

Being human is a market failure

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Abstract

Traditional neo-classic economics prevents the potential of energy efficiency to be fully realised since it does not allow energy policies to be sufficiently developed. In the most orthodox learnings it is claimed that there is no need for energy policies when there are no market failures to be cured and such failures, it is said, are rare. They have to do with public goods, externalities and information to mention some.

Information failure is, it is said, a significant market failure that can occur in two basic situations. Firstly, information failure exists when some, or all, of the participants in an economic exchange do not have perfect knowledge. Secondly, information failure exists when one participant in an economic exchange knows more than the other, a situation referred to as the problem of asymmetric, or unbalanced, information.

Behavioural economics however shows that information can only rarely be assumed to be understood in an unambiguous way. Even if it would be possible to create information in a format that was objectively correct it is transformed by the receiver according to experience, beliefs, tradition and even time available that distorts the information content and may deliver a less than optimal decision. Being human creates market failures in itself.

Energy efficiency being a complex good, since it can be achieved in many different ways, is in particular need for corrections of this market failure. And there are ways to handle the market by making use of knowledge from behavioural economics. The role of the economic man however has to be rewritten.

Prologue

Due to circumstances beyond my control, there will be no big parade this Sunday afternoon.

Colonel Scheisskopf in *Catch 22* by Joseph Heller

Introduction – The Problem

There is a vast potential for energy efficiency improvements. One of the most significant corroborations to this is the IEA World Energy Outlook 2012. Here it is shown that the magnitude is big enough to almost alone hold back global warming at two centigrade, Figure 1. This new scenario, called “Efficient World”, assumes a consequent exploitation of available and profitable efficiency improvements in all sectors. Or, put differently, this would be the result if all of us did what we claim to be doing every day – act economically rationally.

It goes without saying that if all the everyday actions of billions of people should be changed to make the best use of all possible opportunities, both for operations and for investments, it will require a market that works very well. The IEA writes, “the energy savings identified in the Efficient World Scenario will not happen if market actors are left to their own devices” (IEA WEO 2012 chapter 10). To enable a change they mention six issues to put full focus on the energy efficiency. They are to make energy efficiency:

1. **Visible** (The energy performance of each energy end-use and service needs to be made visible to the market.)
2. **A priority** (The profile and importance of energy efficiency needs to be raised.)

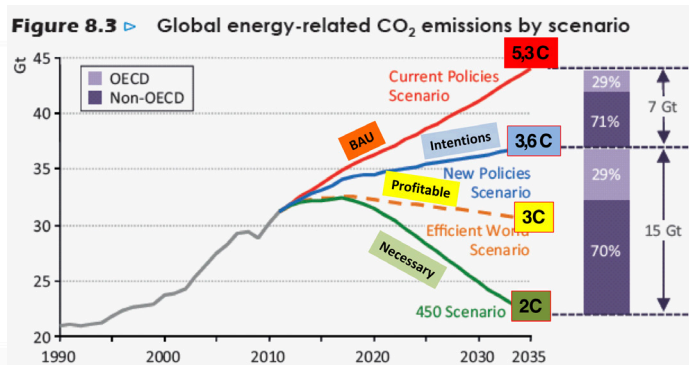
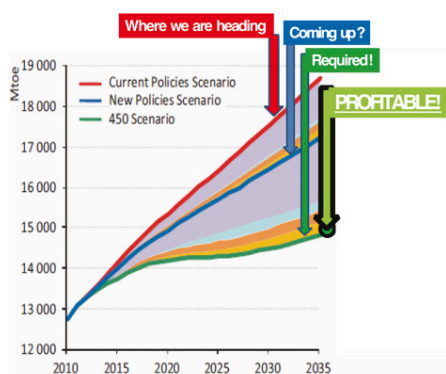


Figure 1. The normal IEA WEO scenarios supplemented with a fourth a new called “Efficient World Scenario” and their consequences for global warming. (Pictures from WEO 2012 with explanations added.)

3. **Affordable** (Create and support **business models, financing vehicles and incentives** to ensure investors in energy efficiency reap an appropriate share of the rewards)
4. **Normal** (Energy efficiency needs to be normalised if it is to endure. Resulting **benefits from learning** and economies of scale help make the most energy-efficient option the normal solution.)
5. **Real** (Monitoring, verification and enforcement activities are needed to verify claimed energy efficiency)
6. **Realisable** (Achieving the supply and widespread adoption of energy efficient goods and services depends on an adequate body of **skilled practitioners** in government and industry.)

It does not require any profound studies to sense that most of these conditions are violated in the market. Even if the most common advice, also from the IEA, is that we should encourage, and provide conditions for, the market to work better we are far from realising the potentials. Here we will argue that this is because the notion of a well-functioning market is rigid, misses important features in actor behaviour and is out-dated.

The market itself is a necessary instrument to get a wide dissemination of products that appeal to the taste and preferences of customers. Not the least products that enable and/or provide energy efficiency. The standard economic model (SEM)¹, however, is based on assumptions about the actors in the market that prevents the market from working accordingly. If the actors do not act as assumed how could the market then deliver and “optimal” solution?

One issue is then that the actor is not as perfect as assumed and the product that the market should accept, use and handle is non-existent. Also, it will be argued that energy-efficiency, as a product, is so vague that there is no real market for energy efficiency.

REFOCUSING HAS BEGUN

If the market should work and assist the transformation we need we have to modernize our view on both energy efficiency as a product and on the actors’ behaviour. Such change of views

can be found in actions leading up to policies based on “Nudges” (Thaler and Sunstein, 2008), and in the notion of limited bandwidth (Mullainathan and Shafir, 2013) and in “commoditisation” of energy efficiency. It is a matter of development of both policies and business models and above all preventing our traditional view of the market, according to SEM (traditional economics), from the shaping of tools for the market.

The IEA seems to have embarked on the road to such a different, more modern view, in their recent publications, but without yet having taken the full step. There have now been published two reports on energy efficiency markets where Energy Efficiency is crowned “The First Fuel” (IEA 2013) and “An invisible Powerhouse” (IEA 2014) because of its size and low costs and because of how difficult it is to get to work.

There has also been a ground-breaking work to identify and categorize the so called “Non-Energy Benefits” (NEB) that are closely connected with energy efficiency improvements in a publication “Capturing the Multiple Benefits of Energy Efficiency” (IEA 2014-2). These benefits add to the value of energy efficiency but are seldom made part of the calculation to motivate the investments.

The IEA has also made a remark on the dysfunctions of the financial market and its inability to recognise the value of energy efficiency:

Energy efficiency currently lacks the attractiveness of investment in clean energy supply, such as renewables, reflecting different policy frameworks and a set of specific barriers, including small transaction sizes and verification and measurement issues. In contrast to traditional energy-supply investment, energy efficiency investments offer expectations of future cost savings rather than an asset generating a specific cash flow. (IEA WEIO 2014)

It is encouraging that an important intergovernmental organisation so clearly speaks out and visualises the lost opportunities and also assists with its vast resources to analyse the problems to be solved.

The ideal consumer in an ideal world

The Standard Economic Model (SEM), that is most often used to describe, understand and prescribe user/customer/actor behaviour, is quite cynical. People are assumed to egoistically be maximizing their own welfare. It is postulated that by do-

1. Standard Economic Model (SEM) is here used synonymously with “neo-classical” economic model which might be the more commonly used expression in literature.

Table 1. The characteristics of the economic man (*homo economicus*) and what it implies.

CHARACTERISTIC	IMPLYING
We are economic agents and are as such rational	Economic rationality only
We are motivated by utility maximisation	Utility can be measured in economic terms and more goods or services is always better than less
We are governed by purely selfish concerns	Other peoples' utility is of no concern
We are "learning players" (Bayesian operators) and adjust continuously according to experiences	Continuous intake of huge amounts of information
We have consistent time preferences	Future consumption is always measured at the same rate
All our incomes and assets are completely fungible	Cash, property and real estate can be exchanged freely at any time

ing so the market will automatically find a state where all beneficial changes have been made and an optimal solution been achieved. This is the magic of the market – the invisible hand has a magic wand.

Of course everybody tries to get the best out of their deals, but all of us have several considerations to make apart from our own personal and individual welfare and we also have a lot of other things on our minds. John Maynard Keynes is said to have been in doubt that actors are rational people who engage in transactions as if guided "by an invisible hand". He rather thought that much economic activity is governed by "animal spirits" and that people are not always rational in pursuit of their economic interest (Akerlof and Shiller. 2009 p. ix).

"The first principle of Economics is that every agent is actuated only by self-interest". This quote from Edgeworth² is the starting point for Amartya Sen in his essay "Rational Fools. A critique of the Behavioural Foundations of Economic Theory" (Sen 1977). He then continues, "This view of man has been a persistent one in economic models ...". Sen further notes that Edgeworth himself was quite aware that this principle was not realistic, but rather that "... man was an impure egoist, a mixed utilitarian".

Sen argues that "commitment" is a better description of what drives individuals in their choices. Such commitment allows for e.g. altruism and "sense of obligations". Choices and actions are, as Sen says, based on "reasoned assessment". Consumers may not be entirely selfish but are capable to include aspects that go beyond those that are pure individual and egoistic. "My own welfare also depends on the welfare of fellow citizens."

But if this knowledge, that humans are not purely egoistic, not perfect and sometimes a bit opaque in their thinking has been known and discussed for long, since the days of Adam Smith and David Ricardo through Stanely Jevons and Leon Walras, from the 18th through the 19th century all the way up till today, how come that the idea of the perfectly rational man – "the economic man" – has survived and even been the standard for so long? The idea has been challenged and alternative

economic doctrines launched, such as institutional economics advocated by Thorstein Veblen, John Kenneth Galbraith and Gunnar Myrdal in the 20th century. Still the economic man serves as the role model for many economists. And he, yes he is a man (Kielos 2012), still rules most thinking in policy setting? And exactly how "ideal" should this person be, to fit the models?

Dissecting *Homo Economicus*

In the standard economic model (SEM) there are several requirements for a person to live up to in order to fulfil the purpose to maximize the "utility". According to one comparison of economic models (Wilkinson 2008, p. 5), the key components in our attitude and actions are as in Table 1.

These characteristics in our mind-set are essential for the market according to SEM because if these assumptions hold, then the model is computable by use of elementary mathematics. This could be one of the explanations for the love of the economic man. He is computable and in being so it will be possible to construct models that enable forecasting and predictions about economic activities and impact. "The model is the message", is one observation in an overview of economic theories and their relevance for policy analysis and setting (Pålsson Syll, 2010).

One such complex of models are "general equilibrium models"³ that attempts to explain how supply, demand, and prices in a whole economy can result in a general equilibrium with a unique set of prices. Such models have been constructed, developed and refined since first conceived by Leon Walras in the 1870s. They have played, and play, a big role in much policy work that is made to advise politicians. They have been challenged and contested as being unrealistic and based on assumptions about human behaviour that does not hold. The actors (the persons) in these models are constrained in their behaviour by their "selfish" or egocentric optimization, by their focus on price (only), by their access to (perfect) information and by the static preferences.

2. Amartya Sen refers to the economist Francis Ysidro Edgeworth (1845–1926).

3. Box 1: <http://www.mpsge.org/tutorial.pdf>.

Box 1. Description of General Equilibrium model characteristics.

When we say general equilibrium, we are normally thinking of models which have the following characteristics:

1. Multiple interacting agents.
2. Individual behavior based on optimization.
3. Most agent interactions are mediated by markets and prices.
4. Equilibrium occurs when endogenous variables (e.g., prices) adjust such that:
 - i. agents, subject to the constraints they face, cannot do better by altering their behavior;
 - ii. markets (generally, not always) clear so, for example, supply equals demand in each market.

Criticism towards general equilibrium is of two kinds. One asks “does such an equilibrium exist at all?”. The other asks how and if it can be reached, i.e. the dynamics. These two stands of criticism is captured in Wikipedia and shown in Box 2.

So there is severe and influential criticism to both the concept of homo economicus and the models that are constructed based on this creature. The models have been refined over the years to not only compare different states of equilibrium but also what happens in the transfer between the states and to take into account exogenous changes such as price shocks. Dynamic stochastic general equilibrium (DSGE) models are such developments, but they still stand on the firm assumption of predictable “economic” behaviour by the actors.

Attempts have been made to motivate the use of the models even if the basic assumptions are not valid. Milton Friedman

Box 2: Quote from Wikipedia.

Let us beware of this dangerous theory of equilibrium which is supposed to be automatically established. A certain kind of equilibrium, it is true, is re-established in the long run, but it is after a frightful amount of suffering.

—Simonde de Sismondi, *New Principles of Political Economy*, vol. 1 (1819), 20–21.

The long run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is past the ocean is flat again.

—John Maynard Keynes, *A Tract on Monetary Reform*, 1923, Ch. 3.

http://en.wikipedia.org/wiki/General_equilibrium_theory#Modern_concept_of_general_equilibrium_in_economics

is well known for the statement that it is enough to note if the behaviour is “as if” the actors were profit-maximizing.

Among the most famous essays in economics is Milton Friedman’s “The methodology of positive economics”, published in 1953. Friedman’s main point was that a theory’s validity should not be judged by the realism of its underlying assumptions but rather by the accuracy of its predictions. In effect, theories should be viewed “as if” their assumptions were true.⁴

The temptation to use these models is probably in the computability and that it would be nice if people and economies behaved in such a predictable way. Societies could be engineered and managed in great detail. If the model would be correct life would be so much easier and therefore also is the basis for normative texts and policy design (Ackerman 2002). Some are even more cynical and claims that the popularity of the models are primarily because the use is good for the career “Nearly all young academic macroeconomists I know want to work with DSGE models, because that is what gets published” (Pålsson Syll, 2014).

DEAD MAN WALKING?

“Dead man walking” is a term widely used to describe an employee who is certain to be fired in the near future.⁵ The idea about the economic man as an agent to achieve transformation of the energy systems, in particular energy efficiency, is such an “employee” that certainly should have been fired long ago. But he hangs around! There seems to be a close resemblance with “Homo Economicus” and the sad figure who not yet has understood that he is obsolete in his job.

Lately criticism has been more formalised by the establishment and growth of “Behavioural Economics”. Richard Thaler and Cass Sunstein argue that the economically rational man is a creature that only lives in textbooks. Such a person, they say, would have to be equipped with the calculation ability of Albert Einstein, a memory of a mainframe computer and the willpower of Mahatma Gandhi. They call such persons Econs. The rest of us, who are less gifted, are Humans (Thaler and Sunstein, 2008).

The findings from Behavioural Economics show more and more clearly that Homo Economicus is a fiction. Only recently the World Bank published a report called “Mind, Society and Behaviour” in which they state:

Economics has ... come full circle. After a respite of about 40 years, an economics based on a more realistic understanding of human beings is being reinvented. But this time, it builds on a large body of empirical evidence – micro level evidence from across the behavioral and social sciences. The mind, unlike a computer, is psychological, not logical; malleable, not fixed. It is surely rational to treat identical problems identically, but often people do not; their choices change when the default option or the order of choices changes. People draw on mental models that depend on the situation and the culture to interpret experiences and make decisions. This Report shows that a more interdisciplinary

4. http://www.learningwhatworks.com/papers/miltonfriedman%20_2_.pdf

5. The term has also been used for many years in the US, far more literally, to refer to a prisoner sentenced to death.

perspective on human behavior can improve the predictive power of economics ... (World Bank, 2015)

If “Homo Economicus” exists or not might however not be the issue, but instead if such a person is relevant for policy setting. There are after all in the real world people who act completely selfishly. A recent study from Japan says that 7 % of a population are dedicated “Homo Economicus” (HE) and another 9 % quasi-HE having quite similar reactions and behaviour (Ubel, 2014). The observations in the Japanese study are captured by Ubel as follows:

The neoclassical economic view of human nature was always a caricature. Now we have a better sense not only of how poorly that view characterizes most humans, but also of how poorly behaved the people are who act according to this caricature.

So HE may exist and even be fairly frequent, not the least among influential people in our society, but they are people that should not serve as a model under any circumstances. Raj Chetty argues in a study of three cases where he has applied the theories from Behavioural Economics that the view of neoclassical economics is the benchmark for analysis but that including behavioural factors is a pragmatic rather than philosophical choice (Chetty 2015).

Maybe that is the choice we have to make? Try to find out when the HE is a useful character and when s/he is not. After all we should give him/her credit for providing us with the answer to the questions about the potential for energy efficiency improvements. All such calculations are made under assumptions about economically rational actions. And if actions were economically rational then the calculation shows exactly how much we could save within the level of “service” society provides today.

Enter homo sapiens

Behavioural economics teaches us that the problem with our limitations to be rational lies in the way we, as humans, are biased in our thinking. We are simply not hardwired to be purely economic. When we make decisions we also think “but” and “if” and take a lot of issues into consideration. Some of these “buts and ifs” improve the decisions and make them more rational but some of them are picked from a variety of experiences that sometimes are not valid and distort the decisions instead of improving them.

We have two modes of thinking when we approach a problem to make a decision. One says that the systems are either **Experiential** (Holistic, Affective, Associationistic, Use vibes from past experiences, Encodes reality in images, metaphors and narratives, Oriented towards immediate action, Experiencing is believing) or **Rational** (Analytic, Logical, Consciously appraising events, Encodes in abstract symbols, words and numbers, Oriented towards delayed action, Requires justification), (Slovic et. al 2002).

One of the characteristics of the experiential system is its affective basis. Although analysis is certainly important in some decision-making circumstances, reliance on affect and emotion is a quicker, easier, and more efficient way to navigate in a complex, uncertain, and sometimes dangerous world.

In his book “Thinking fast and slow” Nobel Prize laureate Daniel Kahneman elaborates in greater detail how we think and also uses the two-systems approach. He explains that we have two systems to approach and think about how to solve a problem. One fast, intuitive and emotional and one slow deliberative and logical. There is a sort of hierarchy between the two ways and the fast one guards (prevents) the slow and reflecting one from being used in vain.

The fast system “operates automatically and quickly, with little or no effort”. The slow system “allocates attention to the effortful mental activities that demand it, including complex computations.” In giving examples of what the systems do Kahneman says that the slow system is required i.e. to “compare two washing machines for overall value”.

The fast system is the one we use to observe and act upon what happens. This system has “models of familiar situations” and it calls upon the slow system when needed. The fast system generates suggestions for the slow system and if the slow system endorses the suggestions “intuition turns into belief and impulses turn into voluntary actions” (Kahneman, 2011. p. 24).

The fast system is actually what we train and educate to enable us to live comfortably and not run into complex considerations in all turns of life. It is about pattern recognition and this, in turn, is what upbringing is about. Kahneman describes the existence of system one as a basis for evolution. We have (as other animals) trained and developed reflexes to survive.

COGNITIVE LIMITATIONS

The work on Behavioural Economics, in particular that of Kahneman, has opened a totally new area for our understanding on how people act in the real world and not act as they are supposed to in a model world. The advantage is that we will be able to address real concerns and to “frame” proposals about (rational) actions in a way that enables people to both understand their better options and to act upon them. The disadvantage is of course that it is not easily computable.

The fast system “has biases, systematic errors that it is prone to make under specific circumstances. It has little understanding of logic and statistics” (Kahneman, 2011, p. 25). Some of the biases can be detected and described for analysis. We have e.g. tendencies to think and act depending on:

- **Availability** of data – we make a mental shortcut by the ease with which examples come to mind.
- **Representativeness** of data – a mental shortcut used when making judgments about the probability of an event and could either think of them as highly probable because we have seen it happen or the contrary because we have only seen it happen once.
- **Anchoring and adjustment** – describes the common human tendency to rely too heavily on the first piece of information offered (the “anchor”) when making decisions.
- **Endowment effect** – the fact that people often demand much more to give up an object than they would be willing to pay to acquire it.
- **Framing effect** – drawing different conclusions from the same information, depending on how or by whom that information is presented.

This list of “cognitive limitations” is by no means exhaustive or an attempt to make an exclusive taxonomy of “biased” thinking, but just serves to show how many pitfalls there are in our effort to make truly economically rational decisions. This is the way we are. We have difficulties to absorb and digest all the necessary information that we should need.

If we would like to get at least a little bit closer to being fully rational we have to find a way to tackle these cognitive limitations. To offset them for a while to allow system two into action. Or to put them onto the right track without any extra effort. This is what Thaler and Sunstein call Nudges and Choice Architecture (Thaler and Sunstein, 2008).

These cognitive “flaws” of our mind are however not only depending on our own abilities, attitudes or training. It also depends on the situation when the decisions should be made. It has been shown that people who are under physical or mental pressure (being hungry or struggling with sudden debts) narrow their chances to “think clearly” – The bandwidth is narrowing (Mullainathan and Shafir, 2013). The strains on bandwidth they face offer an explanation for why poverty so often begets poverty. If you’re impoverished you may fail to perform any number of routine but important tasks not because you are lazy, but because your brain is overloaded by worry and stress.

BELIEFS AND HABITS ARE STRONG MASTERS

Homo Sapiens is a very rational creature when it comes to economising resources such as time and personal efforts even if not in terms of economical maximisation. The fact that we are applying heuristics and learn to recognise patterns to make quick decisions using the fast system 1 instead of engaging the slow system 2 is indeed a way to save time.

Our decisions get even faster once we have recognised a pattern and turned the reactions to it into habits and maybe even cemented the habit by attaching it to a belief-system of some sort. Being social we want to belong and one way of doing it is to stay with a (our) crowd.

The World Bank in their report put forward three principles that guide our actions (World Bank, 2015):

- We are thinking automatically (not deliberately).
- We are thinking socially i.e. take other peoples thoughts and views into account.
- We are thinking with mental models i.e. in a society we share a common perspective that makes sense.

All these three aspects are also highly rational but not be easily translated into economical (monetary) rationality and are hence not compatible with our thinking of the economic man. Instead it outlines how we are acting rational making use of our human abilities to act in line with what is expected and without putting too much effort into gathering and evaluation of information. We are simply developing habits and are true to our (groups) beliefs.

Beliefs

An aspect on this sort of framing is the issue of the person and the values of the individual. The “Cultural Cognition Thesis” describes how peoples’ beliefs about risk are shaped by their core values. People with a more egalitarian or more commu-

nitarian worldview are more inclined to believe that global warming is a risk that we have to deal with than people with a more hierarchic or more individualistic worldview (Kahan et al, 2007). One conclusion is that one should “focus less on facts and more on social meaning” to get the support for sound policies (Kahan and Braman, 2006).

This has also been called “solution aversion” in a study that tried to find out to what extent people were prepared to accept the facts related to global warming and found that those who held values that opposed the solutions that were perceived to put restrictions on market freedom also rejected the facts. “... many people (of course not all) who purport to be sceptical about climate science are motivated by their hostility to costly regulation.”⁶ Their belief in that society should “keep the hands away from the market” is so strong that when solutions are suggested that suggests government involvement they not only reject the solution but also the facts.

Habits

Studies aimed at behavioural changes find that many attempts to make changes based on information and/or economical incentives seldom succeed unless they are made part of a battery of supporting activities:

... strong habits are associated with simple, shallow decision rules. Essentially, people with strong habits possess motivational and informational biases that reduce the likelihood that they will receive and evaluate favorably new, counter-habitual information. These biases reduce the impact of informational campaigns and help maintain existing behaviour patterns. (Verplanken and Wood, 2006)

There have been many campaigns trying to inform people about energy use and motivate saving by providing and focusing on the positive financial outcome. A closer look at these shows less impressive results and occasionally even that they can be counterproductive leading to growing energy use! Something called the “licensing effect” meaning that when the concerned found that the monetary savings not were very dramatic they instead started to excuse their consumption (Delmas et al., 2013).

So there is good evidence that even with the best ambitions to be economically rational we will never be able to gather, compile and handle all the information we need to be a Homo Economicus. We are just by being human and by default ourselves not very fit to act in the market. We are a market imperfection ourselves!

Energy Efficiency on the market

It is fairly obvious that if we shall ever have a widespread dissemination of energy efficiency we have to find a vehicle that allows this to happen. A vehicle that allows massive action and at the same time takes individual circumstances into account. And this is of course the market.

We have appealed to the demand side of the market for decades that the actors should act in their own best economic in-

6. <http://www.bloombergview.com/articles/2014-12-10/why-free-marketeters-dont-buy-climate-science>

terest but the result, even if good, is not by far sufficient. The remaining potential is, as e.g. shown by the IEA, huge.

Part of the problem is that customers are not acting only and purely on economic incentives, part is that we have not really learnt to advocate our product (energy efficiency) in a way that overcomes the cognitive biases and finally part is that our product is not fully developed. Efficiency cannot be bought over the counter but needs to be “commoditised” for the customers to use.

The real issue is not, as sometimes is implied in studies to show barriers to development of energy efficiency, that people need to be motivated and aware before they start to undertake energy efficiency measures. People (customers) are often both aware and motivated. They want to save energy but they cannot for their life put together an appropriate package of measures because it is so complex and entails so many aspects that are totally out of scope for most people to deal with.

Energy efficiency can be achieved by a multitude of different measures in an installation. Traditionally the issue of energy efficiency in industry (and elsewhere) is treated as a choice between two commodities. On one hand energy that can be purchased in bulk and measured in energy quantities as kWh. On the other hand energy efficient equipment to reduce the amount of energy delivered. This is where the problem begins. Energy efficiency as opposed to energy is not a commodity. It is a quality. A quality that can be achieved with many different combinations of equipment and installation alterations, Figure 2. That is why it is fair to say that “Energy efficiency is not difficult, only complicated”.

When you compare two pieces of equipment (or installations) it is possible to judge between them in terms of efficiency by comparing which one uses less energy for a certain amount of service, i.e. light, motive power, heating or cooling. Sometimes this comparison might still be unfair since the two objects compared does not necessarily deliver the same amount of service. We talk about NEB, i.e. Non-Energy Benefits. It is not only the amount of light, heat and power that may be different but also other issues of importance such as less noise, better colour-rendering, higher productivity, better work environment etc. So the two solutions might not be easy to compare. Therefore the comparison may not be easy to capture in a calculation for an LCC-analysis (LCC=Life Cycle Cost). (Nilsson et. Al. 2012.)

We need to make more careful considerations when energy efficiency is an option. Typically when calculating:

- **Benefit** is regularly **underestimated**; as has been mentioned the IEA has recently published material showing multiple benefits that normally are not accounted for (IEA 2014-2). It is mentioned that for industrial projects productivity gains could reduce the pay-back time to half and that every Euro invested in healthier buildings could pay back 4 Euro in e.g. lower costs for health problems.
- **Costs** are normally **overestimated**; packages of measures could share fixed costs and become cheaper compared to measures performed at different occasions (Bonakdar, Doodoo and Gustavsson, 2013). Due to market learning costs fall over time as market gains experience time and both technology and organisation and business models develop (IEA/OECD, 2000).

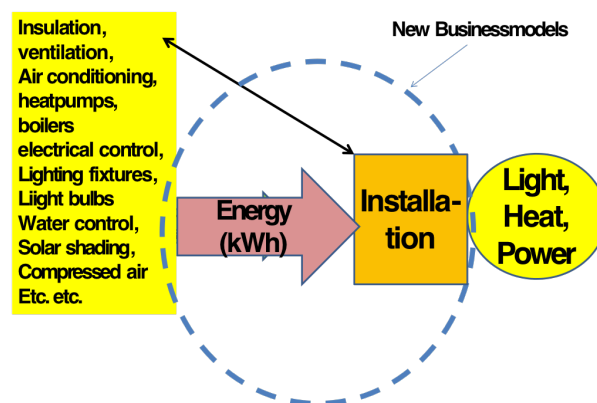


Figure 2. Delivering and altering the service (Light, Heat, Power) can be made with many different sets of equipment in the installation.

- **Planning** is often **absent**; it is only recently the Building directives in Europe has required Building Declarations, which could at least serve as a draft plan for refurbishments, and energy audits/management systems for the biggest companies.

All people involved in considerations of energy issues must reconsider their methods for making the judgements and decisions and ask themselves: Have we checked all the benefits, are we sure of the costs, do we have a plan to handle the change? It seems as if requiring more formal considerations have gradually won acceptance in the EU directives, but still there is a huge gap to fill to enable taking the NEBs (Non-Energy benefits) into account. The recent IEA work is however a good start.

The business-models are often inadequate and the policies to remedy these are not sufficiently developed. Providers still mostly argue with the return on energy efficiency investments and energy cost reductions. This is not wrong, but not sufficient either. Yes there is a need to develop financing, regulations and incentives, but the real problem is that energy efficiency is sold by specialists on different sorts of technologies and seldom by specialist on packages of energy efficiency measures. Yes there are Energy Service Companies (ESCO) and energy Performance Contractors (EPC) but they are too few and their products are often developed for big customers rather than small (Nilsson and Ruhbaum, 2014).

There is a need for many more and new business models to target many more types of customers and allows for combining many more combinations of technologies. If we are continuing with the present fragmentation we will starve as we sit on the edge of a big table full of good food. If we don't solve this issue there is not a market for energy efficiency at all but only several fragments spread over markets for equipment and installations.

Reappraising the attitude to the market

There is obviously a need to make use of the market to reach the full potential but also a problem since it does not happen as easily as it should if people were guided solely by self-interest. There are obviously problems of an objective nature (barriers) that prevents the actions but maybe more problems of a subjective nature that distort or limit the understanding of a profitable offer.

The situation we have to tackle is to develop a new attitude to establish widespread dissemination of energy efficiency since:

1. The customer is rational but rather with his/her time than with money. We have to argue the case for energy efficiency with these features in mind.
2. The market is more complicated than just selling a well-defined product over the counter. We have to organise the business accordingly.

In the neoclassical paradigm the basic assumption is that the market works best without interventions from any side. The choices that people make are carefully considered and people will lose welfare if anyone tries to make any changes. In particular the government should stay out of business.

Nevertheless there are occasions when the market does not work ideally and actions must be taken to restore or assist its function. There have been many attempts to classify the modes of dysfunction of the market and identify symptoms and cures that would at least make the market more “market-like” (Nilsson and Wene 2011). The cures range from low-key interventions with information handling and financial incentives to more sophisticated with actual attempts to at least temporarily replace or boost market functions e.g. by use of technology procurement (IEA/OECD 2003). The problems to handle are normally identified as “barriers” or as “market failures/imperfections”.

BARRIERS

The barriers that prevent the uptake on the market have been identified and analysed in a multitude of models. We will not discuss these in any detail here but just mention a few of the barrier categories in order to ask how relevant they are, which measures are normally taken to overcome these barriers and how this could change with different approaches to the market organisation and customer relations. Would it be possible to reconcile the traditional barrier view with a more behavioural one – a new look at the market?

The standard (neo-classical economic) viewpoint says that it is legitimate for governments to intervene in the market to remove or reduce barriers if (and only if) they result from market failures. The legitimacy of government intervention and the different types of barriers are discussed in IEA/OECD (1997), see Table 2.

The “economistic” view emphasizes that deployment policies should remove or reduce barriers and then leave the rest to the market. Considering how much there has been written about these barriers, their nature and possible solutions there are two observations to be made.

- The first observation is that there has been an amazing amount of policy interventions which are trying to address the above mentioned market failures over the years since the first oil-crisis some 40 years ago. These policy interventions mainly focus on the removal of individual market barriers to rational behaviour with the assumption that once these barriers have been removed, actors will behave rationally.
- The second observation is that the acceptance of energy efficiency measures is however still frightfully low in light of the size of the potential. They just do not match.

MARKET FAILURES

Climate change is the dramatic evidence of market malfunction, but the imperfections, where the market even under the best circumstances might yield a less than perfect outcome, has been known for quite some time. Francis Bator wrote about it already back in some 60 years ago (Bator, 1958). When such market imperfections occur there is, also to neo-classical economists, a case for corrections in order to obtain an acceptable result – in order to move towards optimality. In some cases such corrections are possible by using or creating new market instruments.

Bator’s explanations are very technical and relates to the mathematical conditions for (Pareto-)optimality. These have later been better explained in terms of how market actors behave and if there any conditions at all for the market to be established and cleared. Market failures are mostly characterised as follows:

- **Externalities** which are the costs or benefits that affects a party who did not choose to incur that cost or benefit. Such could be both positive and negative, but what we mostly see in relation to energy is the negative pollution from burning of fuels. The standard argument/solution is that such externalities should be “internalised” by putting a price on the pollution for the polluter to pay.
- **Public Goods** are such that consumption of it by one individual does not actually or potentially reduce the amount available to be consumed by another individual”. Public goods include e.g. fresh air, knowledge, national security, flood control systems and street lighting. Many public goods may at times be subject to excessive use resulting in negative externalities affecting all users; for example air pollution and traffic congestion.
- **Principal-Agent** problem occurs when one person or entity (the “agent”) is able to make decisions that impact, or on behalf of, another person or entity: the “principal”. In energy efficiency “split ownership” and landlord-tenant relations has been debated for many years to deal with the cases where one party is making the investments and another is reaping the benefits. This may be a more important issue when so called Non-Energy Benefits (NEB) are explored in more detail.
- **Information, in particular information Asymmetry**, is primarily where one party has more or better information than the other. This creates an imbalance of power in transactions. Most commonly, information asymmetries are studied in the context of principal-agent problems.
- **Market Structure**. An imperfectly competitive structure is where some monopolistic competitors, monopolists, oligopolists, or duopolists exist and dominate the market conditions. A case that is quite frequent in energy supply. The cure mostly requires some regulation.

During many years these market failures have been addressed and there are reasonable solutions within the SEM framework to deal with them, see Table 3. However, the huge potential for energy efficiency improvements still remains.

THE CRUCIAL MARKET FAILURE IS (STILL) UNACCOUNTED FOR

Since it is accepted that information flow could create market failures for instance by being asymmetric, i.e. that the parties in a negotiation have different interests and access to the infor-

Table 2. Barriers – the usual (economic) framing and indication of new approaches.

Barriers		Characteristic function	Relevance For a New look at the market
(Lack of) Information		Must be available and understood at the time of investment in all types of goods and services	Information needs to take cognitive limitations into account
(Transaction) Cost		Decisions to purchase and use equipment requires an effort that can be translated to monetary value	If information is designed to cognitive limitations costs can be lowered
Risk		Performance of a technology cannot be sufficiently predicted or controlled over a given time period	Business models using “nudges” or design of comprehensive deals could mitigate risk
(Lack of Capital for) Financing		Prevents investments even if they are profitable	As above (ESCO, EPC, Renting)
Price distortion		Costs of energy production is not reflected in energy prices, e.g. fossil fuel subsidies	Unchanged
Market Organisation	a) Split incentives	Owner, designer and user are not the same actor	Business models to be developed
	b) Biased calculation	Payback times used in savings calculations are too short or do not take life-cycle impacts of inefficient choices into account	Planning and energy management
	c) Costs (of equipment)	Small volumes of new technologies cannot compete economically with the current technologies	Business models might help
	d) Tradition in business	Established companies guard their market position and shareholders, including putting short-term profits over long-term impacts	As above
(Inadequate, Excessive or Costly) Regulation		Regulation based on traditional practices and established in standards and codes does not keep pace with development	Regulation to be more assisting (nudges see below)
Capital Stock Turnover Rates		Sunk costs or tax rules that require or encourages long depreciation	Unchanged
Technology Specific		Often related to existing infrastructures both with regards to the hardware and the institutional skills to handle it	New business models in particular to deliver service not technology

Table 3: Market Failures indication of approaches.

Table 3: Market Failures indication of approaches. Market Failure	Possible cure
Externalities	Financial instruments e.g. cap and trade, taxes
Public good	Pricing to avoid excessive use
Principal agent	Renting, ESCOs
Asymmetric information	Regulation, labelling
Market Structure	Regulation, Energy Efficiency Obligations

mation which could lead to that decisions are not based on a true and fair ground, we should be aware that such asymmetry could be created in our own minds. Behavioural economics teach about our cognitive limitations.

Unfortunately we have a permanent market failure built in our own bodies and minds, and that is our own inability to take in the information provided to us in an unbiased manner, see Figure 3. The fast system makes a first selection and has a tendency to bias what it gets.

So just by being human we are by ourselves creating market failures more or less constantly. Failures that have to be corrected to make the market work properly.

Means to an end

By qualifying the traditional (SEM-)view by adding elements based on behavioural economics, as attempted and indicated in Table 2 and 3 above, the understanding of “market inertia” may improve. The key to the market will require some new “tricks”, adopting a view on the customer as being a human, with all the limitation that entails.

But just addressing the old barriers and failures with traditional policies and incentives might still be just “more of the same”. Behavioural economics, however, provides new tools for action when the opportunities to overcome the mental biases are recognised. “Framing” of offers in a manner that enables to avoid the more obvious biases is one way, called “Choice architecture”.

Another is to look deeper into the array of Non-Energy Benefits which could be connected to energy efficiency improvements. For many companies such benefits could be more strategic and important and therefore more appealing than only the chance to lower the cost of energy use (Cooremans 2011 and IEA 2014-2). Sometimes this requires taking the perspective of the customer’s drivers rather than the perspective of product performance characteristics. A view called UBR, Unique Buying reason, instead of USP, Unique Selling Proposition (Nilsson 2012, Nilsson and Ruhbaum 2014).

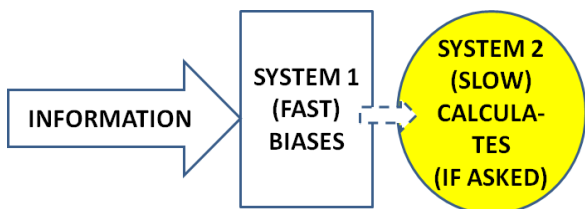


Figure 3. Information flows are systematically distorted (biased) by system 1 before reaching system 2 where the Homo Economicus is supposed to be. (Graphic interpretation of Kahneman.)

FRAMING THE OFFERS – CHOICE ARCHITECTURE

Arguing for energy efficiency is arguing for “improving decisions about health, wealth and happiness” which is the subtitle to the book Nudge (Thaler and Sunstein. 2008). There they recapitulate the basics of behavioural economics and the risks for hasty and biased decisions and lands in a concept they call “choice architecture”. Prospects should be framed in a way that enables an educated choice and avoids making unnecessary (stupid?) mistakes unless we wilfully want to do so. They call it “libertarian paternalism” and a way “to influence choices in a way that will make choosers better off, as judged by themselves”.

Several ways of presenting choices and the way that presentation affects outcomes are explored in Nudge. The book proposes that default outcomes of a situation can be arranged to be the outcome desired by the person or organization presenting the choice. According to the authors this is an underused method. For example a greater supply of transplant organs could be created by a system of presumed consent followed by an opt-out process rather than opt-in. Another principle suggested is laying out various outcomes of a decision in a way that is easy for the person that should make the choice to understand. The offers are framed.

Choice Architecture as outlined in Nudge has a broad remit, from personal decision making, to medical options, to social policy. In the book they have gathered their advice and principles for choice architects:

- iNcentives (who uses/chooses-pays/profits); which partly is about the well-known problem of split incentives but also about cost-perspectives and pricing. What is the real cost of a change of light-bulbs when the pricing of electricity has several parts.
- Understand mapping (Choices related to welfare); Illustrate consequences so it can be correctly interpreted by the user. For instance what does changing of the thermostat yield in terms of temperature (and money).
- Default (Opt-in or opt-out); We have gradually learnt to make energy efficiency the default option and one example is that the computer screen-saver should be installed already

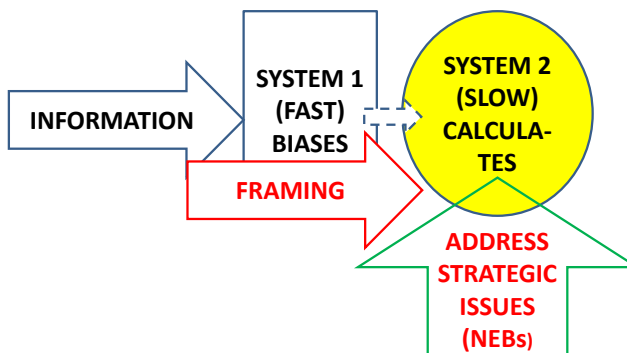


Figure 4. Getting around the information failure of biased decisions by use of framing or by addressing strategic issues.

when unpacking it. You have to opt-out if you don't want it instead of opting-in.

- Give feedback (Understand function); Equipment that uses energy can signal to its user what happens. Plug-out signs or warning lamps can suggest to the user that the equipment want to be unplugged or leave stand-by when not in use.
- Expect errors (Foolproof); The only sure thing about complex equipment is that if there is a chance to make something wrong sooner or later someone will do so. For energy efficiency this is a thorny issue. In most of public spaces it is impossible to switch of the light or the AC when leaving!
- Structure complex choices (Filtering); Models and features should be easy to understand. In Europe the labelling of buildings and equipment are commendable cases.

Application of these **NUDGES** principles may be of good use to frame the offers that people face and help to avoid mistakes regardless of their thinking fast or slow.

ADDRESSING THE ISSUES

The IEA provides a good overview of the benefits that could be connected to energy efficiency improvements, see Figure 5. Many of these benefits have substantial economic value and may be of much greater importance for the decisions that saving energy (and money) alone. They may be strategic in the sense that they have impact on a company's survival, image and competitiveness, but they are either not addresses or recognised in the discussion.

In most companies, energy efficiency has no strategic relevance and there is no link to the core business so that even profitable investments are not taken (Cooremans 2011). Consequently, there is a need to communicate on the multiple benefits of energy efficiency, including the non-energy benefits, create a bridge between strategic management goals and energy efficiency and understand the customer's "Unique Buying Reason".

Conclusion

There is overwhelming evidence that the notion of the economic man, Homo Economicus, to a great extent is a fiction and therefore is not much of use in designing policy measures of any sort. For policy measures to be of use they have to be tailored according to the way that real people think and act with all the limitations that include.

Guidance for how this can be changed is however to be found in behavioural economics and there is good opportunities to come up with a choice architecture that actually assist people in doing the choices that eventually may result in a better use of resources. Applying the experience from behavioural economics also allow us to bridge the traditional analysis of barriers and market failures to actionable policies that addresses the real concerns and overcomes the actual biases that we are all "equipped" with in our thinking.

Both in UK and in the US there have been established offices close to the government tasked to check and develop how policies and incentives work when the cognitive limitations of people are taken into account. All over the world there are developed "Nudge"-networks that consider how incentives can

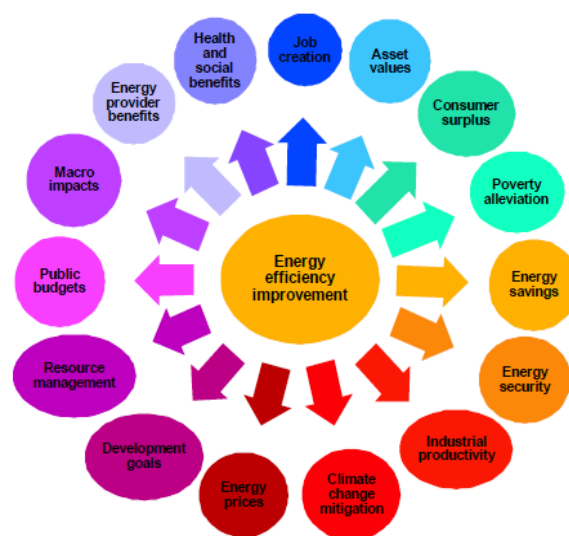


Figure 5. The Multiple Benefits of Energy Efficiency (IEA 2014-2).

be made more effective both in terms of impact and costs. The days when people are assumed to react simply when rewarded or punished via the wallet are soon over. The economic man does no longer rule the game.

There is however still a role for the fictional economic man to play and that is to benchmark how far we can get IF all decisions made were economically rational. Such a benchmark spans the potential for energy efficiency improvements when compared to the present situation. He would then have the same role as colonel Scheisskopf in *Catch 22*. He could plan the parade as long as he does not lead it.

Epilogue

General Peckem looked at him with amazement.

"What do you know about?" he asked acidly.

"Parades," answered Colonel Scheisskopf eagerly. "Will I be able to send out memos about parades?"

"As long as you don't schedule any."

"Can I schedule parades and then call them off?"

General Peckem brightened instantly.

"Why, that's a wonderful idea!"

Extract from *Catch 22* by Joseph Heller, chapter 29.

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