The problem with 'dots':

Questioning the role of rationality in the online environment

Abstract

Regulatory theorists often use the ‘dot’ as a metaphor to help conceptualise their models of a given environment. Lessig famously used the ‘pathetic dot’ in his classic, “Code and Other Laws of Cyberspace” and Murray’s “Regulation of Cyberspace” used interconnected dots to help describe networked communitarianism and to discuss the effectiveness and implementation of symbiotic regulation. However in both models, the dot is seen as a *rational* actor. The rational ‘dot’ is presumed to have a complete set of preferences and the ability to gather all the necessary information in order to make an informed decision that optimally reflect their choices and preferences. However, research from psychology and increasingly economics has shown that humans are often prone to making errors in judgements. The paper argues that using the metaphor of dots to describe how rational actors behave in the digital environment is problematic. Actors deploy heuristics when making judgements resulting in systematic errors and biases, often compromising assumptions of the regulator. Accordingly, the way actors behave in the online environment is not rational at all; thus, models built on rationality start from a false premise.

Introduction

Rational choice describes not only a normative standard, but an empirical model of behaviour. It not only forms the core of the economic approach to human behaviour, it is also the most influential philosophical account of practical rationality. At its core, rationality is rooted in the claim that humans make optimal decisions when clear information is provided. However, there are recurring questions about the scope of rational choice theory in philosophy and, increasingly, in economics. This is because not only do users not have access to all information, they often make no attempt to seek it out. Humans are not omnipotent beings and ‘maximising utility’ is impossible. Human beings do not calculate all possible risks, nor do we compute all the necessary calculations.

In order to conceptualise their theories, Lessig, Murray, and Laidlaw deployed simple elementary models that symbolize how nodes may be affected by regulation.[1] Regardless of whatever difficulties arise, their models represent a major normative ideal; in both, an action is rational if and only if it maximizes the agent's expected utility, and a decision is rational if and only if the action which it is a decision to perform maximizes the agent's expected utility. Whereas the concept of the decision-maker is the rational actor in standard economics, more realistic behavioural models assume the actor is, at the very least, quasi-rational, influenced by the context of the moment of decision-making (Locke 1841).[2] Any actor's preferences and cognition are subject to social contexts to which he has become exposed and accustomed to and to cultural models—including "categories, identities, narratives, and worldviews—that he uses to process information" (DiMaggio 1997, 274). Hoff and Stiglitz argue that "the social context not only primes individuals, eliciting one kind of behaviour or another, but that in a fundamental sense it shapes them—how they think and what they want" (Hoff and Stiglitz 2015).

As a matter of convenience, regulatory theorists often use the 'dot' as a metaphor to help conceptualise rationality-based models. The rational 'dot' in Lessig/Murray models is either presumed to have a complete set of preferences (Lessig, 1998) or the ability to gather all the necessary information in order to make an informed decision that optimally reflect their choices and preferences (Murray, 2007). The first part of the article provides a brief review of prevailing models for regulating the online environment, focussing on rationality's role. The second part analyses the appropriateness of rational actors in regulatory models for the online environment. The third part examines the role of heuristics in judgement making, before concluding with an analysis of potential implications for regulators that assume the online environment is made up of rational actors.

Stepping back through existing cyber-regulatory models

Rationality underpins cyber-regulatory models, featuring in Lessig's lone 'pathetic dot' at one end of the spectrum to the more complex "networked communitarianism" proposed by Andrew Murray to the 'gatekeeper model' proposed by Emily Laidlaw (Laidlaw, 2010). Although some of these models fit neatly into traditional forms of governance, the focal

point has always been on the sovereign power's ability to mandate *de-facto* standards at each layer of the online environment, to gather information, and modify behaviour through various regulatory controls (Morgan and Yeung, 2007). Lessig's assumption that 'dots' stay passive and can be controlled by a variety of regulatory modalities is reflected in his now famous modalities of regulation: law, market, architecture (code) and social norms (Lessig, 1998). As the omniscient or perfectly rational dot in Lessig's model becomes entirely predictable, the regulator should be able to predict the dot's choices. This is largely due to the inference that dots have both the capacity and knowledge to make proper judgements.

Murray's use of the dot metaphor reframes Lessig's metaphor for the digital communications society (Murray, 2007). When a regulator wants to understand how a thing comes to be, they tend to search for some sort of social power acting as an enabler. When looking at Murray's model through this lens, the fallacy in Lessig's claim that nodes are static becomes more obvious. In reality, nodes in the online environment are at any given moment, activated and deactivated, dynamically created and recreated, rather than sitting in a constant form. Murray's work identified that Lessig's thesis incorrectly assumed that regulatory settlements do not come from a 'settled state'. Chaos in the online environment does not give regulators the luxury of time to positively consider policy considerations. Murray also posited that there are clear similarities between nodal governance theory, the theory of the post-regulatory state, Lessig's theory of cyber-paternalism and his version of network communitarianism. What each hints at but does not completely address is where the divergent centres of power are to be found (Murray, 2011). This is one of the keys to effective governance in the online environment. Accordingly, the Internet Gatekeeper in Laidlaw's model holds a particularly important position. Laidlaw argues that, "pursuant to network gatekeeping theory online, gatekeeping is the process of controlling information as it moves through a gate and the gatekeepers are the institutions or individuals that control this process" (Laidlaw, 2010). Murray adds, "Internet gatekeepers are being used to regulate in accordance with the traditional nodal governance model: the harnessing of communicative power by external regulators to achieve a regulatory settlement through the capture of a key gatekeeper as a regulatory proxy" (Murray, 2010)

However, transposing Laidlaw's gatekeeper model for nodal entities and applying them to individual users would result in a model so complex "that the effects of regulatory intervention cannot be predicted." (Reed 2012, 220) In order to have an effective regulatory framework, regulators would be forced not only to understand the complexities of interactions between users, but that user's community's values and their norms. The regulator would have to understand the normative demands of every regulator in every jurisdiction with a claim over the user's interactions with both markets and code (Reed 2012).

All of the aforementioned approaches all consider technology as the determining factor in user behaviour. Unfortunately, this sort of techno-determinism undermines user autonomy (Black 2001). If Murray is correct in his claim that dots are "active", and if each dot in Laidlaw's regulatory matrix is a gravitational node, then there must be some validity to criticism that "agency" be imputed solely to technology, without considering the role of the Internet actor *in relation to* the technology used by Internet actors in the active matrix. If one was to adopt Lessig's model, using code to control behaviour would be a moot point if users migrate away from a specific technology *en masse*. Furthermore, if users are governed by powerful nodes in a network then the assumption Laidlaw makes is that users must visit a specific gatekeeper. Murray goes to lengths to admit that his theory does not address this. Reed suggested that lawmakers "examine the law-making proposal from the point of view of the cyberspace actor" (Reed 2012, 221) before asking two questions: Firstly, will the actor respect the lawmaker's authority over this area of cyberspace activity? And secondly, will the actor recognize the obligations set out in the law as having some sensible meaning? Secondly, Reed calls for, "lawmakers to understand the environment in which the cyberspace actor is operating" (Reed 2012, 221).

It is not clear whether Reed is referring to the "environment" inclusive of both "real world" and online environments or whether he is simply referring to the cyberspace environment singularly. He argues that a heuristics-based (Reed 2012) approach to law-making will "greatly increase the probability" of compliance in the online environment. Furthermore, Reed relies on the social norm that people generally like obeying the law, but argues lawmakers should adopt the approach "as part of a wider normative framework that

guides the activities of cyberspace users". This leads to an interpretation of Reed as only referring to the use of the heuristic approach in the online environment.

Reed correctly asserts that current approaches to regulating cyberspace activity at 'user level' ignore other normative pressures on the actor, generally accepted cyberspace norms, other rules by that lawmaker; and by other lawmakers which claim jurisdiction over the actor's activities. This approach, in a subtle way, still views cyberspace in the same light as the early cyber-frontiersman: that the Internet is to be viewed in isolation from the real world. Lessig and Zittrain focused on the "technology" behind the Internet, yet Murray and Laidlaw's focus on nodal governance still focuses on 'gatekeepers' as agents of control. Both Murray and Laidlaw's theses are limited to regulation of a dynamic matrix. Reed views cyberspace in the same manner, albeit disagreeing with Murray's interpretation of the Internet's complexity as a barrier that cannot be overcome.

Regardless of which regulatory model one gravitates toward, there are two common threads: firstly, they refuse to acknowledge the *behaviour* of the activated dot. The way users behave in the online environment has largely been reduced to generic phrases like 'passivity' or 'activation'. For example, Lessig's theory of the 'pathetic dot' sits in stark contrast to Murray's web of "connected dots" in a matrix. For the network communitarian, the regulator is only warned that actions to affect any single node on their polycentric web, can easily affect all the other nodes within the same system. The second assumption that Lessig (Lessig 1998), Murray and Laidlaw make is that actors in their network ultimately behave *rationally*. In Lessig, Murray, and Laidlaw's theories, the "pathetic" and "connected dots" represent *rational* actors. For Lessig and Murray, the actor's rationality is *crucial* to the decision to regulate. This is because rational choice underpins their regulatory theories – when people are acting irrationally in the online environment, regulation is often justified.

Rationality

If one opens a book on rational choice, one is likely to find advice along the lines of, "look before you leap" or "analyse before you act." For the disinterested rationalist faced with having to make a decision, the only appropriate way to proceed is to list all the rewards/benefits, look for all the consequences/costs, in order to determine the most

appropriate, yet rational way of proceeding. For the rational economist, by comparing options available through the use of probability, outcomes become predictable. Thomas Bayes' theorem showed how a subjective degree of belief should change *rationally* when presented with evidence (Bayes and Price 1763). For neo-classical economists, people's behaviour is explained in terms of rational choices, constrained by prices and incomes. The neo-classical economist accepts individuals' preferences as givens. Predictions about behaviour are rooted in "methodological individualism" and its assumption that people will behave rationally when making decisions under uncertainty (Hayek 1948). These predictions about human behaviour are reduced to formulas which are said to give us insight into how people should behave. However, Bayesian formulas may be a useful and practical mathematic scheme for helping to understand judgement, but they do not describe how most people actually think in their day-to-day lives. For example, people tend to behave differently after they have accumulated wealth, than during the accumulation phase (Kahneman and Tversky 1979).

Rational choice permeates legal theory, legal decision-making, and legal policy-making (Friedman 1953; Friedman & Schwartz 1986; Friedman 1955; Hastie & Dawes 2010). It is based on the assumption that humans not only want to maximise the relative utility of decisions, but will make choices that do so. Within this assumption, there are two descriptive claims: The first concerns our cognitive abilities. Individuals make decisions more or less accurately assess (at least within the limits of the information they have rationally decided to weigh in making said decision), the probability of various possible outcomes to which decisions may lead to, including probability of their own future state of satisfaction or well-being in relation to routes they choose. The second descriptive claim embedded is motivational: Once calculations of net gains and losses are made, each one of us chooses to act in a way that maximises our own utility, arranging our social lives to satisfy as many of these self-desires as possible.

Yet rational choice theory dominated the latter part of the 20th Century's policy landscape (Kelman 2011) and underpins our frameworks for understanding and modelling social and economic behaviour (Blume and Easley 2008). Interpreted as "wanting more rather than less of a good", rationality is widely used as an assumption of the behaviour of individuals in microeconomic models and analysis and appears in almost all economics textbook

treatments of human decision-making. Kelman recounts how rational choice theory has dominated policy design and evaluation before arguing that this needs to be re-thought and moderated. He offers plenty of examples: (i) providing more information about the cost-benefits of consequences fails to change behaviour; (ii) where changing direct incentives (consequences) fails to change behaviour; (iii) where self-control, not choice, is the critical determinant of behaviour. After recognising that full rationality could only be achieved if human beings had unlimited cognitive abilities, evidence began to highlight the fact that human very rarely followed rules initially posited by Bayes and in reality, our behaviour deviates substantially from rationality (Kahneman, Slovic and Tversky 1982; Kahneman and Tversky 1984).[3]

Bounded Rationality

Even the most hardened rationalist would recognise the folly in thinking that human beings were "fully rational Bayesian of subjective utility" (Gigerenzer and Reinhard Selten 2002). The value of expected utility theory as a descriptive model for actual individual behaviour has long been contested (Thaler 1991). Herbert Simon argued that rational utility maximising behaviour is limited by various factors, such as gradual satisfaction in cases of increasing wealth and by the principles of logic (Simon 1957).

Simon's premise of "bounded rationality" suggests that individuals look at a limited range of solutions in a given problem and then accept the first satisfactory one. Sitting in opposition to unbounded rationally, which views people as omnipotent beings capable of computing all of the possibilities, bounded rationality is an explanation for how people make decisions about optimisation under constraints and refers to the rational principles that underlie *non-optimizing* adaptive behaviour of people. Rubenstein classifies decision models categorised as bounded rational models as explicitly incorporating procedural elements of decision making that are absent from standard models of rational choice (Rubenstein 1998). For Gilboa and Schmeidler, bounded rationality is a way to judge decision-making quality: a decision is not rational if it embarrasses the decision maker once the situation is explained to him (Gilboa and Schmeidler 2001). Models of bounded rationality address the following question: How do people make decisions in the real world, where time is short, knowledge lacking, and other resources limited? Bounded

rationality theorists argue that, rather than using unlimited information, we add limiting parameters to help make our decision making easier. Some theorists refer to this as “the repair program” (Bernoulli 1954, 23). Simon’s theory of bounded rationality also demands an inquiry into the following normative question: How do make people make decisions when optimisation is out of reach in an uncertain world and asks several descriptive questions: (1) what is in the “adaptive toolbox” of a person and/or a culture? (Gigerenzer, Gerd and Todd, 1999, 563)[4] This is because some rules of thumb are hard wired, in part, through *evolution*. For example, bees make a collective decision about where to build a new hive (Seeley 2001). (2) What rules of thumb do individuals use? Are these social or individual rules of thumb? Or in the alternative, did the mental shortcut come about through individual learning or through social processes? (Snook, Taylor and Bennell 2004) Rieskamp and Otto determined people select strategies they expect to be successful in solving problems. However, instead of assuming that people deliberately trade off strategies’ costs and benefits, their theory states that the strategies’ expectancies are the result of a *learning* process (Rieskamp 2008).(3) Is the rule of thumb chosen by the subject “ecologically rational”? Our memory determines which rules of thumb can be used, and some have applicability that appears to be correlated with their “ecological rationality”: “A rule of thumb is ecologically rational to the degree that it is adapted to the structure of the environment” and “a heuristic is not good or bad, rational or irrational per se, only relative to an environment. It can exploit certain structures of environments, or change an environment.” (Gigerenzer and Gaissmaier 2011, 451)

The study of “ecological rationality” addresses two related questions: How does cognition exploit environmental structures, and how does it deal with error? Ecological rationalists ask why a mind should waste time and effort in estimating the optimal weights of cues if they do not matter or even detract from performance. It is the idea of rationality measured by *performance*, not *procedure*. This is because human cognition is linked to *past* environments and how we have evolved in response to those environments. A match between a rule of thumb and an environmental structure does not necessary imply that the rule evolved because of that environment. Therefore, research into the ecological rationality seeks to determine in what environments a simple rule of thumb will work better than computing through entire multiple regression models. The second query bounded

rationality asked is a normative one: In what world will a rule of thumb work and in which will it fail? Studying judgement in an uncertain world allows you to ask the empirical question: when is it better to choose rules of thumb rather than having to rely on a Bayesian formula? Secondly, in environments where rules of thumb produce better outcomes than rationality, how can regulators and policy-makers use this information accordingly?

Regardless of the arguments for a bounded rational perspective, most economic theories, including those relating to the economics of the online environment assume that individuals act as rational decision makers solving problems according to objective standards. Bounded rationality is the starting point for behavioural economics which was developed as a reaction to utility theory (Simon 1958). Inspired by Simon's premise of "bounded rationality", behavioural economists hypothesised that the actual behaviour of individuals systematically differs from rational choice.

A Challenge to Rationality

Moving away from well-established theories of rationality and responsive regulation (Baldwin, Cave and Lodge 2011), new theories of "problem-centred" approaches to regulatory compliance have been developed; largely in part to perceived failings in the assumption in classical economic thinking that only economic optimization is in play. This is due to the fact that classical economists have largely ignored a myriad of other factors, large and small, that our minds are attempting to integrate simultaneously. Moreover, increasing attention has been paid to motivations and behavioural (Sunstein and Thaler 2008; Jolls, Sunstein and Thaler 2008) approaches to regulatory enforcement.[5]

Two challenges to the theory of rationality and the rational actor emanate from the field of cognitive psychology. The Heuristics and Biases School (H&B) led by the pioneering work of Daniel Kahneman and Amos Tversky (Tversky and Kahneman 1982) and the Fast & Frugal School (F&F) led by the work of Gird Gigerenzer (Gigerenzer 1999) originated as participants in an intra-disciplinary debate that have yielded insight into both law and policy-making. The H&B School developed from "prospect theory" after Kahneman and Tversky discovered that different framing of the same prospect led to

notable differences in choices (Kahneman and Tversky 1979). A series of experiments revealed that actual choice problems revealed three patterns:

1. Gains are treated differently than losses. Except for very small probabilities, risk seeking is observed for losses and risk aversion for gains (Hirshleifer and Riley 1992).

2. Outcomes received with certainty are valued higher relative to uncertain ones (Arkes and Blumer 2000).

3. The way in which a given problem is formulated has an impact on the outcome (Kahneman and Tversky 2000).

In his speech made when collecting his Nobel Prize, Kahneman stated that his research "attempted to obtain a map of bounded rationality, by exploring the systematic biases that separate the beliefs that people have and the choices they make from the optimal beliefs and choices assumed in rational-agent models" (Kahneman 2003). Before Kahneman and Tversky's research, it was assumed that the conditions for rational models hold and therefore, define optimal reasoning. On the other hand, Herbert Simon had asked a fundamentally different question: "How do human beings *reason* when the conditions for rationality postulated by the model of neoclassical economics are not met?" This is not a rhetorical question: very rarely are the required conditions for classical rationality met. The limits of Simon's theory of bounded rationality can be seen in former US Secretary of Defence Donald Rumsfeld's now infamous, yet apt remark:

"Reports that say there's -- that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things that we know that we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns, the ones we don't know we don't know" (Rumsfeld 2002).

A move away from rationality

By the mid-2000s, several economists argued that any theories about rational choice could no longer be counted on to provide "right" answers. Stiglitz stated that "it simply wasn't true that a world with almost perfect information was very similar to one in which

there was perfect information" (Stiglitz 2010). George Sorros was even more damning: "rational theory is no longer taken seriously outside academic circles" (Sorros 2009). All in all, "cumulative prospect theory", Kahneman and Tversky's revised and update version of prospect theory, and the experiments they had undertaken as the basis of their theory, had shown that assumptions about rationality were, at best, questionable. Individuals are successful in competitive environments without acting fully rational, and this irrationality can ultimately lead to orderly choices (Tversky and Kahneman 1992). To put it even more succinctly, if the conditions for rational decision making have not been satisfied, then it can be inappropriate to reason optimally.

Inspired by Simon's theory of "bounded rationality", a new breed of economist rooted in behavioural science began to make claims that individuals' actual behaviour is hardly rational at all. On the contrary, our judgements are made of different kinds of systematic deviations often referred to as biases, anomalies, or *heuristics*. Behavioural economists began to develop models based in 'bounded rationality' to provide a number of quasi-rational explanations for why individuals deviate from rational decision making. They also developed positive models that recognise the existence of systematic errors in the way people actually behave.

Heuristics

As the studies about judgements were still in their infancy, research was limited to determining how people dealt with monetary risk and determining gambling outcomes through 'small world' experiments. Our use of heuristics have been relegated as inferior to complex methods for inference, or even irrational. Most of the outcomes of experimental 'games' led to poor outcomes when applied to "large-world" scenarios; (Savage 1954) in "small world" games, everything is known for certain. However, when formalised heuristics became seen as indispensable and often more accurate than complex models. In a number of "large world" experiments, simple heuristics were more accurate than standard statistical methods that have not only *the same* but *greater* information (Gigerenzer and Goldstein 1996). Early indications from research designed to measure the effectiveness of heuristics caused Simon to claim that there has been a

“revolution in cognitive science, striking a great blow for sanity in the approach to human rationality” (Gigerenzer Hertwig and Pachur 2011).

Decision theories based on heuristics rejected the assumptions of rational choice theory. Kahneman and Tversky’s work on cognitive thinking made the case that “people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgemental operations.” (Sunstein and Cass 2005, 531) Heuristics are tools people use for a variety of complex decisions; for example, we deploy heuristics in order to assess probability, to predict values, and to decide on whether or not to trust someone. By judging probability of a successful outcome in uncertain circumstances, humans evolved to develop shortcuts to avoid hard calculations through the use of certain “rules of thumb” or “maxims”. ‘Rules of thumb’ usually are expressed in questions of uncertainty with a quantifier like “what are the chances?” or statements like “I think that…” or “It is unlikely that…” Heuristic processing is passive in nature and involves using simple rules for making decisions rather than thoroughly examining all available information under standard economic models. Furthermore, research into this type of psychological phenomena sought to determine what was preventing individuals from optimising their own behaviour. From these insights the psychological phenomena discovered by Kahneman and Tversky has become integrated into economic reasoning. This integration lead to advances in the field of behavioural economics; the study of this psychological phenomena is commonly attributed to the Heuristics and Biases School.

Heuristics and Biases School

The Heuristics and Biases School took issue with the first of the two prongs posited by bounded rationalists. In contradiction to the standard economic model, Kahneman and Tversky claimed that humans are actually quite poor at decision making, regardless of the information available. They expressed concerns that various constituents have proven to be poor at maximising utility; for example, jurors use of mental heuristics when ascertaining facts during trials (Hastie, Penrod and Pennington 2013) and legislators acting on their perceived policy preferences of voters. The reliance by *Homo heuristicus* on mental shortcuts resulted in systematic biases and error in judgements. While the

H&B School also rejected rational choice as a positive model of choice, it embraced rational choice as the normative model for understanding decision making. The H&B School can be characterised as "pessimistic" - they believe *Homo Heuristicus* has limited computational capacities, making him susceptible to making inaccurate judgements even when they have perfect information. This is in part because of our reliance on substitute attributions such as "*availability*", "*anchoring*" and "*salience*". For the H&B theorist, evaluations of consequences are often subject to change. The way we reason is vulnerable to both elicitation and the way the query is framed. For example, whether something is presented as a loss or a gain results in significant differences in responses (Tversky and Kahneman 1981).[6] It has long been recognised that *Homo Heuristicus* acts differently when presented with extrinsic than under intrinsic rewards (Vohs, Mead and Goode 2006; Gneezy and Rustichini 2000).[7] Consequently, less than maximum utility is achieved as we are prone to making both sub-optimal judgments. While our deployment of heuristics may be highly economical and efficient, these biases often cause inefficiencies during times of uncertainty.

Although there are numerous types of heuristics, noteworthy are three classifications developed by the H&B School:

- *Availability*: A cognitive short-cut in which the frequency or likelihood of an event is based on how quickly instances or associations come to mind;
- *Representativeness*: a short-cut in which instances are assigned to categories of types on the basis of overall similarity or resemblance to the category
- *Adjustment and Anchoring*: short-cut in which inferences are tied to initial standards or schemas.

Kahneman subsequently went on to develop a theory of dual processing systems in human thinking. System one is akin to "intuition", tirelessly providing us with quick impressions, intentions and feelings (fast thinking). System two is more akin to reason, self-control and intelligence (slow thinking). System one: "operates automatically and quickly, with little or no effort and no sense of voluntary control" (Kahneman 2011, 20) while System two "allocates attention to effortful mental activities... including complex calculations" (Kahneman 2011, 20). Dual process theories presume there is an interaction

between the fast, associative, low-effort heuristics, and a slow, rule-based information processing mode based on high-effort systematic reasoning. Dual processing reasoning happens routinely in our day-to-day lives. Consider someone needing to fly after two well-publicised airplane crashes. The initial System one reaction might justification the trepidation one has about boarding a plane as "*bad things happen in threes*" or view the incidents as over representative of how infrequent airplane crashes are in reality. Imagine a passenger refusing to board, thinking: "It would be just my luck something bad would happen to me". System two acts to "calm" the panicked voice inside our heads, overriding System One's initial reactions. System two adds reason and a more realistic assessment of the risk of flying. The heuristic approximates the risk of flying when complete information is not available. When facing a hard problem of probability, the deployment of a System one heuristic results in a systematic error: Airplane travel is statistically speaking one of the safest forms of getting from place to place.

System one processing can also be seen in the other broad categories of heuristics posited by Kahneman and Tversky. The availability heuristic occurs when the frequency of some event is estimated by judging how easy it is to recall other instances of this type (how "available" such instances are). This often leads to erroneous conclusions. Slovic et al contend that our affective responses occur rapidly and automatically (in System one), and that people recall the way they felt during a previous experience as a kind of substitute for a more systematic, all-things-considered judgment (Intuition) (Slovic 2002). Kahneman and Tversky determined that when using the "affect heuristic" people "assess questions of probability by reference to affect, and that method leads to predictable errors." (Cushman 2003) For the H&B theorists, these errors interfere with our *rational* decision making. However, when a German psychologist named Gerd Gigerenzer was able to prove that accuracy through full disclosure was often trumped by a "less-is-more" heuristic, the Fast of Frugal School of Heuristics was born. When people rely on one good reason (and ignore the rest) it can lead to much higher predictive accuracy than achieved by full disclosure (or linear multiple regression) (Czerlinski, Gigerenzer and Goldstein 1999; Gigerenzer 1999; Gigerenzer and Todd 1999).

Fast and Frugal School

Kahneman and Tversky published a series of experiments showing that the reasoning deployed to solve a problem exhibited fallacies. They repeatedly emphasized that heuristics are sometimes good and sometimes bad, but virtually every experiment designed by the H&B School was "designed to show that people violate a law of logic, probability, or some other standard of rationality" (Gigerenzer, Hertwig and Pachur 2011). As a consequence, heuristics gained a negative connotation: they were seen as something to avoid. Furthermore, computational models were replaced by one word labels like anchoring, availability and representativeness. Because the nature of Kahneman and Tversky's work focused on the fallacies in our reasoning, it was commonly assumed that heuristics were "second-best approximations" of more complex "optimal" computations, serving the purpose of "trading off accuracy for effort" (Gigerenzer, Hertwig and Pachur 2011). Both schools contend that people use heuristics to make decisions on the basis of limited information. However, unlike the H&B School, proponents of the F&F approach reject rational choice theory on both normative and positive grounds: regulatory strategies should be assessed on the basis of their success or failure in real world environments. Unlike the H&B School that theorises that our reliance on heuristics result in errors that interfere with our ability to make optimal judgements, the F&F school rejected rational choice on the grounds that it is not indicative of how individuals actually process information. The F&F School believes that the mind is composed of a variety of "modular heuristics"[8] or tools that evolved or learned to solve adaptive problems in either the primordial past or as problems present themselves (Gigerenzer 1999; Gilovich, Griffin and Kahneman 2002). These tools often produce lexical, one-cue solutions to judgement making and other decision problems.

As the H&B School takes a "pessimistic" stance on the role heuristics play in our judgement making, the F&F School can be said to be "optimistic" - heuristics are very good at helping us meet our proximal goals. Not only does *Homo Heuristicus* have a biased mind and ignore part of the available information, his mind can handle uncertainty more efficiently and robustly than an unbiased mind relying on more resource-intensive and general-purpose processing strategies. Gigerenzer's work focused attention on the use of just one regulatory tool *when it is appropriate to do so*. The F&F School sought to answer questions about when it is appropriate to leave information out as "surplus to

requirements". This approach was not without its critics. This is because most economic models based on bounded rationality are based on *a priori* hypotheses about behaviour rather than "grounding them in fact established by direct observation." (Simon 1993, Xii)

The F&F School view heuristics cautiously, but "optimistically". Although heuristic consistency is helpful in certain situations it may not be helpful in others; therefore, the F&F School advocate studying heuristic strategies. For example, where an individual imitates the majority using the "imitation heuristic" (Gigerenzer and Todd 1999; Goldstein 2001; Heinrich 2001), the imitation may not necessarily be a bad thing. The F&F School argue that using a heuristic should be examined for "ecological rationality" or measured by *performance* rather than *procedure*. It is an integral part of the F&F School that regulators need to analyse the environment to determine whether the phenomena reflects an unbiased mind or whether the unbiased mind tries to get along with the environment. If it is the latter, then does that environment have other structures that the regulator has not thought of? For example, consider the imitation heuristic. The H&B School argue that imitating someone may result in poor outcomes; however, for the F&F School there are plenty of examples where the relationship thrives on imitation like parent/child, teacher/student, and sergeant/soldier. For the F&F School, heuristics like "imitation" are rooted in our evolution and should be tested for *performance* in various environments.

To explain the impact of the environment of decision making, consider the example of *recognition* heuristic's role in determining the relative size of two cities; for example, Chicago or Chongqing. When asked which city is larger, one will use a simple search rule (search first to see if one recognizes each city), a simple stopping rule (stop looking for other cues to city size if one recognizes one city in a pair but not the other, and a simple decision rule (decide that the recognized city is more populous). Subjects will identify immediately which of two cities one "recognizes" (if one recognizes but one) and then decide, without further reflection, that the recognized city is larger. In Western environments, almost all survey participants choose Chicago even though Chongqing has approximately 33 million residents to Chicago's paltry 2.75 million. Conversely, if one was to survey using the same question within China, most people were likely to choose Chongqing.

As Kelman states:

> "*Users of the [recognition] heuristic co-opt a basic psychological capacity to solve a problem that was not necessarily confronted when the capacity developed, given the features of the novel environment. In this case, the capacity they draw upon is the capacity to recognize, to know whether or not they have confronted in the past an object they are now confronting. They then implicitly "search" within memory to see if a city is recognized because the recognition cue permits them to resolve the novel judgment task, determining the relative population of the cities, since it turns out that a factual feature of the environment they are acting in is that recognition correlates with larger population." (Kelman 2011)*

F&F theorists also argue that there are inherent risks in making decisions. Gigerenzer offered four themes for thinking about risk, uncertainty, and decision making:

1. The best decision under risk is not the best decision under certainty;

2. Heuristics are indispensable for good decisions under certainty; they are **not** the product of a flawed mental system or mental laziness.

3. Complex problems do not require complex solutions.

4. More information, time, and computation are not always better. An example of this would be the "gaze heuristic" (Gigerenzer, Hertwig and Pachur 2011): "The gaze heuristic is the simplest one and works if the ball is already high up in the air: Fix your gaze on the ball, start running, and adjust your running speed so that the angle of gaze remains constant. A player who relies on the gaze heuristic can ignore all causal variables necessary to compute the trajectory of the ball—the initial distance, velocity, angle, air resistance, speed and direction of wind, and spin, among others." (Gigerenzer 2004) Cricketers will use this to figure out how to catch a ball instead of figuring out where the ball will land using complex trajectory calculations (where all the variables are known).[9]

Gigerenzer's concluded that people simplify in order to make decisions in an uncertain world. This is thanks in part to evolution as humans have adapted to use these rules of thumb. For example, Gigerenzer determined that we often use a class of "one-good-

reason" heuristics that order the cues in a given situation. Search comes to an end "after finding the first cue that enables an inference to be made" (Kelman 2011). We tend to choose the alternative this cue favours (Gigerenzer, Hertwig and Pachur 2011). One-good-reason heuristics were actually better at inferring from information beyond mere recognition than optimization strategies developed from having access to complete information. This conclusion was very controversial at the time. Gigerenzer asked his colleagues at a conference which would be more successful: take-the-best heuristic or multiple regression techniques – techniques used to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable. None of his fellow scientific peers predicted the take-the-best heuristics would be more successful.

Gigerenzer's twenty studies confirmed the obvious: human beings are not very good at predicting, but are rather good at hindsight. Ultimately, F&F theorists argue that there are some heuristics that work better on their own and should always be used in isolation, because using heuristics or rational choice only muddles the waters of the mind. Because these heuristics work better on their own, regulators and policy makers should consider designing environments that make responses to the environment more reliable because they are ecologically rational (Goldstein and Gigerenzer 2002). This is because a heuristic's accuracy is *always* relative to the structure of the environment. As Kelman stated: "the ordering of cues like take-the-best may not provide the best fit to the observations, but when predicting new observations, it often outperforms strategies that achieved a better fit" (Kelman 2011). This begs two questions for F&F theorists: how is one's reliance on a heuristics used? And is it possible to design environments that encourage improvements in decision making? (Gigerenzer, Hertwig and Pachur 2011)

Descriptive theories of judgement and decision-making are based on the following psychological assumptions:

- Independent evaluations: Every option has a value that is measured by a single number (options are not evaluated relative to other options, but are evaluated independently).

- Exhaustive search: The value of an option is calculated by using all available information (for gambles, the probabilities and values for all possible outcomes).
- Trade-offs: To calculate an option's value, low values on one attribute (e.g., a value) can be compensated by high values on another attribute (e.g., a probability).
- Objective probabilities: The probabilities used to calculate an option's value are equal to the objective probabilities (the objective probabilities are not transformed in a nonlinear way).
- Objective values: The outcome values used to calculate an option's value are equal to the objective monetary values (the objective values are not transformed in a non-linear way) (Katsikopoulos, Schooler and Hertwig 2010).

Yet in the online environment, the Lessig/Murray/Laidlaw models based on rational choice fail to provide a comprehensive understanding of these systematic biases and errors that come about as a result of humans using heuristics when making judgements. Try as *Homo Heuristicus* might to make good decisions, actors often make mistakes assessing evidence and reasoning from means to ends.

Rationality across Digitally Mediated Platforms

Characteristics of the online environment may challenge assumptions about how we assess and implement judgement and make decisions on digitally mediated platforms. There are occasions not enough information is provided to make a full and rational decision and others where there is too much information to make a good judgement. Excess information may result in actors embarking on limited searches for cues. For example, privacy advocates have long argued that access to personal data should be a system of opt-in rather than opt-out.[10] This policy has the potential to confuse users and policy makers; for instance, a data protection framework where users grant permission to data processors (opt-in) before collecting their data may result in users and policy makers systematically believing that their personal data will have *more* protection. As a consequence, users may voluntarily provide more personal data under the contractual framework required by the website operator. An “opt-in” framework requiring permission

before collecting personal data could result in misapprehension based what is effectively optimal disclosure. If the F&F School is correct, then full disclosure of all the relevant information will produce less optimal results than disclosing the most relevant information. It is also possible that when people disapprove of trading access to personal data for money, they are generalizing from what Sunstein calls a set of "moral principles that are generally sound, and even quite useful" (Sunstein 2005). It may appear to those predisposed to believe that all harms from privacy violations were close to inevitable. It might also happen because fact finders think defendants should have been aware of these purportedly *ex ante* risks – "since those judging behaviour from the *ex post* perspective will suppose that, all along, they themselves did know, and others should have known, whatever eventuated" (Kelman 2011).

Consider the following example: An internet company decides to offer a new service or product to Internet users. Before doing so, it concludes that the best financial model to achieve the most sustainable growth is to offer an app for free online. An aggressive marketing campaign is launched to encourage users can download the app. By agreeing to the terms and conditions, the user expressly grants permission to the internet company to collect, analyse and sell users' personal data to advertisers. Management concludes this strategy after procuring research suggesting only 100,000 people are willing to pay for the app for a one-time fee of £9.99, but that a free download would be an attractive option for tens of millions of users. The company determines that the best way to secure access to users' personal data is to store it in a secure farm of servers. All information is anonymised and proportional steps are taken to secure personal data. The company has to decide whether or not it spends £1million to ensure all of its servers have a basic level of security above that minimum Information Commissioner recommendations or spend £20M to secure the entire server farm at the highest level of security. It concludes that the £20M cost is not justified. How would people react to this? Vicussi states that people punish organisations that base their decisions on cost-benefit analysis, even when a large amount of money is placed on human life (Viscusi 2000). The quirk here is that under Data Protection laws, the company would not be liable at all for any breaches if it had acted on a competent cost-basis analysis; and might even insulate the company from a fine or sanction from the Information Commissioner.

The standard economic model of rationality is based on the concept that obtaining and harnessing complete information is costly for the consumer. Furthermore, it presumes the consumer knows their own preferences and limitations. Consumers make decisions consistent with perceived price stability and given limitations they may face on time, money, and the information they have. The economic term for this is “rational utility maximisation”. On the other hand, behavioural economics describes how people sometimes fail to behave in their own best interests. A person’s behaviour is affected by social determinants like context, preferences, framing, experiences, and exposure. People also exhibit behavioural traits as self-control problems, making inappropriate distinctions between gains and losses, and difficulties in choosing among large sets of options. Behavioural economics experiments helped to identify areas where government intervention may be warranted when the traditional economic models may not. These findings have implications for effective policy interventions. How information is framed in the online environment can have dramatic effects on how users respond to that information. Policymakers must use care when designing disclosures if they want to achieve certain results. Considering Fuller’s polycentric web and Murray’s symbiotic regulation in the online environment, this is especially apropos.

Moving away from the rationality in the online environment

Both Lessig and Murray’s theories assume that the “rational” actor has adapted to his/her environment. If this were the case, then one would only need to study the environment to predict the behaviour of Lessig’s “pathetic” dot. Murray’s active dot matrix does not account for irrationality among actors, and any quasi-rational behaviour is equalised through the volume of actors in the given environment. Again – behaviour *should* be predictable by examining the environment. Predicting behaviour by examining the environment would make the study of heuristics obsolete. The online environment lacks the ability to provide users with the clues normally present during traditional methods of communication. Certain environments lack processing cues, leading users into making systematic errors and biases (Asch 1946; Fiske 1980; Anderson 1981; Wason 1966; Rosenthal and Jacobson 1968; Tversky and Kahneman 1974). Rationality is rooted in the concept that we make decisions when provided with the best information and make optimal decisions when based with clear information. On the contrary, users very rarely

have access to complete information, nor do users seek complete information. Users do not calculate risks, nor compute all of the calculations before doing tasks normally associated with the online environment - entering into contracts, communicating in public forums and sharing personal data.

Secondly the way users make decisions is paramount for understanding how regulators should respond to less than rational outcomes or predictable irrationality by users: If consumers behave rationally, regulation would be unjustified; however, if irrational consumers make less than optimal private choices, regulation may be justified. Determining whether a user is rational has implications for regulatory designs in the online environment. F&F theorists understand some decisions made by actors in the online environment may be completely rational; therefore, regulatory intervention would not be needed. However, the H&B School views the same actors as potentially irrational and that this irrationality would justify regulatory intervention. Yet for Lessig and Murray, rationality is at is a *crucial presumption* about actor behaviour in the online environment and sits at the heart of their regulatory theories. Consider the following example: A user enters into a standard contract with a social network by signing the terms and conditions. Within the contract there is a forum selection clause that stipulates the following:

> *"it is agreed… that all disputes and matters whatsoever arising under, in connection with or incidental to this contract shall be litigated, if at all, in and before an approved dispute resolution provider located in the Republic of Malta… to the exclusion of the Court of any other state or country."*

When opening their account, users are likely to pay little (or more likely no) attention to forum selection clauses. There are possible arguments that this either rational or irrational behaviour. The H&B School would argue that the user is acting irrationally, possibly from an optimism bias that leads users to underestimate the probability that they would ever need to litigate. The F&F School argue that this behaviour is completely rational as it is not rational to spend all the time reading all contracts more carefully given the time and effort that doing takes.

How do we need to decide who is correct? There are not only opposing arguments, but opposing definitions of rationality. For the 'naïve lawyer', a lot is to be determined by

whether a user is acting rationally. If users disregard these clauses, then the regulator might want to intervene. Users may make wrong choices from either the existing contracts available or because the existing contracts may be too limited a set. If the market fails to offer contracts that some consumers would prefer, regulatory interventions may be justified. The consumer may be better off litigating in her home country, but chooses the social network that has a litigation forum in Malta. If there is a range of options, but chooses to ignore the forum then the H&B School would argue that this would be an erroneous decision. Neither of these arguments shows that the regulation is justified.

The second concern regulators might have would be that the market fails to offer contracts that at least some users would prefer. The social network may benefit if litigation is inconvenient (especially if users are not aware of the inconvenience). In this set of assumptions, then the social network has a vested interest in making it harder for users to litigate and will make more money or make offerings more attractive in other ways. Competitors to the social network may also adopt a forum clause to their standard terms and conditions. Does the strength of argument to regulate change if consumers are rational or irrational? First assume irrationality, then rationality. However, this does not suppose users are *rationally ignorant*. The average consumer does not take the time to look at forum selection clauses, and it is perfectly rational for them not to, as it is not worth the time and effort. If users are considered to be irrational, then this confirms the naïve view that regulation might be justified. This does not inform us that irrationality is driving this conclusion. The regulator needs to compare this outcome to what users would do if they were acting rationally. It may be completely rational for them to avoid reading the terms and conditions of their contract. On this occasion, it may be that we need to stipulate that consumers are rationally *ignorant*. Does this eliminate the need to regulate? Of course not, as the market would still unravel in the same way. The race to the bottom would continue and social networks would move towards adopting the same forum clause. Sometimes what matters is the *ignorance*, not the *rationality*. Rational *ignorance* is still *ignorance*. If users are ignorant (for any reason) social networks will *behave* in the same way. This begs the question, ‘why is the “naïve view” so attractive to regulators?’ It affords the opportunity for regulators to design a regulation to solve the problem. In this case, the regulatory settlement would be designed to make users spending more time

reading and understanding forum clauses. If it is rational for consumers not to spend more time reading the clauses, then this regulation would not be cost-justified. In other words, neither regulation nor rationality is monolithic. We have different regulations that influence different margins with different costs and benefits. Regulations may be designed to improve disclosure and regulations may also prohibit or require terms to be clearer.[11]

At a high level of abstraction, one could suggest that both the F&F and H&B schools think about judgement making in the same way: heuristics are deployed whenever judgement or decision making is required and the amount of information available is incomplete or the computational abilities that some people possess are not deployed. Both schools agree that using less-than-optimal strategies is sometimes necessary, because employing optimal methods is not always an available option. For example, catching a ball is entirely computational. If we had all the relevant information (speed, wind, force of which the ball was hit), we accurately calculate where the ball would land. However, using a one-input (gaze heuristic) is a suitable solution to "solve" where the ball will land. By keeping the eye on the ball and adjusting our running speed to ensure that the angle of the gaze (the angle between the eye and the ball) remains constant or within a small range, one can accurately determine where to run to catch the ball. At the same level of abstraction, it is also "functional" to use heuristics. By deploying mental shortcuts, the answers often meet our ends well. However, these ends are often defined and sometimes using them becomes dysfunctional. There is widespread agreement that in a multi-nodal setting, one actor may not treat another's interest as if it was their own. Using heuristics in decision making can be exploited by those who have the capacity to manipulate an environment. Propagators manipulate to trigger a particular judgement or induce a certain type of outcome. This highlights another difficulty with the Lessig and Murray presumptions about rational actors. Any deceit is at the expense of an actor that theoretically (according to Lessig and Murray) engages in gathering fuller information cues or encountered (single or simple) cues that he would have encountered absent the manipulation (Kelman 2013).

Conclusion

This article has outlined the problems with rationality as a premise for regulatory models in the online environment. Furthermore it has suggested that regulators should move away from Lessig's control and Murray's nodal governance models toward a regulatory framework based on the way people actually *behave* in the online environment. This means the regulator has to look at the environments whereby an actor resides and then examine that environment for the likelihood of errors and biases when making decision making. Irrationality may exist through our reliance on mental shortcuts when making decisions. The article has also provided an overview of how the two schools of heuristics view human behaviour in contrasting terms. Using heuristics when making judgements leads to good decisions in some environments, yet in others, we are prone to make poor decisions. As a result, we behave less than rationally and make predictable errors and biases. If we are to make better laws for the online environment, regulators should analyse the types of decisions whereby users are prone to act less than rationally and subsequently form policy where necessary to compensate for any irrational or quasi-rational behaviour.

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Notes

[1] Lessig's famous 'pathetic' dot sitting passively at the mercy of four modalities and Murray's 'active dot matrix'.

[2] John Locke refers to this concept as *Tabula rasa* (often translated "blank slate") is the notion that the human mind receives knowledge and forms itself based on experience alone, without any pre-existing innate ideas that would serve as a starting point. See Locke, J. (1841). An essay concerning human understanding.

[3] The key papers can be found in Daniel Kahneman, Paul Slovic, and Amos Tversky *Judgment under Uncertainty: Heuristics and Biases* (1982). The heuristics-and-biases literature should be distinguished from the literature on prospect theory, which involves the nature of people's utility functions under conditions of risk, not mental shortcuts under conditions of uncertainty. See Daniel Kahneman and Amos Tversky, Kahneman, Daniel, and Amos Tversky. "*Choices, values, and frames*" American psychologist 39.4 (1984): 341.

[4] The "adaptive toolbox" is the collection of heuristics and building blocks an individual or a species has at its disposal for constructing heuristics, together with the core mental capacities that building blocks exploit.

[5] Cass Sunstein became President Obama's regulatory czar and Downing Street formed a Behavioural Science team to implement the concepts put forward in Sunstein's "Nudge".

[6] For example, when two groups of people play a game but, in the first group, it was referred to participants as a "competition game" and, in the other group, it was referred to as a "community game." In the latter, people acted less selfishly even though it was exactly the same game. See Tversky, Amos; Kahneman, Daniel (1981). "The Framing of decisions and the psychology of choice". Science 211 (4481): 453–458

[7] See for example the money experiments in Vohs, K. D., Mead, N. L., Goode, M. R. 2006. The psychological consequences of money. Science 314 (5802), 1154-56 and Gneezy, U., Rustichini, A., 2000. A fine is a price. Journal of Legal Studies 29 (2000), 1-18.

[8] Very broadly speaking, F&F theorists believe heuristics are "massively modularized" (MM) MM is a general theory of mental functioning, designed, in essence, to revitalize the traditional idea that the mind possesses specific "faculties" each of which evolved to solve a fairly particular problem an organism faced rather than a more general capacity to learn and reason. These faculties—mental

"modules"—have a number of critical features. Most important, modules are domain-specific - they are devoted to solving particular problems; mandatory -people do not have any more control over the cognitive outputs of the modules than they have control over whether their knee reflexively rises when it is hit; and/or opaque- not amenable to self-conscious scrutiny; and, above all, strongly encapsulated in information. They draw conclusions only from the delimited set of inputs the module is designed to process, even if other cues might seem rationally relevant to drawing a conclusion.

[9] "Trajectories" Available at: http://hyperphysics.phy-astr.gsu.edu/hbase/traj.html#tra3 Accessed 12/02/2014

[10] Directive 2006/24/EC of the European Parliament and of the Council of 15 March 2006 on the retention of data generated or processed in connection with the provision of publicly available electronic communications services or of public communications networks and amending Directive 2002/58/EC

[11] Carnival Cruise Lines, Inc. v. Shute, 499 U.S. 585 (1991), the court enforced the clauses. The court declined to consider the adequacy of passengers' information about those forum selection clauses. "Respondents have essentially conceded that they had notice of" that provision. What the respondents conceded was "the respondents do not contest… that the forum selection clause was reasonably communicated to the respondents, as much as three pages of fine print can be communicated." Respondents concede regulations aimed at greater communications might not be beneficial. But other regulations (such as prohibiting these clauses) might still be beneficial.