insights through a systematic interrogation of the documents, texts, and other material artefacts that are produced by and about organizations"* (Ventresca & Mohr, 2017)

The archival study was further supported by interviews to add some credibility to the research and support my hypothesis.

3.4. Choices

It has been noted earlier that this study is interpretive with a leaning towards pragmatism. It has also been observed that pragmatic research can be supported through a multi-method study (Dudovskiy, n.a.). Hence this study makes use of a multi-method mode of research, which could include both deductive/inductive, objective/ subjective, value-free/biased and qualitative/quantitative (Dudovskiy, n.a.)

For instance, in the case of relationships with touchpoints, it may be observed (from the archival study) that many consumers state a high degree of preference with a feature. This high degree of approval was recorded in the form of percentage – which is technically a quantitative study. However, my research makes use of this approval percentage qualitatively to support my hypothesis. On the other hand, the interviews (see 3.3) cover qualitative and subjective feedback from the interviewee, which is again used to support my hypothesis. Hence I decided that a mix and match of these methods adds credibility to this research, and also slightly supports the 'pragmatic' viewpoint that this research proposes.

3.5. Time Horizons

As mentioned earlier (see 2.3), policymakers are constantly releasing reports of BI studies. Hence a study of secondary data through archival research allows for a meta-analysis of patterns of various contextual settings that have occurred over different periods (Rabinovich & Cheon, 2011).

So as highlighted earlier (see 3.3), although this study may appear to have the intention of being a longitudinal study, the actual time horizon is cross-sectional. Testing of the theories that will be proposed at the end of this study could be further tested in a longitudinal study, but currently, this

project is time-bound to a few months (since it is a Master's level thesis) and is one of the limitations of this study.

3.6. Techniques and Procedures

3.6.1 Archival Research

In the study titled 'Archival Research Methods', (Ventresca & Mohr, 2017), the author points at four characteristics of archival research design. The first two characteristics concern how the researcher approaches the archival methods. The second two pertain to how the researcher interprets the data. (Ventresca & Mohr, 2017)

1. Few vs many: In this research, I make use of the 'Few', i.e. an intensive study of archival materials from a few case studies. The reason I have chosen few materials is because of time constraints. In the scope of a master's thesis, it was not ideal to observe an extensively large number of projects. This is a limitation of this research, as an analysis of many more projects could lend a higher degree of credibility to this research. (Ventresca & Mohr, 2017)
2. Read vs Measure: The basic distinction between both is that for the former, the researcher reads through large amounts of information to gain insights, while the latter is a more conventional form of social science research that involves 'coding' the information as data. Since this research does not involve any coding exercise but relies on interpretations from different types of study, the 'Read' method was followed (Ventresca & Mohr, 2017).
3. Descending vs Ascending: This study does not follow any strict chronological or other order of reading through the data. While it can be argued that recent BI projects have most probably leveraged insights from BI projects done earlier, this research attempts to look at patterns (relationships between consumers and touchpoints) from all of them (Ventresca & Mohr, 2017)
4. Objects vs Relations: As highlighted many times now, this research is concerned with looking at 'Relations' that "…connects elements [consumers and touchpoints] of a discourse system together into some larger, more systemic whole" (Ventresca & Mohr, 2017)

The process for obtaining data for the archival study was twofold:

1. The first was by scanning through existing reports published by organisations like the OECD, The European Commission, World Bank Group, BI Teams, and many other (OECD, 2017); (OECD, 2017); (Lourenço, Ciriolo, Almeida & Troussard, 2016); (World Bank, 2015) However, awareness about every institutional body that was researching this area was limited.

2. Hence the second method was to send out a survey, shared through social media channels like LinkedIn and Twitter, asking relevant stakeholders to contribute towards the knowledge building of BI, and asking them to share the link (to the survey) with their professional network. As earlier mentioned, the logistics behind designing the survey and the approach towards it was done in collaboration with the IEA, hence the responses have been left out of the survey. However, since the survey itself was open to the public on these social media channels, the structure of the survey and additional details about the number of responses received have been included in the Appendix (see 8.1)

Both these methods helped build a compilation of studies that contained BI in energy projects conducted around the world. Since it was earlier mentioned that BI tested projects usually have reports associated with it (see 2.3), the scope was limited to such projects. However, a couple of projects that were behaviourally informed/aligned (with neither ad-hoc testing nor any formal report) have also been included in the results section (see 4), due to their strong connection to behaviour change as well as their novelty in policy design.

The archival method process to understand the role of touchpoints has been conducted by summarising each project to bring forth its context. Then a subsection is dedicated to the understanding how the touchpoints may have built strong relations with the consumer, and whether this may have had a part to play in the success or failure of the BI intervention. It should be noted that that the degree of success of a BI intervention depends on a lot of factors apart from only the relationship between consumers and touchpoints, and these factors are limitation in this study in the sense that it would require verifications through RCTs and other trials. However, that is part of the BI process (see 2.3). In this dissertation research, only relevant interpretations from the archival study and interviews have been drawn.

The criteria for selecting these case studies were not very straightforward, as no BIECR intervention is the same. Even if the policymaker tried, issues like timing of the intervention, household types, region, etc. will all play a role in the outcome of the BI intervention. However from the studies received, it was observed that only certain projects, like OPower's Home Energy Reports (see Case 1), have been deployed repeatedly, and not each of them has been behaviourally-tested either (see 2.3). Keeping this into account, the following criteria were kept in mind when selecting the case studies:

1. Availability: There could be projects that have leveraged BIECR but have not released a formal report. Also despite the global reach by the IEA, many policymakers may not have submitted

their BIECR findings. Keeping the practicality of this endeavour into account, only projects with reports that were available have been considered.

2. Touchpoint Novelty: Some policies and programmes are almost like each other (refer OPower example above), while others are constantly innovating by implementing different touchpoint techniques. To draw relevant findings, the novelty factor was kept into consideration.
3. Type of intervention: Except for one study (Case 4), only projects that were 'behaviourally-tested' have been included here due to the availability of reports for these studies (see 2.3).
4. Policymaker: Only interventions (including trials and tests) that were conducted in collaboration with/ funded by policymakers (such as ministries, utility companies, etc) are included. Except for one study (see Case 2) that has been included due to its novelty in policy design, no academic or individual studies have been considered. Reason being that interventions done by policymakers suffer from issues of persistence and lack of time, which is the pragmatic aspect that this thesis leans towards. Moreover, academic level studies do not have easy access to conducting RCT studies (compared to policymakers) and would require explicit permission from people with whom they conduct experiments. This would considerably limit the pragmatic aspect that my research would like to address (see 3.1).

These case studies have also been thematically arranged under each behavioural lever (see 2.3.1), to help the reader understand how the behavioural levers are employed. But the reader must note that many interventions use hybrid levers (see 2.3.1); hence the BI lever classification is only a representative classification.

The reason for using a variety of different case studies in the field of BIECR is to be able to develop mechanisms that are persistent and scalable (see 1.2). But for this to work, the study would need to assume that there are some commonalities/ generalisations that can be consistently applied across different situations. The only way of establishing or interpreting these generalisation calls for analysis across a heterogeneity of variances – an idea that has been supported by other studies (Botella & Ponte, 2011; Hammersley, Foster & Gomm, 2000). In this study, there are only a few cases (eleven, to be precise); but it should be noted that each of these cases only alerts the investigator to the presence of key elements 'within' these cases (Ayres, Kavanaugh & Knafl, 2003). My thesis is based on the suggestion that patterns of events observable 'across' these heterogeneous case studies is what's necessary to identify commonalities, which should also recur in other case studies and hence be persistent and scalable (Ayres, Kavanaugh & Knafl, 2003; Hammersley, Foster & Gomm, 2000). **Hence this research is based on an 'across-case' and not a 'within-case' approach.**

3.6.2 Interviews

Interviews generally fall under three categories: unstructured, structured and semi-structured (Qu & Dumay, 2011; Robert, 2016). For this research, semi-structured interviews were conducted with individuals.

The purpose of conducting the interviews is to complement the archival research study. In the words of Welch (2000)

- *"A comparison of the main differences between archives and in-depth interviews reveals that the two sources usefully complement each other in case study research"* (Welch, 2000)

Welch further stated that it is it a form of triangulation - wherein the flaws of one method are strengths of another, and combining different methods should bring out the best of each while overcoming their unique deficiencies (Welch, 2000)

The interviews were separately conducted with three leading experts of BI (see Details of Interviewees) with some assistance from the IEA. Each interviewee had links to a specific project, and the interview was conducted after first having analysed this BI project report. Hence the structured part of the interview was shaped around understanding gaps/interesting points that were observed from that BIECR project. Apart from this, a more unstructured relaxed interview atmosphere allowed for the interviewee to go deeper into their experience and learnings from the project, and to eliminate the possibilities of any personal bias creeping into the results of the interview (Robert, 2016). Any interesting points that were uncovered during the interview were discussed in more details. Key observations that are relevant to this research are covered in the discussions section (see 5)

3.7. Chapter Conclusions

From the methodology, I have identified that the study is inductive, and interpretive (but leaning towards pragmatism). The study shall adopt an archival research methodology of Case studies that follows an 'across-case' approach, and this shall be supported by semi structures interviews with BI policy experts.

4. Results

The results here, as highlighted earlier (see 3.6.1), are summaries of the BI policies types that form the basis of this archival research. This section is longer than what is desired but is justified by the archival research methodology that is employed.

I would like to remind the reader about my reason for using such a variety of different case studies within the residential sector – a justification earlier shared in Section 3.6.1. Heterogenous case studies lend stronger credibility in interpreting generalisations – which is exactly what this research is attempting to pursue in its attempt at sketching out mechanisms that are scalable and persistent (see 1.2). Studying a homogenous set of case studies may not render effective results, and the "danger of error in drawing general conclusions from a small number of cases must not be underestimated" (Hammersley, Foster & Gomm, 2000). The observations that I am hence trying to draw are based on an 'across-case' and not 'within-case' approach (Ayres, Kavanaugh & Knafl, 2003).

To save time, the reader is required to simply read through and understand these summaries to get a gist of each project. The discussions sections (see 5) will call forth observations from the necessary case studies, and help the reader connect the dots to the final observations. The observations shall be mostly be made through the sections dedicated to 'Touchpoints' within each case study. However, without the context of each project, the touchpoints lose their meaning – hence both are equally relevant to make the connection to the Discussions section.

4.1. Simplification and framing of information

Case 1 - Home Energy Reports (HERs)

In 2017, Japan's Ministry of Environment commissioned Oracle Utilities OPower to work with four major utilities across Japan to reduce household energy consumption (Oracle News Connect, 2019). Oracle collaborated with utilities to send quarterly Home Energy Reports (HERs) containing personalised energy usage information and efficiency advice to 60,000 households in each of the five utility territories – a total of 300,000 households (Oracle News Connect, 2019).

The OPower energy efficiency programs, including Home Energy Reports, are part of a larger Oracle utilities demand-side programmes that have already been deployed in many places around the world, to enable consumers to conserve energy. This is done by addressing consumers biases such as cognitive dissonance, myopia in intertemporal choices and a shift in their current social norms. The HERs adopt the use of salience and framing of information to develop targeted messages that are specific to each

customer: reports provide information on the customer's specific energy use, compare their use to that of similar homes, and provide recommendations for saving energy.

The HERs are usually two pages that consist of modules including a historic energy consumption trend-line compared with neighbours, cooling energy use comparison with neighbours, average daily peak usage for the last month, tips for the home, and few others (Oracle, 2017)

The effectiveness of this programme was previously tested through randomized controlled trials of similar OPower programmes implemented in the United States (Allcott & Rogers, 2014). Customers of a specific utility are placed into random groups, with each group receiving a differently designed HER – these groups are referred to as the 'treatment group'. A control group does not receive any intervention, i.e. they continue with the regular billing scheme. The effectiveness of HERs is studied by comparing the energy consumption between the different groups in the short term and is further tested for its persistence over long periods.

Touchpoints

Although not specific to this project in Japan, the previous detailed study of three similar OPower projects was conducted in the United States to test persistency of the effects of HERs (Allcott & Rogers, 2014). Economic theory suggests that, when presented with new information, consumers should adapt their beliefs and behaviour accordingly and permanently; in the context of HERs, they would be expected to respond by adjusting and optimizing their energy consumption (Allcott & Rogers, 2014). However, this is not the case in practice; energy consumption slides back to previous patterns when consumers stop receiving HERs. This might be because HERs are perceived as a cue, and promptly forgotten about. However, regularly receiving HERs can ultimately affect behaviour change, engraining energy-saving habits in consumer behaviour in a somewhat persistent way (Allcott & Rogers, 2014). HERs also include EC tips for each consumer.

As compared to the level of detail of the HERs, simpler energy bills – for instance highlighting just the neighbourhood average followed by an injunctive message – was tested through trials conducted by researchers from California State University in a Californian community (Schultz *et al.*, 2007). The paper suggested that a normative message (neighbourhood average) should be followed with an injunctive message – in this instance a sad or happy smiley face – so that consumers who consume more than the average try and reduce their consumption, while also ensuring that consumers who consume less than the neighbourhood average do not increase their consumption to match the neighbourhood average (i.e. the 'boomerang effect') (see 2.1).

Note

A similar project of delivering reports by mail was conducted in the Netherlands, using similar behavioural levers. However, no change in behaviour was observed in that project. That project has not been included in this research due to confidentiality reasons. But due to the lack of change in behaviour observed from the result of that study, it was decided to have a semi-structured interview with the person who was involved with the project since the start.

Dr Kirk (name changed) is a coordinator at the Behavioural Insights Team and holds a very senior position in the Behavioural Insights Network in the Netherlands. The interview intended to understand why the project he worked on did not result in any change in behaviour. Dr Kirk discussed some interesting points, and key points shall be touched upon in the discussions section.

Case 2 - Framing the health co-benefits of energy savings

In a University study[2], the benefits of framing energy savings as health benefits instead of cost savings were studied (Asensio & Delmas, 2016).

To obtain the results for this study, advanced energy metering technologies were employed with real-time energy use information provided to households at the appliance level (Asensio & Delmas, 2016). The study used engagement analytics – by providing relatively fast feedback and then observing when and how households interact with the feedback. This feedback was provided through an online dashboard that was easily accessible through a smartphone or web browser.

The study groups were divided into three categories. One group received feedback in terms of the cost benefits (translating kilowatt-hours into dollars), the second group received feedback in terms of the health benefits (translating kilowatt-hours into pounds of air pollutant emissions), and the third group was the control group (for baseline calculation) (Asensio & Delmas, 2016)

Touchpoints

It was observed that while both the households responded immediately to tailored messages (through the dashboard), the effectiveness of repeated messages on consumption behaviour varies with the frame in which these messages were shared. Health framing induced persistent energy savings behaviour of about 8-10% over 100 days. Cost-framing, although resulting in energy savings initially, sharply attenuated after 2 weeks – resulting in no significant difference versus the control group after 7

[2] Note that this is the only academic study covered here, due to its novelty in framing messages in terms of health (and not cost)

weeks. Households in the health group viewed the pages more often, clicked more often and stayed longer on the website (Asensio & Delmas, 2016)

The messages were always easily accessible through the web browser, and it was observed that the consumers who were part of either group would occasionally visit the website themselves to view the data. Apart from this, personalised weekly reminders were sent to both control groups in each household in both the treatment groups. The representative messages for either decision frame were as follows:

1. *"Health frame: Last week, you used XX% more/less electricity than you efficient neighbours. You are adding/avoiding XX pounds of air pollutants, which contribute to known health impacts such as childhood asthma and cancer.*
2. *Cost Savings frame: Last week, you used XX% more/less electricity than your efficient neighbours. In one year, this will cost you (you are saving) $XX dollars"* (Asensio & Delmas, 2016)

The weekly interaction was sent on every Tuesday morning, and this day received the greatest number of initial page entrances on the web link. The study further suggests that "Timely information about consumption and its external effects can provide great value to consumers." (Asensio & Delmas, 2016).

The study claims to have conducted a supplemental analysis to understand whether greater conservation effects could be identified for households with higher engagement metrics. But it was observed that there were no interaction or additive effect of page entrances (or other measures of engagement) on conservation and concluded that user engagement is necessary, but not a sufficient criterion for conservation behaviour (Asensio & Delmas, 2016)

4.2. - Changes to the Physical Environment

Case 3 - Energy conservation during flexible tariff supply

In 2011, a University level study was initiated with assistance from RWE Effizienz GmbH, as the energy utility, and Miele & Cie.KG, as the appliance manufacturer (Stamminger & Anstett, 2013). This study was conducted among 67 households in Germany, to test whether smart appliances can enhance energy demand flexibility by looking at their impact on consumer behaviour when facing intermittent availability of renewable energy (Stamminger & Anstett, 2013)

As the markets drive the demand for electricity from renewable energy sources like wind and solar, the lack of consistency in supply (unless supported by storage batteries or other means) causes the tariff to

switch from cheap (during high availability) to expensive (during low availability). However, due to various other commitments (e.g. being at work), there would be limits to how customers could respond to these changes in pricing. This trial hence aimed to overcome consumer inertia and the status quo bias by encouraging a shift in the usage of high energy-consuming appliances – washing, drying, ironing and dishwashing – to times when there is a larger availability of wind and solar power and thus lower energy prices.

To achieve this objective, this trial leveraged the use of 'changes in the physical environment', by providing consumers with smart appliances connected to smart meters. The appliances would be triggered to start only when the price signals are low, and consumers would need to shift their behaviours and practices to match the triggered start of the appliance.

The results of the first 12 months of this study showed that the main interest in participating in this programme stems from the possibility of reducing the individual electricity bill. However, the findings from the 8 months between November 2011 and July 2012 indicate the estimated costs of powering appliances to be €105, and average savings due to flexible response to be about €27 if a flexible tariff is used (Stamminger & Anstett, 2013). Since the possible savings do not cover power costs, participants could be further motivated pointing to the possibility of doing something good for the environment by using renewable energy when it is available and cheap.

Touchpoints

The change in behaviour seems to be associated with the timing of the appliances and availability n cheaper tariff. Some differences were observed between the operation of these different appliances, but overall, the motivation to stick to the shift in behaviour were stated as cost benefits and environmental awareness. Although studies were not conducted to frame the environmental benefits, it was observed that most of the participants declared themselves to be of 'high environmental awareness' (Stamminger & Anstett, 2013)

Since the project adopts a change in the physical environment, the main concerns are around the human behaviours that need to shift as well to support the appliances. 92% of the panellists now use the time-delay or smart-start functions of their appliances (Stamminger & Anstett, 2013). Washing-machines (100%) and tumble-dryers (90%) are the two most named appliances which the panellists quote to shift in operation time in response to the flexible tariff; Beside those, only the dishwasher (85%) is seen as an additional appliance which may be used more at low tariffs or used less at high tariffs (Stamminger & Anstett, 2013).

4.3. Changes to the default policy

Case 4 - Default set-point for air conditioners[3]

To address the rising demand for air conditioning in India (OECD/IEA, 2018), the Government of India leveraged behavioural insights in a bid to ensure that consumers stick to energy-efficient methods of consumptions. The government, in collaboration with the Bureau of Energy Efficiency (BEE), released a policy mandating all-new room air conditioners manufactured, commercially purchased or sold in India would have a default set-point temperature of 24 deg C (Government of India, Ministry of Power, 2020)

This national policy meant that new room air conditioners, when switched on, will start running at 24 deg C; it does not restrict consumers from changing the temperature to a lower set-point if desired. By resetting the default every time the appliance is switched on, the government hopes to address consumer inertia and the status quo bias – enabling the consumer to think about the cost (and possibly health) disadvantages when they choose to reduce the temperature every time. Moreover, it puts a slight additional cognitive effort on the consumer if they desire a lower temperature, and maybe this should help in limiting this behaviour.

The evidence for the default of 24 degrees C was based on research previously conducted (Government of India, Ministry of Power, 2018). BEE held a meeting with air conditioner manufacturers, and suggestions to explore the technical feasibility of setting default air conditioner temperatures at 24 degrees C were put forth (Government of India, Ministry of Power, 2018). The positive results of the technical feasibility study enabled BEE and the Government of India to move forward with this mandate.

Touchpoints

The touchpoint here is the air conditioner remote, which would switch on at 24 deg C by default. There is the inherent assumption that every person would feel comfortable at 24 degrees C. While this may be supported by research evidence, it is to be noted that the temperature sensor of an air conditioner is set within the air conditioner itself. Depending on room size, shape, etc, the temperature varies even within the room (Patel & Dhakar, 2018). Hence the location of the occupant within the room is also crucial in determining the thermal comfort felt by the occupant, and this factor can play a major role in setting the thermal comfort of the space. If the occupant determines that 24 deg C is not comfortable, then he/she could change the temperature setting every time the air conditioner is switched on, as it is not a highly demanding task to do so.

[3] This is a behaviourally aligned project (see 2.3) but has been included due to its novelty in design.

This has been partially been assisted by BEE campaigns through digital media and other platforms (beeindiadigital, 2020a; beeindiadigital, 2020b) to alert people to the cost benefits of setting the temperature at 24 degrees C. This serves as a recommendation and a constant reminder (frequency), which could encourage consumers to reflect on their air conditioner temperature settings. However, it may be a trade-off with thermal comfort and may call for further BI study.

Case 5 - 'CoolBiz': Changing set-point temperature and clothing style for summer[4]

In 2005, the Ministry of Environment in Japan released the CoolBiz policy, encouraging businesses and the public to raise their air conditioning temperature to 28 degrees C, and also promoting a summer business style (CoolBiz) to encourage the business people to wear cool, comfortable clothing that allows them to work efficiently in offices where thermostats are set at 28 degrees C (Government of Japan, Ministry of the Environment, 2005)

Initially, the policy was slow to pick on, as a study conducted among 1200 participants showed that only about 33% of the offices had raised the temperature of their air conditioning (Government of Japan, Ministry of the Environment, 2005). But the Fukushima Daiichi nuclear disaster in 2011 raised the bar even further. Severe electric shortages were observed, and the CoolBiz policy gained a lot more strength. The Japanese people took a step further by switching to electric fans, going to work in even more casual attire, shifting working hours to cooler times and dimming lights in public areas, workplaces and stores. Overall household summer electricity consumption reduced by up to 18% (Potera, 2017)

While this disaster became a crucial element in strengthening this policy, it was observed that the heat-related deaths did not increase, but rather decreased by 5-9% (Potera, 2017). This was because the use of energy for air conditioning in urban areas contributes further to urban heat island effects, and energy conservation behaviours limit the rise of UHI (and hence the mortality rates). However it was also observed that people were not extremely comfortable with the increased temperature; self-estimated productivity was lower, and occupants were more receptive towards decreased illumination than increased temperature (Tanabe, Iwahashi, Tsushima & Nishihara, 2013). In a field measurement survey questionnaire study, it was found that over 70% of the occupants were thermally dissatisfied during July and August when the CoolBiz policy was enforced (Haneda *et al.*, 2009).

[4] This is a behaviourally aligned project (see 2.3) but has been included due to its novelty in design

Touchpoints

The touchpoints in this policy were not obvious. The initiative started with the government leading by example: raising office temperature settings and having their employees wear casual summer clothing during the summer while promoting the message through adverts and other campaign type messages. Hence apart from changing the default policy, social norms were leveraged too (Hongo, 2014; Laporte, 2015). Communications campaigns helped strengthen the policy over the years, with every passing year observing a steady increase in awareness levels. However, despite the results showing positive effects such as peak demand control, summer heat mortality level reduction and reduction of GHG emissions, occupant surveys also show high dissatisfaction levels (Haneda et al., 2009; Tanabe, Iwahashi, Tsushima & Nishihara, 2013). Hence the policy, while effective, suggests a strong top-down rather than a bottom-up driven approach.

4.4. Hybrid behavioural levers

Case 6 - Reducing peak demand stress through challenges

In 2017, the Jemena Electricity Networks (in collaboration with Ministries and BI teams), an energy utility company that operates in the eastern states of Australia including Queensland and New South Wales, tested a demand response intervention informed by behavioural insights to reduce household energy consumption, especially during the periods of peak demand on hot days (Jemena, 2019).

The primary aim of this trial was to reduce stress on Jemena's electricity distribution network during times of peak demand when households use three times more electricity than usual (Jemena, 2019). The intervention addressed the prevalent social norms towards energy consumption in six selected Victorian suburbs in the Jemena Electricity Network, and their overall consciousness of the issue.

To achieve this objective, the trial leveraged the use of competitions, goal setting and incentives that enable a shift in social norms of the customers. The core of this program centres around a voluntary demand response programme that 613 households signed up for. Depending on their suburb, they were assigned to one of two treatment groups:

- Personal Rewards, where the points they earned from participation could be converted into gift cards; or
- Community Rewards, where the points they earned could be donated to local schools and community organisations (Jemena, 2019).

85% of participants reported that the intervention motivated them to reduce their electricity usage and their electricity bill, increasing their awareness about energy conservation (Jemena, 2019).

Touchpoints

Calls for Demand Response (DR) challenges were sent across the summer period with 48 hours' notice. The consumer would sign up for a DR challenge and would be allocated a target for their energy consumption for three hours - to reduce their expected consumption. If they met their target, they earned points. Also, they could participate in other challenges (such as quizzes and watching videos) that were designed to educate participants about the electricity market and how to manage their electricity usage and bill. Feedback and progress were usually monitored through smartphone apps and web portals.

Percentage use change of energy consumption over the 3 hours appears to be stronger and more consistent for the group receiving personal rewards. Moreover, the personal rewards group spent more time accessing their live feed of energy consumptions. Motivations mentioned by consumers for taking part in demand response programmes included: earning personal rewards, saving money on their electricity bill, learning how to reduce household electricity consumption, donating to a local charity (or their community) and reducing stress on the grid (Jemena, 2019).

91% per cent of Personal Rewards participants and 78% of Community Rewards participants respectively reported were very satisfied or satisfied with the trial (Jemena, 2019).

Case 7 - Eco-friendly heating modalities in France

A project similar to Case 2 was carried out by the Inter-ministerial Directorate for Public Transformation in France (DITP, 2020). This project was designed to apply lessons from behavioural science to reduce pollution linked with heating wood in residential spaces for warmth.

The objective of the project was to encourage consumers to reduce wood heating to warm their homes in winter (when this is not necessary) by making users aware of the health damage caused to them as well as those around them. The project targeted consumers who would use wood heating as a supplement (either rarely or for pleasure) despite having an eco-friendly mode of heating from electricity. Hence this project is not specific to electricity but rather energy conservation, since wood heating is not only highly polluting but is also inefficient (depending on the type of wood, type of heating furnace, etc). However, lessons from this project have been included as since it targets energy conservation using behavioural insights.

The program leveraged the use of behavioural insights by simplification and framing of information as well as the use of social norms. A randomised controlled trial (RCT) was held wherein 300 homes were equipped with a pollutant sensor (DITP, 2020). The homes were divided into three groups:

- one group was the control group – that received a sensor but no additional informational. They had access to their personalised emission profile after the intervention
- The second group perceived the micro-sensor along with weekly generic information about the health consequences of emissions due to indoor wood heating.
- The third group received the same generic information as the second group, and also received personalised information on the emission profile This was supplemented with their ranking in terms of exposure compared to the control group.

From the results of the experiment, it was observed that only the third group – that received both framings of information towards health benefits as well as the comparison with comparable households – showed a 20% reduction in the average level of exposure to PM2.5 (DITP, 2020). This suggests that health information and sensor readings are not enough, but personalised information and the use of social norms was effective at changing consumer behaviour.

Touchpoints

Group 2 (generic) and Group 3 (personalised) received weekly feedback. But whereas Group 2 received generic information, Group 3 received personalised weekly feedback which included pollution profiles taken at 5-minute intervals. The feedback was shared in the form of letters that arrived by mail.

Note

An interview was held with Lisa (name changed), Senior Advisor at the French Behavioural Insights Unit at DITP in France, and the manager of this project. Key observations from this interview shall be reflected on in the discussion section.

Case 8 - Loyalty based smart challenge program

BC Hydro, an electric utility company in the province of British Columbia in Canada, created a voluntary loyalty program that has been running for many years. The program is called ‘Team power Smart’ (TPS) and works for its consumers by inviting them to participate in an energy-saving challenge and earn rewards (BC Hydro, n.d.)

The program aims to encourage customers to reduce their energy consumption by leveraging multiple BI levers such as social norms, goals/ commitments as well as rewards and incentives. To achieve this objective, the program requests its customers to voluntarily participate in the competition. The program leverages social norms by sharing success stories from other team members to maintain motivation. Moreover, the 10% reduction and the $50 reward set a measurable goal that targets consumers status-quo bias and inertia.

The project team tried to increase participant engagement through three dimensions: enjoyment (''I like this''), affiliation (''This is who I am''), and resonance (''This is right for me'') (Kassirer, Korteland & Pedersen, 2014). Receiving cash bonus and rewards help increase the enjoyment factor of the challenges; identification with the program (affiliation) was stimulated through the use of clothes pegs, light switch cover plates, weather-stripping kits, and pin buttons; resonance was improved by signing up for the program and committing to the goal, while co-creation activities, social causes and passionate hobbies were considered key elements of improving resonance (Kassirer, Korteland & Pedersen, 2014).

It was observed that active membership has grown steadily over the years. Each year, more people take the challenge, and a growing proportion of those taking the challenge have reduced their energy by 10% or more (Kassirer, Korteland & Pedersen, 2014). Findings from the study also indicated that participants who completed the challenge but then did not sign up for another challenge marginally slip back during the intervening period (Kassirer, Korteland & Pedersen, 2014). Lack of a formalised, structured goal, cash incentives, milestone dates, or fatigue from participation was assumed to be responsible for causes of slippage.

Touchpoints

The first touchpoint is when the TPS project invites consumers to participate in the challenge. But after that, the program leveraged multiple types of touchpoints to interact with the consumers. Program communication, newsletters, direct mail, e-mail alerts and three magazines a year were given for members. Member magazines also function as a coffee table book, which can be passed around and increased visibility as well as word-of-mouth communication.

Note

An interview was conducted with Andrew (name changed), program manager at BC Hydro, who also has relevant academic and professional experience in the use of BI in energy policy. The interview was semi-structured and key points of the shall be covered in the discussions section.

Case 9 - Smart meters and flexible time-of-use (ToU) tariffs

The Commission for Regulation of utilities in Ireland funded and supported the Economic and Social Research Institute (ESRI) to conduct experiments concerning the use of smart meters to explore consumer time-of-use tariff choice by leveraging the use of behavioural insights (Belton & Lunn, 2020)

ToU tariffs charge different prices for electricity at different times of day, providing price signals to consumers to shift usage from peak to off-peak times (Belton & Lunn, 2020). The objective of this experiment was to investigate consumer attitudes, comprehension and decision-making towards smart meters and ToU tariffs. The study highlighted that loss-aversion, risk aversion and status quo biases can inhibit ToU tariff demand; however, opt-out policies to induce take-up of such tariff are underlined by potential difficulties as well as the associated ethical question, so this study hoped to achieve these objectives through "softer" approaches that leveraged the use of simplification and framing of information as well as feedback mechanisms

The achieve this objective, the experiment introduced smart meters and ToU tariffs through three key issues that the consumer could consider: whether they should get a smart meter installed, whether they should choose a ToU tariff, and finally what tools can help them choose between different ToU tariffs (Belton & Lunn, 2020).

For the take-up of smart-meters, letters from a fictitious electricity supplier were distributed that framed the benefits of smart meters in a couple of different ways: one framing included the environmental and infrastructural benefits of smart meters, while others highlighted the potential monetary benefits. For the tariff choice, participants were then asked to imagine a smart meter installed in their homes, and then choose between four different tariff choices (flat rate, 2 tariffs per day, 3 tariffs per day, 4 tariffs per day) (Belton & Lunn, 2020)

Finally, the tariff choices themselves were framed in different ways; for some the tariff choice was presented in plain text format with time and price, while others were presented in a visually colourful and comprehensible format that showed an hourly break down. This was then combined with asking participants to estimate their energy usage through the 7 days of the week and based on their perceptions of what they would consider as the cheapest ToU tariff. This stage was also aided by a reward scheme (shopping voucher worth $50) to encourage customers to choose correctly – acknowledging that this was the most cognitively demanding part of the exercise which would affect the results of the study (Belton & Lunn, 2020).

The findings indicated that there is a high degree of acceptability for smart meters with slightly more people responding positively to the environmental framing (80.6%) compared to the monetary framing (72.6%) (Belton & Lunn, 2020).

Touchpoints

Complex ToU tariffs were met with a higher degree of aversion, signalling that consumers respond more positively to familiar alternatives – a mere-exposure effect (Belton & Lunn, 2020).

Importantly, asking consumers to estimate their consumptions through personalised calculation tools and then comparing them across different tariffs had a substantially positive effect on the quality of decision-making, compared to tools that only gave costs based on the average user. While this is important in encouraging the successful adoption of ToU tariffs, its more practical applications include encouraging consumers to consume more during peak renewable energy production periods, or discouraging consumers from using too much during peak demand periods on hot days.

Case 10 - Apps to support flexible tariffs

PEAKApp and *leaf*s are two separate field trials with similar objectives (Cohen, Kollmann, Azarova & Reichl, 2019; Reichl et al., 2019). The leafs project was carried out with 2 perspectives – one was a field trial in the Upper Austrian village of Eberstalzell, while a large-scale survey in the federal states Salzburg, Styria and Upper Austria (Cohen, Kollmann, Azarova & Reichl, 2019). On the other hand, the PEAKApp project was released in Austria, Latvia, Estonia and Sweden, with field trials conducted in each of them (Reichl et al., 2019)

The overarching objective of each of these interventions was similar – to tackle the challenge of developing smart services to better utilise electricity from renewable sources. This was done by leveraging behavioural insights and ICT devices. To achieve this objective, field trials developed an application for the participants who would have access to their consumption data via smart meter technology.

PEAKApp leverages the use of simplification and framing of information, social norms, feedback mechanisms and rewards/punishment schemes (along with discounted electricity prices). The main features app included displaying dynamic pricing, electricity consumption analysis (in a graphical user-friendly and easy-to-understand way), benchmarking to compare energy consumption with similar households, a game that provided insights on the household's electricity consumption and the electricity consumption of specific household appliances (Reichl et al., 2019).

The members of the PEAKApp study were divided into three groups – one was the control group, the second was the group that received the app only, and the third group received both the app plus discounted messages in the form of push notifications (such as a banner alert on the smartphone or can be seen online when the user signs in to their online portal) (Reichl et al., 2019).

Results from the study showed that discounted electricity prices for a period elicited an increase in consumption during those periods. However, the power of the study was not high enough to suggest if this increased consumption was correlated to the shifting of loads.

The PEAKApp benchmarking function (that compares energy consumption with similar households) has some important modifications compared to the OPower reports. The team argues that households have access to their smartphones/tablets/laptops much more that IHDs or printed reports. Moreover, since Opower reports were delivered by post, there was no clarity on whether these reports were opened or read by the people – something that can be assessed through an app as the user logins can be traced (Reichl et al., 2019)

Through the Sonnenbonus field trial study, it was observed that on average the treatment increases electricity consumption during the bonus period by 5.2%, and around 83% shifted their electricity consumption to the Sonnenbonus time slots.

Touchpoints

Constant prompts and messages on the app facilitated a greater deal of interaction from the app. Moreover, these prompts were more effective in the afternoons or evenings. Gaming features were more effective for individuals than couples, and heavy app users were more effective at reducing energy consumption.

It was observed that the group that received discounted messages interacted two to three times more with the app than the group that only had the app (and no price rebates). Moreover, the study confirmed that dynamic pricing schemes had a significantly higher impact (towards optimised electricity consumption) than only information on electricity consumption (Reichl et al., 2019)

Environmental reasons for discounted prices (such as abundant solar and wind power) may be more effective at eliciting behavioural change suggesting a sense of altruism among people; while on the other hand, discounted pricing that starts in the afternoon or evening were more effective at increasing energy consumption compared to discounted rates in the mornings – reflecting the diurnal rhythm of most households. Individuals were more likely (than couples) at interacting with the ‘gaming’ feature of

the application. This can in turn increase the chance of the user becoming a heavy user of the app. Heavy users were able to decrease their overall electricity consumption by 7.1% (Reichl et al., 2019). It was also observed that the average usage rate of the app decreased throughout the experiment.

Case 11 - Alternatives to the In-Home Display (IHD)

Currently, in the UK, the government is committed to ensuring that smart meters are installed in every home (and small business) by the end of 2020 (BEIS Behavioural Insights Team, 2019). As part of this initiative, energy suppliers are also obligated to offer households a free IHD which provides near real-time display of energy consumption (BEIS Behavioural Insights Team, 2019). However recently, newer energy feedback technologies/ methods – like smartphone apps – have emerged, that may deliver similar or better (or worse) impacts compared to the IHD.

Hence in 2016, the Department for Business, Energy and Industrial Strategy (BEIS) asked suppliers to offer customers alternatives to the IHD – with research that proves that these devices also offer similar energy-saving potential. Two energy suppliers in the UK undertook the research, to test how smartphone applications (apps) compare with IHDs (BEIS Behavioural Insights Team, 2019)

To meet these objectives, the suppliers conducted trials that leveraged behavioural levers like simplification and framing of information, feedback mechanisms and social norms and comparison in smartphones apps like the IHDs to some degree, however with some notable differences. For instance, levels of engagement were observed to be different between IHD and apps – It was observed that all app participants did not use the app from the beginning of the trial but nearly all IHD participants had their device plugged in. Moreover, the average time spent on the app reduced throughout the trials, suggesting signs of habituations as people got accustomed to it (BEIS Behavioural Insights Team, 2019)

App users also are a more strongly self-selected group compared to the IHD users, since app users would have to voluntarily download and interact with the app compared to IHD users who access their device. So, survey users for app users may show more bias towards app usage and would skew the results of engagement more towards the app users. Not all apps participants used the app at the beginning of the trial, whereas nearly all IHD participants seem to have had their IHD plugged in. Also, in the second trial, it was observed that push notifications were beneficial at prompting consumers to monitor their energy consumption (BEIS Behavioural Insights Team, 2019)

The study concluded that the two technologies are not direct substitutes: each having certain advantages and disadvantages, functioning through different behavioural mechanisms. However,

despite the versatility of the app as a platform to show social comparison, tailored advice, gamification, etc., IHDs were still found to be slightly more effective at reducing customer's energy consumption compared to the application (BEIS Behavioural Insights Team, 2019)

Touchpoints

Constant push notifications on the app helped prompt consumers to monitor their energy consumption. However, if IHDs are placed at an observable location in a home, it too can receive greater attention than a phone. The study was not able to cover the levels of engagement with the IHD well since it does not have such a feature as compared to the smartphone.

It was also observed that time spent on the app reduced over time, and it was suggested that people slowly got habituated and accustomed to the information on smartphones.

Moreover, both app and IHD has a traffic light to depict current energy use feature, with some minor differences:

- The app's default screen showed a sum of gas and electricity use, displayed as pounds/pence used per hour. In contrast, IHDs showed electricity use (not electricity and gas) as the default screen. (BEIS Behavioural Insights Team, 2019)
- Customers had to have the app open to see energy use changing. In contrast, IHDs sometimes turn 'red' in response to an action, and occupants may passively notice this (BEIS Behavioural Insights Team, 2019)

4.5. Details of Interviewees

Insights into how BI has been shaping energy conservation policies have been gained by interviewing three people. As earlier highlighted in the methodology, these interviews were semi-structured (but done through official channels), and are meant to complement the archival study (see 3.6.2).

The questions mainly tried to identify any gaps in the relevant case study, and allow the interviewee to talk more about their experience with the project. The conversations were confidential – so all their responses have not been included in this thesis; moreover, each interview lasted between 30 minutes to 1 hour. However, snippets of the conversation that were relevant from each interviewee have been cherry-picked to assist the Discussions section (see 5).

Real names of the interviewees have been omitted from this study due to confidentiality reasons. However, a brief description of the professional position the person held and/or their role in the project has been mentioned.

The interviewees and their respective profiles are as given in table below:

INT 1	Dr Kirk (name changed) is a coordinator at the Behavioural Insights Team and holds a very senior position in the Behavioural Insights Network of Netherlands. He was not responsible for Case 1. Instead, he overlooked the implementation of a project in the Netherlands that was similar to Case 1 in many respects. However, that project was met with null results, which was surprising considering the success of HERs (see Case 1). This prompted an interview with him to understand the reasons why. The results for the intervention that Dr Kirk was responsible for are not public yet, and the interview was held in confidentiality.
INT 2	Dr Lisa (name changed) is a Senior Advisor at the French Behavioural Insights Unit in the Inter-ministerial Directorate for Public Transformation (DITP) in France. She is the project manager for Case 7 - which was about using eco-friendly heating methods in homes that still use wood heating.
INT 3	Dr Andrew (name changed), program manager at BC Hydro and overlooking Case 8 – BC Hydro's Team Power Smart Challenge. He comes from an academic and professional background using BI.

Table 1: Details of interviewees (Source: personal)

4.6. Chapter Conclusions

Several case studies were noted, and three expert interviews were held. The archival research study successfully represented eleven 'across-case' studies with relevant insights about the touchpoints and their interaction with consumers. The interviews helped learn more about certain projects, and relevant insights from these interviews helped draw out the commonalities (see 1.2) that help build the discussions section presented next (see 5).

5. Discussions

During the interview phase, INT 2 (project manager for Case 7) gave a general comment stating that policymakers are always in a quicker 'proof-of-concept' phase for BI policy projects. This is established by setting up a policy intervention within one year, and immediate results are desirable and appreciated. On asking why one year was chosen as the time frame, she stated that

- *"It was really arbitrary; it was a balance between the 3-months project that administration used to have [previously] and quality research. Quality research has (most of the time) 3 years, and clearly, this is not possible in administration; so we have to compress as much as possible…let's say that it was really a point of discussion – of course for administration it's too long, of course for a researcher it's too short. One year was really…the best compromise"* - INT 2

She went on to further state that it is very important to validate results (irrespective of short or long-term study), to study how it can be replicated. This study agrees with this view, as it is in line with being a 'behaviourally tested' (see 2.3) project that can hopefully generate the most successful BI intervention. While this research is interpretive, understanding this perspective is important in line with its leaning towards pragmatism (see 2.4.1, 3.1)

Hence from the various case studies gathered as well as the interviews, certain generalisations were observed from the way the touchpoints seem to have garnered more interest or success (see 3.6.1). As earlier highlighted, these generalised observations intend to support a more persistent and scalable BI intervention. They do not in any way suggest that BI policies should not be tested, but rather that they would facilitate ways through which BI policies could be tested faster and scaled up in energy conservation policies in residential households.

Three observations shall be discussed below:

- Touchpoint Perception
- Sense of Ownership
- Cue-Action-Reward

5.1. Touchpoint perception

In the literature review, it was mentioned that consumer behaviour and touchpoints are shaped by each other (see 2.4.1). This suggests that there is more to the relationship a consumer has with a touchpoint than its physical features.

In an educational video titled 'how the Internet Redesigns your mind' (Everett, 2017) the narrator elaborates on a research study called the 'Rapid Assimilation of External Objects Into the Body Schema' (Carlson, Alvarez, Wu & Verstraten, 2010), both of which discuss how objects/ tools integrate into our 'extended' sense of the body. This means that tool and body now function as one unit rather than separate entities, and our perception of this tool's function changes we operate with it in the world.

For instance, I use spectacles to see clearly and a wallet to store money and credit cards – which may resonate with other people similarly. But the way I use a smartphone varies significantly from other people. For instance, I may choose to browse twitter feed on my phone, another person chooses to play games, and yet another person rarely interacts with their smartphone except for phone calls or text messages. Also, constant access to a smartphone could generate a need for instant gratification (Wilmer, Sherman & Chein, 2017). Since tools here take the physical place of touchpoints in BI interventions, the difference in the way the consumer perceives the tool should be crucial in the long-term persistence of energy conservation behaviour.

Such observations can be made from the case studies presented. Take for instance Case 11, that compares IHDs vs smartphone apps in communicating energy consumption data. Despite the additional features that a smartphone can provide over IHDs – such as viewing energy use while away from home (BEIS Behavioural Insights Team, 2019) – consumers with the apps saved slightly less than consumers with IHDs.

This was complemented with other observations from both Case 10 and Case 11 (which were app-based forms of energy feedback), where a couple of commonalities occurred. First, app-based users require constant prompts (in the form of push notifications) to keep engagement levels high. Second, the engagement levels slowly started declining after a period. While it has been claimed that there were 'signs of habituation' that led to the decline (BEIS Behavioural Insights Team, 2019), an alternative theory can be proposed: since people already have an existing relationship with smartphones – possibly one of instant gratification or any other (Wilmer, Sherman & Chein, 2017), – push notifications, gamification or other features were constantly needed to match this existing relationship in an attempt to build one around energy conservation (EC). But it seems that push notifications are not able to maintain the strength of its engagement for too long, possibly because consumers become 'habituated' to the lack of instant gratification (which was the original relationship with the smartphone) rather than the prompts, leading to a loss in engagement.

Case 8 serves as a great antithesis to this argument, as TPS consumers maintained high levels of engagement due to the constant novelty of the tasks BC Hydro gave them. INT 3 stated that

- *"…we've been experimenting with some different challenge delivery mechanisms, where we start to apply more gamification and short-term challenges…we're constantly looking to how we can evolve the program and how we can apply behavioural insights. So, we've been working with the local app where we did little games and quizzes, and we would reward people for participating in these little games and quizzes on their phone – just to break up that long twelve-month period into smaller segments. We're running an experiment right now with the third-party vendor, where twice a month we will send people a specific assignment – like something tailored to their individual situation. So, for instance, your situation could be "please hang out your laundry" – that's your assignment for this time and for this week. Hang out the laundry on the line outside, and if you prove to us that you've done so as result of this communication by taking a quick picture with your phone and uploading it to a micro-site, we'll give you points"* – INT 3

It appears that from the TPS project, the constant novelty of engagement matches the original perception of the touchpoint, i.e. using the smartphone for instant gratification. If the rate of deployed activities were much lower or not as enjoyable as the other features a smartphone has, then it can be argued that the consumer would shift attention soon.

There is a sense of loss-aversion (see 2.1.1) that may be at play. If the touchpoint (smartphone) has a perceived functionality of instant gratification to begin with, then the cost associated with giving up this higher level of instant gratification to view EC notifications would be perceived as much greater than if the smartphone was used for its most basic functionality of text messages/ calls. This does not mean that prompting would work better on consumers who use the basic functions; on the contrary, it can be argued that if the prompts are not rewarding enough, it may be regarded as a nuisance or completely ignored altogether.

Providing a high level of engagement through a variety of touchpoints may not be necessarily feasible. The inherent properties of smartphones to serve different needs for different people makes things more complex. But letters, for instance, are regarded for its limited functionality. Since school days, people have read and written on paper. Although schooling may be shifting towards digital platforms today, we can generally assume that paper reports allow for long term reading and reflection, and this idea also resonates with representativeness heuristics (see 2.1.1). In my own home and many others, I have people stick paper reports to the fridge or other prominent locations. A similar argument was also put

forward by INT 2, as it was observed that for Case 7, the sensors that were installed could be connected to the internet (using 2G). It would have hence been convenient to communicate information faster and more frequently through smartphone apps rather than paper letters. But INT 2 chose letters as the preferred means of communication because:

- *"We were thinking that, if you are busy and so on, sometimes with digital information you don't look at it really long. If we print something and you have it in your living room or put it on the fridge, you can read it carefully. Ideally, if there are more people involved, then it would be interesting to test before sending the information. Initially we designed a very huge type of multi-arm experiment, but it was very difficult to recruit [people], so we reduced and prioritised with physical letters – in terms of increasing the probability to read, check, and to make it so easy. It's a hypothesis, and it would have been great to have a control [RCT]"* – INT 2

This logic is justifiable; in the book "Thinking, Fast and Slow", Daniel Kahneman discusses how the brain functions in two systems (BetterCognitions, n.d.; Kahneman, 2011). System 1 is fast, requires minimal effort and happens unconsciously; System 2 is slower, requires effort, and is a conscious and deliberate decision. Touchpoints seem to inculcate a sense of Fast or Slow thinking. In the case of smartphone prompts, System 1 is enough to process immediate feedback. But in the case of paper reports (like HERs), System 2 is more used to process and reflect on energy consumption. If the touchpoint (e.g. smartphone) usually prompts System 1 thinking among consumers, then trying to use the touchpoint to prompt System 2 thinking may not fit well - or vice versa.

While some case studies have argued that people may not open paper reports or glance at their IHDs (see Case 10), it can be similarly argued that the manner in which interventions are communicated should reflect the consumer's original perception of the touchpoint (smartphone, IHD, etc) – not the other way around. This hypothesis is in line with representativeness heuristics (see 2.1.1), as people compare new information or situations to other similar information or situations. Understanding the relationship between consumers and touchpoints may be a crucial first step, before utilising these touchpoints to encourage behavioural changes. Trying to create the perception of EC from a smartphone that is perceived as a device for instant gratification (or messaging, etc) may require both a higher degree of frequency as well as novelty to keep up to the status-quo (see 2.1.1).

In case of trying to target consumers, who use the phone for its basic function, another issue is that of similarity. Smartphones are a relatively newer invention and constantly require active human interaction. It can be safely assumed that they cater to a younger, more educated and economically

stable group of consumers (Ma, Chan & Chen, 2016). Other people may not be able to use a smartphone in the same manner. As one study pointed out, "*When the task is open-ended and the tool is unfamiliar, task experience actually works against the user, resulting in lower task performance"* (Tomasi, Schuff & Turetken, 2018).

On the contrary, IHDs are passive feedback devices, and consumers are more acquainted with letters (like HERs). So, while the statistical evidence of a BIECR policy is unpredictable unless RCTs are run, the suggestion is that touchpoint that could have the most preferable relationship with a consumer is that which should be selected. Since there are not a lot of touchpoints that we have observed – smartphone apps, IHDs, paper reports to name some - identifying which touchpoint is preferable among a combination of three or four touchpoints should be convenient. This identification lends more power to the invariance that comes up in studies that explore mechanistic evidence (Marchionni & Reijula, 2019). For instance, smartphone apps which constantly engage and come up with novel challenges etc. may be more suited to a young crowd, while reports and IHDs may work better for an older crowd.

After identifying which type of touchpoint works best for which type of consumer, RCTs can further explore the different framings which would get the best out of each touchpoint. Hence, the touchpoint issues address the first (and an arguably important) part of the mechanistic evidence part of the equation, before moving ahead to difference-making evidence.

5.2. Sense of Ownership

Another interesting observation is how touchpoints inculcate a sense of ownership in the individual, which could potentially lead to better and persistent results. This can be done by having the consumer sign up for the touchpoint rather than 'defaulting' (see 2.3.1) the touchpoint for the consumer, By saying that the consumer owns the touchpoint (such as a smartphone app or IHD), we can also stretch the idea to the point that the consumer owns his/her relationship with the touchpoint – i.e. energy conservation.

Before further discussions, it must be noted that ownership is not to be confused with responsibility (Rae, 2018). This section assumes that responsibility towards energy conservation behaviour is a necessity, but it also argues that it is far more difficult to inculcate a sense of responsibility for EC than it is to inculcate a sense of ownership for a touchpoint. Inculcating a sense of responsibility towards EC does not happen quickly, and various factors such as social norms, environmental awareness, education levels, political affiliation, and many others may affect this. However, inculcating a sense of ownership

for a touchpoint (and hopefully the message the touchpoint conveys) should be manageable. Touchpoints enter a consumers life before the message on the touchpoint, hence a sense of ownership to the touchpoint should happen first too before framed messages. Hence this is to suggest that 'ownership' of the touchpoint can further facilitate the information that is framed through it, i.e. energy conservation.

Framing of messages does not necessarily work the same way for different people. For instance, using personalised/targeted messages is seen as a strong and preferred mode of framing, and has been observed across several successful interventions such as the OPower HERs (see Case 1). Even in Case 7, it was observed that personalised health messages were the only ones that elicited a positive response from the consumers. While it can be said that these messages built a sense of responsibility, it is unclear the consumer felt like the owner of any touchpoint.

Certain case study designs explicitly imbibed a sense of ownership. In Case 3, for instance, consumers had to sign up for the energy challenges themselves – thus claiming ownership of the challenge and energy conservation behaviour. In the end, high satisfaction levels of 91% and 78% (personal reward participants and community reward participants respectively) were expressed by the consumers. Similarly, Case 3 was an experimental study where sixty-seven households voluntarily decided to take part in the experiment and installed smart appliances in their homes. Conclusions showed that 92% of them continued to use the time-delay or smart-start function of their appliances after the experiment was over (see Case 3).

Arguably, the framing of these messages (cost versus environmental) does not justify causal motivation for doing these tasks despite the claims made by the consumers; the cost savings were simply too low, and the participants were environmentally conscious to begin with (see Case 3). Unless the costs become low to maintain high levels of engagement, this leaves only environmental consciousness as a prime motivator in the long run (Stamminger & Anstett, 2013). But in an urban population, it may not be easy to identify everyone's levels of environmental (or cost or health) consciousness. For instance, in a study done among Chinese citizens for energy conservation, it was noted that *"…pro-environmental awareness seems to have limited effect to predict Chinese residents' electricity-saving behaviour. Compared with Western residents, Chinese residents put more attention to the economic benefits or convenience."* (Rae, 2018). In another study, it was found that political liberals were two to four times more likely than political conservatives to respond positively to home energy reports; political

conservatives were more likely (than liberals) to dislike and opt-out from receiving HERs (Costa & Kahn, 2013).

The region, political stance, education, population pressure, cognitive abilities, GDP per capita and many other indicators could lead to varying degrees of environmental consciousness among different people (Duroy, 2005; Salahodjaev, 2018; Stern, 2004). But urban populations lack homogeneity. Hence targeted messages become a complex task, as different consumers have varying degrees of response to differently framed messages. In such a situation, asking the consumer to choose the touchpoint they prefer would inculcate a sense of ownership to the touchpoint, and also appear to be more convenient than asking the consumer which type of framing suits them best. Choosing the best framing type comes next, and should be evaluated through RCTs, etc. as it remains a vital component of the BI process. However, the amount of effort and detail put into giving a sense of touchpoint ownership to the consumer is relatively faster as compared to evaluating which type of framing message works best – which would be ideal for administrative bodies (like governments, policymakers, etc) that lack time (see 5)

Health framed messages too, while politically neutral in some sense, is also complex to frame. People are more sensitive to health issues (INT 2). But despite the clear health detriment of wood heating in Case 7, INT 2 stated that:

- *"most of the people have a positive view of wood heating…very very positive [in the context of the ambience and energy a fireplace creates in a home]. So, all our flyers were focused on 'adjusting' this view. I will not say 'destroy', because destroy would be negative and not true. So just adjust the effect of this heating on health"* – INT 2

While the effect of pollution produced by a fireplace at home is direct and can be measured, connecting the energy we receive at home to the unhealthy emissions of an energy power plant, for instance, are an indirect process. It would be ethically incorrect to assign random emission numbers to indoor air pollution levels in a consumer's home by relating it to the energy coming from the grid.

Another case for ownership of a touchpoint can be inferred from Case 8, where people voluntarily sign up for the Team Power Smart membership as well as its challenges. INT 3 stated that:

- *"…when people join team power smart, because people have that built in urge to want to comply to group norms (even if they are unwritten), people already start to act a little bit more like how they think or how they believe a Team Power Smart member probably should act. And they*

already start to do a bunch of stuff. We try to make that a little more active by getting people to sign up for energy challenges…the idea is that if you sign up for a challenge, which is only available to Team Power Smart members, then you commit or make a pledge, to make efforts to reduce your consumption over the next twelve months " – INT 3

From Case 9, too, it was observed that asking consumers to estimate their consumption through personalised calculation tools and then comparing them across different tariffs had a substantially positive effect on the quality of decision-making (see Case 9). Meanwhile, from Case 11 it was observed that since app users had to voluntarily sign up for the app, they were a strongly self-selected group compared to IHD users. This was despite IHD users displaying better energy conservation behaviour in the results – however, the arguments for this have been presented in the previous sub-section (see 5.1).

All these observations suggest that, despite the use of 'defaults' as a reliable behavioural lever, a sense of consumer ownership of the touchpoint can have positively higher effect in EC behaviour. It can also be argued that the consumer could feel like the owner of the message a touchpoint displays – a strong sense of nationalism as displayed in the default CoolBiz policy in Japan (see Case 5), or the health/ environmental/cost framed messages (see Case 2 and Case 3) appeals to people who like to take ownership of the situation rather than merely feeling responsible. But the argument brings us back to the issue of beliefs and the cognitive dissonance bias (see 2.1.1). Having a person believe in the touchpoint through a sense of ownership may be a preferred alternative to identifying which 'message' aligns best with every individual – especially in a heterogeneous city.

Hence it should be ensured that the consumer is persuaded (and not coerced) into owning the touchpoint, else it may weaken the BIECR intervention. More importantly, the touchpoint should be explicitly be introduced as a device that encourages energy conservation, and not merely a display of energy information. The idea is that voluntarily signing up for the touchpoint (ownership) should help establish a concrete relationship between consumer and EC through the touchpoint. Reflecting on the comment from INT 3 given above, the consumer may then start "to act like act a little bit more like how they think or how they believe" (INT 3) the owner of an EC touchpoint should act.

5.3. Cue-Action-Reward

Dopamine is the chemical messenger occasionally released by the brain, contributing towards a feeling of satisfaction and pleasure (on completing tasks) as part of the brain's reward system, and a key hormone in regulating movement, learning, and emotional responses (Psychology Today, n.d.). The cue-

action-reward system hypothesis presented here is based off neurological and psychological studies done on rats and demonstrates how touchpoints appear to be key agents in triggering rewards (and hence probably a dopamine release) (Syed *et al.*, 2016), that could be pivotal in leading to robust and persistent behaviour changes. The studies also claim that mere prediction of a reward is not sufficient for dopamine release, but is also contingent upon the correct action-initiation (Syed *et al.*, 2016). Also, a lecture video by Dr. Robert Sapolsky, an eminent neuroscientist and professor at Stanford University, explains how dopamine surges are higher (in rats) if the reward is received only 50% of the time instead of 100% (Sapolsky, 2011). This may suggest that the 'urge' to do a task is much higher when the rewards are inconsistent rather than consistent.

This hypothesis also further build on one of the studies presented earlier (Tomasi, Schuff & Turetken, 2018), where results showed that both closed task structures and a familiar interface have a positive effect on performance, while an open task structure and unfamiliar interface have a negative effect. The interface problem was addressed in the previous section (see 5.1); this section is geared more towards task structures and rewards.

These techniques could play a role in ensuring that the BI policy is robust through touchpoints – where robustness is closely linked with factors that lead to a reward and should encourage EC behaviour if done correctly. These are:

- Should act as a cue
- Preferably trigger a reward – inconsistently and subjective to the consumer.
- Preferably be a closed task structure that can facilitate correct action-initiation.

Case 1 appears to meet all these conditions, as the OPower HERs act as a 'cue', triggers a reward through social injunctive norms (emojis), and also contain specific tips and actions that suggest closed task structures (Allcott & Rogers, 2014; see Case 1). Moreover, the rewards are not necessarily consistent; consumer energy patterns change every month and the owner may not be below average all the time. This could trigger the aspect of Dr Sapolsky's theory – that inconsistent reward may trigger a greater urge to do the right actions that lead to the reward. While it is unclear if they trigger dopamine release (since this study has not been carried out on people and it may be unethical to do so), OPower HERs appears to be a successful BI intervention.

One question that may be worth asking is whether every individual has received a reward at some point? It is unclear from the HERs, but it would be preferable that each consumer receives a reward to

close the cue-action-reward loop. This could be explored by changing the scope of comparisons (on the HERs) occasionally to that of a fewer number/ closer group of households, that could demonstrate better consumer ranking or a below-average consumption among this different social comparison group. From a consumer's perspective, maybe he/she did try to change certain EC behaviours. However, the change could have been insubstantial to warrant a 'lower than average' reward message from the existing social comparisons. But then I would argue that if the small actions are never recognised or complimented, then the incentive to do more would also fade within a short period.

The idea of framing the reward message by modifying social groups etc. must proceed with caution, however. The intervention by INT 1 did not meet with success - despite its claims to have all the elements of an OPower HER. On further discussion with INT 1, certain noticeable differences were observed. For instance, in the Netherlands, neighbours have different energy suppliers. Hence the social comparison that was used (with injunctive messages) had to be compared to consumers on a national level; the OPower reports, however, compared consumer energy consumption with neighbours. The effects of a social reward appear to have more effect when compared with peers and neighbours (Smith & Morris, 2014; Wilhelm *et al.*, 2012). This may be understandable since the feeling of a community (and thus social norms) would be strongest in the immediate and local vicinity. Social comparisons at a national level may not be as effective, since each region varies significantly – including housing type – and strong feelings of a community may be lost at this level. In defence of this analysis, INT 1 stated,

- *"These regions are quite comparable when it comes to housing type. [So] probably when you reduce those regions for comparison on the basis of public data source, you might be able to get some better comparison"* - INT 1

He suggested that the Netherlands could try using public data records to split up each region based on the postal code, which may deliver some promising results. However, INT 1 stated that this would be a part of future works. Hence, we may conclude that the cue-action-reward circuit was not completed here, since the social comparison (reward) used was not localised enough. This strongly suggests that the presence of the reward matters, and so does the scope of comparison.

One could argue that injunctive social norm messages may not be the only trigger of a reward mechanism, as HERs also compares a consumer's energy use to their past years' energy use. However, I would disagree with the effects of such a reward playing any significant role; comparing energy consumption to that of last year's may not feel as rewarding unless the cost savings are justified, or if

the environmental motivation is high enough. But environmental consciousness related issues have already been argued for in the previous section (see 5.2)

Case 8, too, appears to support this hypothesis. The Team Power Smart (TPS) project by BC Hydro is experimenting with different types of challenges, and INT 3 claims that:

- *"if we communicate with people often, and we keep it to a single, very specific behaviour – a behavioural action that is immediately executable and tailored to an individual situation, and we reward people for it (it doesn't even have to be much), it looks like we are gaining some promising results there"* – INT 3

INT 3 gave some ideas about what these single, specific behavioural challenges are – like hanging the clothes outside for drying when the weather is good, clicking a picture, and then uploading it to a micro-site. But he also agrees that asking for proof of such actions (by uploading a picture) may not be possible for all types of challenges (e.g. switching off the lights).

A key driver of such positive action depends on the levels of engagement at the touchpoint itself, which may be fuelled by the reward system. However, the cue can vary from a simple glance at a device (IHDs) to opening the device and scrolling (smartphone). Case 10 argues that smartphones are convenient from an evaluation point of view, as user logins can be traced. But they also agreed that there was no clarity on whether reports were opened or read by the people, or if people had a high degree of access to IHDs. I feel that this a very weak argument against touchpoints like reports and IHDs, as 'no clarity' does not mean that it does not happen. Case 11 was a case in point, where a study between IHDs and smartphones led to IHDs being the winner.

I have a personal experience to counterargue against the claims made in Case 10. For instance, in 2019 I was staying in Glasgow, UK, at my friend's house which had an IHD device. It was placed in a prominent location, such that every-time I passed by the IHD, I always took a glance at it. I noticed that the meter displayed a much higher number (electricity cost for the day in £) on some days than others. On further discussion with my friend, I understood that her roommate (2 people were sharing the house) had a personal electric heater in her room, and one she used often when studying (it was the winter season). It became obvious when this heater was being used through mere observation of the readings on the IHD.

Identification of energy consumption with behaviour can strongly support the cue-action-reward hypothesis. For Case 11, the BIT team noted that the 'traffic light' system of the IHD was more passively

noticeable since it was always on, as compared to the smartphone app. It can be argued that if an IHD is placed in a prominent location, people can slowly start to associate their actions with energy consumption. Within a time frame of one day, it may be possible to associate laundry with higher energy consumption; shorter timeframes, depending on how often the person glances at the IHD, can even help consumers associate smaller high energy consumption behaviours (through the traffic light system) with energy-guzzling appliances such a toaster, kettles or hairdryer. This unconscious micro-assessment of energy consumption done by the consumer holds great potential in triggering a reward system.

For instance, let's assume that a consumer wishes to boil a kettle of water for some tea. When the consumer walks by the IHD on the way to the kitchen, a simple glance at the IHD can be a cue/ reminder that the kettle is a high energy-consuming device, facilitated by the red traffic signal light displayed on the IHD. This could prompt the consumer to boil enough water (1 or 2 cups as desired) instead of a whole kettle which will reduce the time taken to boil the kettle. After the water is boiled, a glance at the IHD (which should reflect a green traffic light signal now) – should serve as a reward system for intrinsically having made the correct small decision (closed task). It may be argued that such a scenario is too constructed and may not reflect reality, or that consumers may not be able to calculate the numbers on the IHD to truly know if they have consumed less; but I would argue if the sense of ownership between consumer, touchpoint and EC was set up well (see 5.2), then the cognitive dissonance bias (see 2.1.1)should strongly help in aligning correct behaviours with beliefs.

The reward mechanism can also be seen at work in Case 5. When the Japanese started with the Cool Biz policy, it was a change in both home and office behaviour. Hence as people slowly started becoming accustomed to the idea, the reward system also started kicking in. The cue of wearing casual clothing at home would start being associated with the reward of positive appreciated from society when the person sets out from home. It can be argued that the reward mechanism that the Japanese government intensely promoted – through their actions and widespread positive campaigns may have been critical in closing the cue-action-reward loop of this intervention. In this case, the reward mechanism was based on external factors that were carefully promoted by the Japanese government.

For Case 4, the Bureau of Energy Efficiency (BEE) in India has been attempting to do something similar (although arguably the policy is new, and it may take a few years to know the impact of this intervention). The changing of temperature defaults of air conditioners is the cue, but it is also followed with positive messages and posters that encourage sticking to the 24 deg C default. For instance, on the

official BEE page on Instagram, there is an image of a popular Bollywood icon with the caption “If we save energy, then India will be illuminated” (roughly translated from Hindi), followed by other images that promote the use of 24 deg C for air conditioners (beeindiadigital, 2020a; beeindiadigital, 2020b). Such messages could enable a reward mechanism through the recommendation effect and nationalist angle, and thus close the cue-action-reward cycle. Since this was a behaviourally aligned policy (see 2.3), the policy could be enhanced if BI was implemented well.

It must be reiterated at this point, that the reward is what makes the cue. In the words of Dr Robert Sapolsky, dopamine is not about pleasure, but rather the ‘anticipation’ of pleasure (Sapolsky, 2011). Meaning that if the reward never existed, then the brain would not be able to associate what the correct cue is. Having the touchpoint generate the timing of the correct cue, as well as the reward through the effective design of the touchpoint, is a preferable and controllable scenario compared to letting the consumers figure these out by themselves. This should help build more persistent and scalable behavioural changes.

In the cases presented earlier, what if some tweaks were implemented to leverage this learning? I would argue that RCTs that set up control groups to test these findings should benefit greatly. Take Case 8 for instance; if RCTs were done to compare one group that received a reward all the time versus another group that received infrequent rewards for positive behaviour, then could this increase the effectiveness and persistence of EC behaviour? Or if we were to consider Case 11; if a tangible point-based reward was ‘randomly’ assigned to people who reduced the amount of time that high energy (red traffic light) consuming devices were used, would this improve the persistence of EC behaviours? From the evidence, it can be concluded that exploring this hypothesis may be a potential avenue of research.

5.4. Chapter Conclusions

This research aimed to analyse touchpoints in the field of BIECR and sketch out mechanisms (for policymakers) that facilitate robust, persistent and scalable BI policy interventions. The archival research and interviews have led me to conclude that this research was a success; touchpoints appear to offer possible mechanistic pathways towards robust, persistent and scalable BIECR policies (see 2.4.1).

Three mechanistic pieces of evidence were observed in the discussions section (see 5), that could facilitate robust, persistent and scalable policies by the policymaker. These are:

1. People usually have an existing perception/ preconception about the tools in their life. Leveraging the use of representativeness bias (see 2.1.1), it would be preferably to match the function of the BIECR touchpoint to that of this existing perception (if any)
2. People give a higher preference to the things they own. Introducing the touchpoint in a manner that inculcates a sense of ownership among consumers may be preferable.
3. Touchpoints act both as cue and reward, and it would be preferable to close the cue-action-reward loop through the touchpoint itself.

Keeping in line with the spirit of what 'mechanisms' truly are – i.e. an arrangement or sequence of steps in achieving a particular end (thefreedictionary, n.d.) – a logic diagram has been constructed (see Figure 8) to offer a how-to guidance for policymakers in capturing each of the mechanisms (see 5) within a BI intervention.

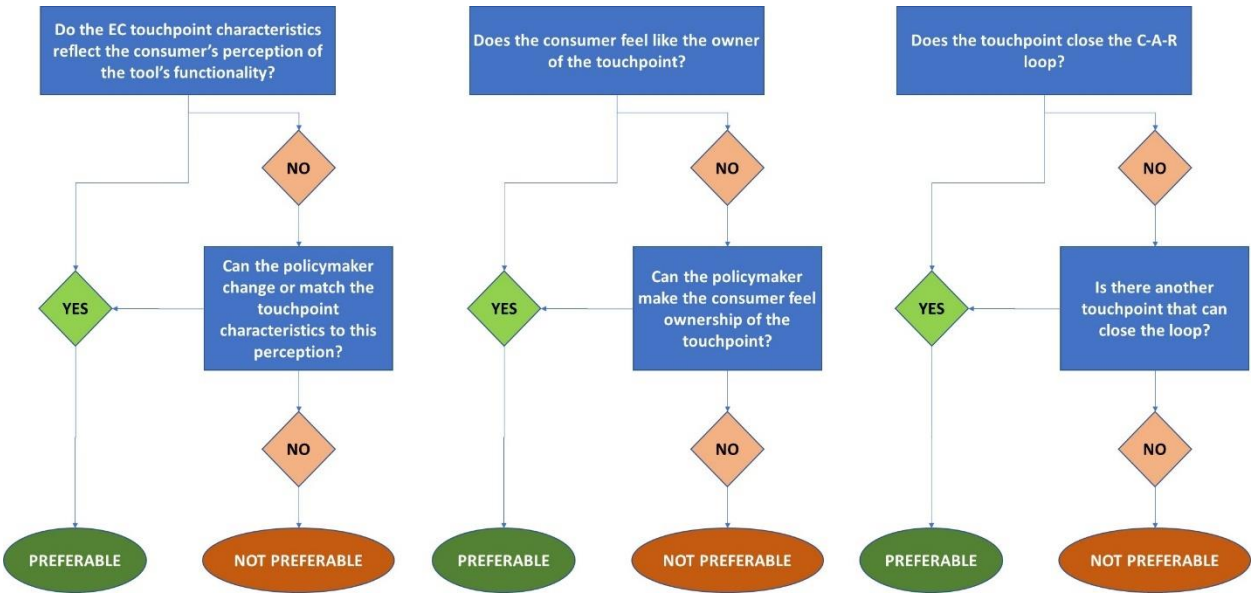

Figure 8: Three logic diagrams that combine the mechanistic evidence; C-A-R stands for Cue-Action-Reward (Source: personal)

While the logic diagram frames only single questions for each mechanism, it could be argued that it does not represent the entirety of BIECR policies that could be implemented. Hence I have tried to support each of these logic diagrams with additional questions that align with the discussions presented in Section 5.1, 5.2, 5.3. These questions have been presented in Table 2, and can be asked by policymakers that are conducting an intervention. The questions are representative, and the policymaker is free to frame the questions depending on the context of the BIECR policy to be implemented. But the answers to these questions could guide the policymaker to implementing more robust, persistent and scalable interventions.

Touchpoint Perception	Sense of Ownership	Cue-Action-Reward
1. Do we know what sort of existing perceptions the consumer has about a potential touchpoint? 2. How well acquainted is the consumer with the potential touchpoint? 3. Is the tool leveraging these 'existing' perceptions of the touchpoint, or trying to create new ones? 4. Is the consumer well acquainted with the touchpoint interface?	1. Can the consumer voluntarily sign up for the touchpoint (or the message that he/she desires on the touchpoint) in some way? 2. Is the consumer fully aware that this touchpoint/ message is intended for energy conservation purposes?	1. Does the touchpoint trigger a reward mechanism for each individual? 2. Is the reward consistent or inconsistent? 3. Is the reward intrinsically or extrinsically motivated? 4. Is the action be initiated correctly? 5. Is the action tailored to the individual? 6. Is the action a closed or open task structure? 7. If the reward is a social comparison, is it local enough?

Table 2: Possible questions to facilitate a policy intervention that employs the mechanisms suggested here (Source: personal)

As it can be observed from Figure 8, the best option should be one in which all the three mechanisms – i.e Touchpoint perception, Sense of Ownership and Cue-Action-Reward - lead to a 'preferable' state. However, this does not suggest that non-preference should cause the policymaker to substitute a touchpoint with an alternative touchpoint that meets all these criteria. Instead, the focus should be to try and improve the relationship through whichever touchpoint has been currently considered. Every policy intervention is unique, and certain physical characteristics of touchpoints – such as salience of touchpoint, placement, timing, etc. (OECD, 2019) – play unique roles in different situations. This is the power of behaviourally-tested policies (see 2.3), and mechanistic evidence is required to complement difference-making evidence (see 2.4) – not override it.

6. Conclusions

This thesis began with the identification of a subtle problem in BIECR policies – they were not persistent neither were they easily scalable. The identification of this problem led to the realisation of touchpoints specific research of BIECR policies, and whether a healthy relationship with touchpoints could be the key to mechanistic evidence (see 2.4.1) that could facilitate persistent and scalable BIECR policies.

I shall now guide the reader through the various objectives of this research, drawing on lessons for future research of theory and practice.

6.1. Assessment of research objectives

6.1.1 Objective 1

The first objective was to critically identify as many policies and program types (including tests/trials) that have leveraged BIECR.

By collaborating with the IEA, a high degree of access to the current BIECR interventions were possible. Moreover, the survey (see 3.6.1) released with support from the IEA was crucial in the outreach to as many professionals around the world.

While the information obtained is by no means the full scope of studies done around the world, it was possible to select a large proportion of the types of projects being done. This is in light with a conversation with INT 3, who stated that a there are about a 100 BI (which includes BIECR) projects being run in North America (the United States and Canada), and the vast bulk of them are HERs (see Case 1) (INT 3); so noting lessons from each of these may not be very insightful.

Hence it can be concluded that interventions identified were in line with the 'across-case' study that was proposed (see 3.6.1) and was meaningful and successful for this research.

6.1.2 Objective 2

The second objective was to summarise identified studies into their context, general objective, BI levers used, and details about touchpoints.

Through careful analysis of each of these documents, summaries were successfully constructed, and was useful for conducting this research.

6.1.3 Objective 3

The third objective was to interpret commonalities/ generalisations between residential consumers and touchpoints that facilitate the development of mechanistic relationships.

The discussions section was able to successfully do so, by interpreting generalisations between consumers and touchpoints from these cases, and giving argumentative and supporting statements where necessary (further supported by snippets from the interview). The details shared in the discussions section (see 5) exhibits success with this objective.

6.1.4 Objective 4

The fourth objective was to summarise the key mechanistic relationship factors that could assist in developing more robust, persistent and scalable policies for BIECR policies.

The chapter conclusions of the discussions section (see 5.4) successfully highlight three strong mechanistic relationship factors, and the conclusions section brings it all together in the form of a logic diagram that is congruous with the discussions. Hence the fourth objective was a success.

6.2. Conclusions – Theory, Policy and Future Research

This research revealed that archival study is very useful at interpreting generalisations (see 3.6.1). Obtaining mechanistic evidence is highly dependent on the constant application of the same theories across different contexts to see if it works. Using archival methods for existing BIECR policies, I have been able to demonstrate it's strength in interpreting commonalities about touchpoints that could foster mechanistic evidence. But I believe that the ideas I have proposed have only scratched the surface, and greater detail of archival research study could form the strong evidence base that can feedback into BI theory. This level of study is perfect for research organisations like the IEA due to their easy access to BI policy experts around the world.

On the other hand, policymakers practical experience is essential to fuel this research. This suggests that a high degree of collaboration between research organisations like the IEA and BI policymakers around the world is a necessity. The survey that was adopted in reaching out to BI policymakers around the world is great to start with, but a high degree of engagement between stakeholders is crucial in maintaining the constant inflow of BI research reports from around the world. I feel that this should be part and parcel of the 'global platform' that the IEA wished for in their proposal document (IEA, 2019) (see 1.1), and this would sustain the future for policy and practice.

Reflecting on the logic diagram that I have built (see Figure 8), I would argue that all future research for mechanistic evidence should be positive-effect-generating only. For instance, from this research it can be suggested that receiving a reward is always better than not receiving a reward; likewise, being the owner of a touchpoint is always better than not being the owner of a touchpoint – both of which are positive-effect-generating. No one could state that an individual does not want or like a reward (Kristensen, 2018), although they may debate about 'what' the individual considers as a reward in the first place. Mechanisms that could go either way, as suggested by Grüne-Yanoff (2016) in the case of the recommendation effect (see 2.4 for example of consumer trust in government), have the potential to be both positive for some individuals but negative for others, and could disrupt the overall mechanistic equation (Figure 5). Such equations, while theoretically useful to know, are a deterrence in the policy application. Identifying the degree to which a potential negative mechanistic evidence could result in a net positive or net negative outcome is a subjective experience, and would be difficult to ascertain in a heterogeneous urban population (Figure 5). Hence positive effect generating mechanistic evidence (see Touchpoint perception, Sense of Ownership and Cue-Action-Reward) would be ideal at building robust policies, while potentially positive/negative-effect-generating mechanisms should be kept to a minimum – unless it is proven to work in a specific context/ region that RCTs could help ascertain.

6.3. Recommendations

In the literature review (see 2.2), it was mentioned how socio-technical system (STS) transitions have become an important avenue of research due to the perceived negative effects that prevalent energy relation STS systems bring. However, in a socio-technical system, the social and the technical sides are not dichotomous elements (McMeekin & Southerton, 2012). Rather social elements complement the technology and vice versa. Through this research, I have implicitly noted how touchpoints are not mere technology objects, but rather share a 'social' relationship of sorts with the touchpoints themselves. I believe that exploring this research avenue is worthwhile, and humbly hope that trials and tests (like RCTs) in the future can verify the degree to which these findings play a robust, persistent and scalable role in BIECR interventions.

In the introduction section, I had also mentioned how demand-side management (DSM) like behavioural changes takes on a larger role of meeting short-term flexibility needs (see 1). I agree with this perspective; the results proposed here strengthen BIECR interventions but are best used to giving policymakers the breathing space on planning out how to ramp up energy supply. Rationally speaking, if everyone is conserving energy all the time, then it would be difficult to obtain breathing space through

BIECR policies in the future – when energy supply needs to be ramped up again. So, if energy demand is seen to be increasing dramatically faster than supply can catch up with, the preferable route for a policymaker is to leverage the use of BIECR to manage DSM, calculate future energy demand, build/increase energy supply facilities, and then let the effects of the initial BIECR intervention degenerate. In this way, the technique can be employed in the future, when energy supply needs to be ramped up again.

Similarly, BIECR policies can play a strong role in UHI mitigation in cities (see 2.2). Summer peak energy use is becoming increasingly common due to increasing urbanisation (see 2.2), but also occurs for a very short duration during the year. BIECR policies are the perfect leverage in such situations (see 4.2 and Case 5), as it can help in mitigating the effects of UHI while lowering mortality rate and provide some little relief on peak hot days.

6.4. Ethics

In Section 5.1, I identified that leveraging the use of the smartphone touchpoints as a device of instant gratification could help strengthen BI policies that use apps. But while I stand by my analysis of the current situation, I am also opposed to the idea of promoting the use of the smartphone as a device for instant gratification.

Leveraging BI to improve energy conservation activities is, in my opinion, a welfare-improving measure (Grüne-Yanoff, 2016). But using it through smartphone apps also reinforces the idea for people to use their smartphone more as a device for instant gratification, thus exacerbating problems such as the user's ability to think, remember, pay attention, and regulate emotions (Wilmer, Sherman & Chein, 2017)

On the contrary, I believe that using other devices like IHDs or paper reports are more ethically sound, and policymakers exploring BIECR should make employ devices that promote welfare rather than relying on smartphones.

6.5. Limitations

The scope of the research considered was, to be very frank, large. As earlier highlighted (see 3.3), the preferred study would have been a longitudinal type study – especially when discussing issues of persistence on a scale of a few years at the least. But archival research does have its strengths as demonstrated through this research. It could help bring out key points, while considerably reducing the time taken for longitudinal studies – time which, as highlighted earlier (see 5), most policymakers lack.

In my case, the time factor was also a detriment to carry out an archival study within a few months. Such an archival study, encompassing all the BIECR projects, could be strengthened far more when studied over a longer period. This study was interpretive, but my ambition for taking this on, despite knowing that I am leaning more towards pragmatism, is to shed a bit of light on a pathway towards scalable and persistent BI policies (see 3.3). Hence, both the methodology adopted and the data obtained are limited to the timeframe in which this study has been conducted, and I accept that this would affect the findings of this study.

Moreover, the findings of this study border on causality. Hence while archival 'across-case' studies are great at drawing forth commonalities (see 3.6.1), rigorous testing – possibly through RCTs(see 6.2) – is a necessary next-step.

6.6. Reflections

My background an engineer is what made me dive into the pragmatic and mechanistic avenue of this research. As an engineer – who technically applies the use of scientific principles – I was drawn towards this field to test if an engineering-like application works. I believe that it has.

But when I came up with the idea of these three sections based on my observations, little did I realize that the findings of my study would closely match with the three engagement principles of the Team Power Smart project (Kassirer, Korteland & Pedersen, 2014), namely enjoyment ("I like this"), affiliation ("This is who I am") and resonance ("This is right for me"). The Cue-Action-Reward hypothesis appears to closely align with the concept of enjoyment, Sense of Ownership with affiliation, and Touchpoint perception with resonance. While the TPS project employs their principles to increase participant engagement in low-priority, repetitive behaviours, my findings focus on the relationship between consumer and touchpoint as a means of achieving robust, persistent and scalable behavioural changes.

However, I only found out about the TPS study towards the end of the research, and to say that it influenced my discussion would be untrue. Hence, I have chosen to maintain the integrity of my research by maintaining the current structure of this report, and only stating this now. But concurrently, I feel that the similarity with the TPS project lends strong credibility to my research, and suggests that my interpretations hold ground.

7. References

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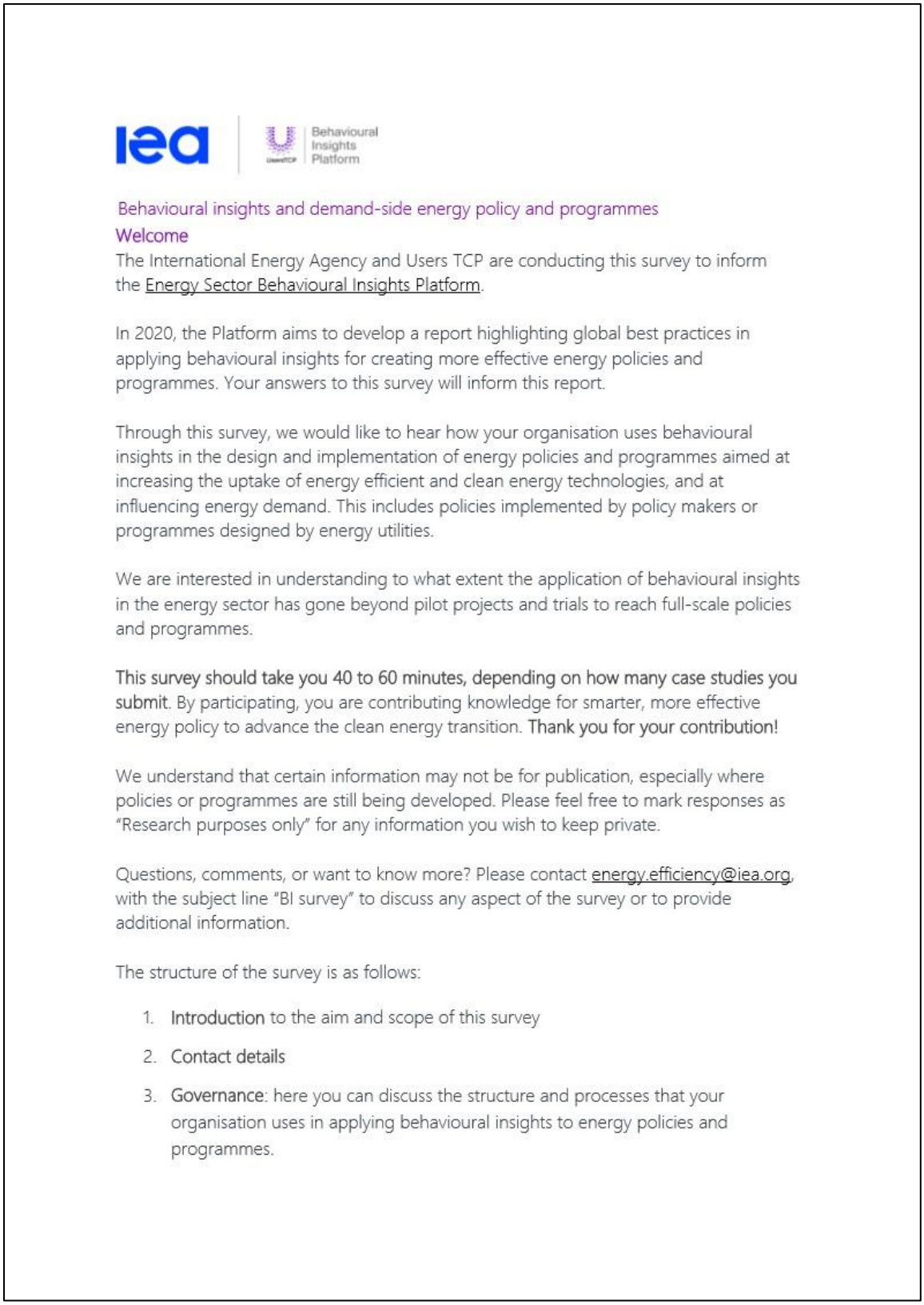
8. Appendix

8.1. Appendix A – Survey shared through IEA

As mentioned earlier in Section 3.6.1, a survey was sent out through social media channels so that policymakers from around the world could share some of their works with the IEA. The whole survey format has been given in the subsequent pages.

I would like to remind the reader again that this survey was was a call for all BIE policies, and not only BIECR. About 80 responses were received, of which only around 25 were BI related. A majority of the responses received were either empty, or consisted of policies that used traditional methods like campaigns, etc. that was not in line with BI policies.



Behavioural insights and demand-side energy policy and programmes

Welcome

The International Energy Agency and Users TCP are conducting this survey to inform the Energy Sector Behavioural Insights Platform.

In 2020, the Platform aims to develop a report highlighting global best practices in applying behavioural insights for creating more effective energy policies and programmes. Your answers to this survey will inform this report.

Through this survey, we would like to hear how your organisation uses behavioural insights in the design and implementation of energy policies and programmes aimed at increasing the uptake of energy efficient and clean energy technologies, and at influencing energy demand. This includes policies implemented by policy makers or programmes designed by energy utilities.

We are interested in understanding to what extent the application of behavioural insights in the energy sector has gone beyond pilot projects and trials to reach full-scale policies and programmes.

This survey should take you 40 to 60 minutes, depending on how many case studies you submit. By participating, you are contributing knowledge for smarter, more effective energy policy to advance the clean energy transition. Thank you for your contribution!

We understand that certain information may not be for publication, especially where policies or programmes are still being developed. Please feel free to mark responses as "Research purposes only" for any information you wish to keep private.

Questions, comments, or want to know more? Please contact energy.efficiency@iea.org, with the subject line "BI survey" to discuss any aspect of the survey or to provide additional information.

The structure of the survey is as follows:

1. Introduction to the aim and scope of this survey
2. Contact details
3. Governance: here you can discuss the structure and processes that your organisation uses in applying behavioural insights to energy policies and programmes.

Figure 9: Survey design sent out by the IEA through social media channels - 16 pages (Source: IEA)

4. **Case studies in behavioural insights applications**: here you can describe how your organisation has applied behavioural insights to specific policies and programmes. For each policy or programme, we would like to know:
    - General information: sectors targeted, location, time frame…
    - Objective, design and implementation.
    - Evaluation and lessons learnt

Section 1 of 4: Introduction

What do we mean by "behavioural insights" (BIs)?

BIs are insights from disciplines such as behavioural sciences, neurosciences, psychology and behavioural economics. These disciplines aim at understanding what people are doing, why they are doing it, and how we might encourage people to change what they are doing.

Policy makers and other energy professionals can use BIs to better understand how individuals take decisions that affect energy consumption, and how they might respond to energy policies and programmes.

Are behavioural insights the same as "nudges"?

No. In their 2008 book Nudge, Thaler and Sunstein define nudges as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives."

In this survey, we are interested in nudges but also policies designed to change people's choices or economic incentives. For example, BIs could inform the design of an electric vehicle subsidy scheme, influencing eligibility, timing and delivery of the subsidy. This application of BIs is not a nudge because the subsidy is designed specifically to change people's incentives when purchasing a vehicle.

What types of policies and programmes are we interested in?

We are interested in all policies and programmes using BIs in their design or implementation.

Examples include financial incentives like grants and subsidies, innovative energy pricing regimes and taxes, information provision tools (e.g. energy labels, smart energy bills), regulations (e.g. standards for default appliance settings), and procurement programmes (e.g. smart meter rollouts).

Tell us about policies and programmes that leveraged BIs:

- Explicitly, using evidence from trials conducted before full-scale implementation; or
- Explicitly, using evidence from previous BIs research or programmes; or
- Implicitly, by aligning with evidence from behavioural sciences, even if the use of BIs was not intentional.

Some policies and programmes may be undocumented, ongoing or at a planning stage: we are interested in hearing about all of them.

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- Explicitly, using evidence from previous BIs research or programmes; or
- Implicitly, by aligning with evidence from behavioural sciences, even if the use of BIs was not intentional.

Some policies and programmes may be undocumented, ongoing or at a planning stage: we are interested in hearing about all of them.

- ○ 0*

**Please indicate, in your view, the reason why no full-scale policies or programmes have been implemented using behavioural insights.*

Please estimate how many full-scale, energy-related policies or programmes your organisation is currently working on using BIs. These might be at the research, design, implementation or evaluation stage.

- ○ I don't know
- ◉ 8+
- ○ 4-8
- ○ 1-3
- ○ 0**

*** Please indicate, in your view, the reason why your organisation is not currently working on any full-scale policies or programmes using behavioural insights.*

Section 4 of 4: Case studies: Behavioural insights applications to specific policies or programmes

Document submission

On this and the following pages, you have the opportunity to provide detailed information about your organisation's application of behavioural insights to energy policies and programmes.

For each case study, we would like to know:

- General information: sectors targeted, location, time frame, etc.
- Objective, design and implementation
- Impacts and lessons learnt

To make things as simple as possible for you, you have the opportunity to upload documents discussing these aspects of behavioural insights applications by using the buttons below.
Feel free to complement this information on the following pages if any of those aspects are not mentioned in the sources you are sharing.

If you don't have any documents to upload, please tell us about relevant policies/programmes in the next pages. You will have the possibility to discuss multiple policies/programmes separately.

Top of Form

Document 1

Document 2

Document 3

Document 4

...

Section 4 of 4: Case studies: Behavioural insights applications to specific policies or programmes

Case study 1: A) General information

The next three pages are for recording information about the first case study you would like to submit, i.e. a specific policy or programme that your organisation has designed and/or implemented using behavioural insights.

Please start by providing some general information on this policy or programme. (You will have the possibility to discuss additional case studies in the following pages).

Title of the policy/programme.

Note: If you are discussing a policy or programme for which you have uploaded an explanatory document, please use the title of the uploaded file.

If a webpage is associated with this policy/programme, please paste the link here.

Which of the following sectors does this policy/programme apply to?

- ☐ Residential buildings
- ☐ Commercial/ office buildings
- ☐ Passenger transport
- ☐ Freight transport
- ☐ Agriculture
- ☐ Industry
- ☐ Appliances / equipment
- ☐ Public sector
- ☐ Other (please specify)

Please mention the main institutions involved in this policy/programme and their respective role.

(e.g. Ministry of Energy: institution in charge; experts from University X and from the Behavioural Insights Team in the Prime Minister's office were consulted)

Where and when was this policy/programme put in place?

Please discuss the name and jurisdiction (city-, state-, national-level) of the location where the policy/programme was applied.
Please discuss when the policy/programme was put in place, while differentiating between the trial period and when it was implemented at full scale.

Section 4 of 4: Case studies: Behavioural insights applications to specific policies or programmes

Case study 1: B) Objective, design and implementation

Please discuss the objective of this policy/programme, and provide details on its design and implementation.

What type of policy/programme are you describing?

(e.g. financial incentive, communications campaign...)

Which behavioural decision has this policy/programme been targeting?

- ☐ Purchase / installation of appliances, equipment, vehicles or clean energy devices
- ☐ Use of appliances, equipment, vehicles or clean energy devices
- ☐ Transportation choice
- ☐ Energy tariff choice
- ☐ Other decisions (please specify)

What is the behavioural issue this policy/programme aims to address?

(e.g. inability to consider long-term energy consumption implications of purchases)

What is the behavioural lever this policy/programme uses?

- ☐ Simplification and framing of information
- ☐ Changes to the physical environment
- ☐ Changes to the default policy
- ☐ Use of social norms and comparisons
- ☐ Use of feedback mechanisms
- ☐ Reward and punishment schemes
- ☐ Goal setting and commitment devices
- ☐ Other (please specify)

Briefly describe the policy/programme: how was it designed and implemented?

Section 4 of 4: Case studies: Behavioural insights applications to specific policies or programmes

Case study 1: C) Evaluation and lessons learnt

Please discuss the impacts of the policy or programme, the evaluation methodology used to assess them, the lessons learnt thanks to the evaluation and the challenges faced during design, implementation and evaluation.

Briefly describe the impact of the policy/programme.

(e.g. the average reduction in household energy consumption compared to the baseline period was X%)

This information is crucial for helping other policy makers learn from your experiences; however, if you would prefer us to use it for research purposes only, please check the box below.

☐ *Please omit quantitative results from publication*

If the policy/programme has been formally evaluated, please describe the evaluation methodology and source of data/information.

(e.g. randomised controlled trials with energy meter readings)

If a sample of energy users was selected to run the evaluation, what was the sample size and sampling method?

Please mention all the demographic factors that were taken into consideration (e.g. median age, household size, building typology) to ensure that the sample of energy users closely represented the population of the jurisdiction where the policy/programme was implemented.

Did the policy/programme impacts confirm expectations? What unexpected lessons emerged (if any)?

Please also discuss what did not work, and what elements might have failed to show the expected impact.

What were the biggest challenges in the context of this policy/programme?

Submission received

Thank you for submitting information about this policy/programme.

**Do you have more case studies to share through this form?*

- ○ Yes, I would like to share more case studies
- ◉ No, that's all for now

Thank you!

Thank you for taking part in this survey. We will keep you posted on the next steps of the project.

If you think other colleagues might be willing to share insights on applications of BIs to energy policy and programmes, please mention their names and contact details below and we will reach out to them.

Alternatively, feel free to share the survey link within your network!

Note: If you have additional contacts, please e-mail us at energy.efficiency@iea.org

1.
2.
3.
4.
5.

Is there anything else you would like to tell us?

Would you like to know more? Please contact energy.efficiency@iea.org, with the subject line "BI survey".