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Head or Heart...How Do We Choose? An Integrative Model of Analytic/ Intuitive Processing Dynamics In Real-World Task Prioritisation Decisions

Summary (144)

Many decisions, especially in business, are concerned with use of constrained resources. Classical theories tell us that rational individuals will weigh-up available information and optimise utility. The problem with classical theory is that it does not always match reality, and people are often not, as has been long-established, strictly rational. Designing tools, processes and systems that reflect how people naturally think and act, could result in higher quality decisions and more consistent results. Developing the required level of understanding is dependent on representative models of mental processes used in the complex contexts found in the real world. In this paper a new variant of dual-process theory is presented (default-supplementary) which helps to resolve some of the contradictions and controversies in current formulations of dual processing. Ongoing research into how individuals make decisions under real-world conditions is discussed, to receive feedback and guidance.

Track

Track 18: Organisational Psychology

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Development comments

This research is an ongoing project that is entering the empirical data gathering phase. As such it is probable that significant further progress will have been made by the time of the conference, in which case information on specific development of methods and possibly initial results will be available for discussion.

Introduction

Many decisions, especially in business, are concerned with use of constrained resources: decisions of what to do now, what to do later, and what not to do at all. Classical decision theories tell us that rational individuals will weigh-up available information and optimise utility. Much management theory is based on people doing exactly that, whether involving a manager's own decisions, or decisions made by employees, customers or suppliers. Significant resources are invested in support of consistent, objective decision making. The problem with classical theory is that it does not always match reality. People are often not strictly rational, they have biases, take shortcuts, invent missing information or answer a different question.

A popular area of research in psychology and economics concerns the nature of these "irrational" decisions and represents a significant opportunity. The application of dual-process theories could result in higher quality decisions and more consistent results. More specifically, improved prioritisation of tasks can impact any area where constrained resources are employed, such as strategy formulation, financial investment, maintenance of physical assets and project management. Developing the required level of understanding is dependent on representative models of mental processes used in the complex contexts found in the real world, rather than the controlled conditions of the laboratory.

This developmental paper describes ongoing research into how individuals make decisions under real-world conditions, to receive feedback and guidance. It discusses the main psychological theory being applied in this area, i.e. dual-process theory (DPT) which frames cognition in terms of two distinct types of processing, i.e. intuitive (System 1 or Type 1 processing) and analytical (System 2 or Type 2 processing). Moving on from either/or theories of these two types of processing (Evans, 2007), the discussion moves to how they interact (Hodgkinson & Sadler-Smith, 2018). In this paper existing models are integrated into a new proposed theoretical framework which better reflects empirical results and helps to resolve ongoing controversies (see 'Interactions between systems' section below). Based on these theoretical proposals the planned methodology of the research is described.

Two ways of thinking: Dual-process theories

Philosophical discussion relating to differing modes of thought date back many centuries (Frankish & Evans, 2009). Theories based on empirical evidence appear more recently, in the mid to late nineteenth century (Cassel, Cassel, & Manning, 2013) when psychology arguably moved from a branch of philosophy to an independent science (Collin, 2012). William James and Sigmund Freud, while working with very different focus, noted that when analysing conscious thought processes, awareness is not constant: gaps exist. Freud considered the "unconscious" as making up the majority of "psychical" life, stating that "consciousness is only ever a very fleeting state" (Freud, 1949, p. 188). James (1892) coined the now familiar phrase "stream of consciousness" to reflect the invisible depths and relentless flow of the human mind. This sits in contrast to classical economics, built on the idea of humans as "rational agents", maximising utility using all resources at their disposal. Herbert Simon

demonstrated that decision makers tend to balance the effort involved with the likely quality of the decision, an approach he called “satisficing” (1956) and theorised in terms of “bounded rationality” (1984).

The first reported use of the term “Dual Process” was in explaining how responses to a question could be manipulated by how the question is asked (Wason & Evans, 1974). Schneider and Shiffrin gave one of the most compelling accounts of how dual processing could work (Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977) in detailed experimental evidence and accompanying explanations for how a task can progress from an effortful, controlled activity to ease and automaticity through experience and practice. The resulting model used associative memory and cognitive control to define the two “qualitatively different” methods exhibited. Sloman (1996), also presented empirical evidence in support of a model based on associative mechanisms. Key to his reasoning was the phenomenon of holding two different opinions simultaneously, even when one can be demonstrably true and the other false. Associations relating to personal experience, particularly related to affect, were highlighted by Epstein (1998). The positive contribution of affect to decision making (Damasio, 2001; Damasio, Everitt, & Bishop, 1996) has helped to shift opinion from intuition as a suboptimal evolutionary throwback to an adaptive cognitive resource (Hofmann & Wilson, 2010). A “systems” classification of these processes was proposed by Stanovich and West (2000), a position adopted by Kahneman (2012), and also supported by theories originating in neuroscience (Lieberman, Jarcho, & Satpute, 2004). Neurological evidence for two independent neurological systems has not been conclusive however, and more recently the existence of overarching networks has received support (Baars, Franklin, & Ramsoy, 2013; Bressler & Menon, 2010; Fox et al., 2005). The network approach brings together established theories relating to working memory (Baddeley & Hitch, 1974; Koshino, Minamoto, Yaoi, Osaka, & Osaka, 2014), attention (Norman & Shallice, 1986; Petersen & Posner, 2012) and modularity (the specialisation of brain areas) (Fodor, 1985) that explain the flexibility and ambiguity of the structures used by mental processes.

DPT doesn’t describe a single theory, but a broad grouping of different ideas. The range of terminology used and attributes assigned to the various DPT models available has been a source of criticism (Keren & Schul, 2009).

Evans (2008) groups features from various theories under themes that he termed “clusters”:

System 1	System 2
Cluster 1 (Consciousness)	
Unconscious (preconscious)	Conscious
Implicit	Explicit
Automatic	Controlled
Low effort	High effort
Rapid	Slow
High capacity	Low capacity
Default process	Inhibitory
Holistic, perceptual	Analytic, reflective
Cluster 2 (Evolution)	
Evolutionarily old	Evolutionarily recent

Evolutionary rationality	Individual rationality
Shared with animals	Uniquely human
Nonverbal	Linked to language
Modular cognition	Fluid intelligence
Cluster 3 (Functional characteristics)	
Associative	Rule based
Domain specific	Domain general
Contextualized	Abstract
Pragmatic	Logical
Parallel	Sequential
Stereotypical	Egalitarian
Cluster 4 (Individual differences)	
Universal	Heritable
Independent of general intelligence	Linked to general intelligence
Independent of working memory	Limited by working memory capacity

Table 1: Grouping features of DPT into themes (Evans, 2008)

This range of defining characteristics is too broad to be of practical use, so an initial research activity has been to generate a working definition that can then be applied.

Interactions between the systems

Much of the evidence supporting DPT provides a rather “black box” view of judgement and characterizes a decision as either Analytic or Intuitive. Individual preferences (Cobb-Clark & Schurer, 2012; Roberts & DelVecchio, 2000), processing based on constraints (Evans & Curtis-Holmes, 2005) or on expertise (Shiffrin & Schneider, 1977) suggest a more dynamic picture. Several dynamic models of dual-processing have been proposed: pre-selection (PS); parallel-competitive (PC); default-intervention (DI); and a novel variant of dual-process theory which we term ‘default-supplementary’ (DS).

Pre-selection (PS)

Imagine a traveller. They can go by car or train. The decision needs to be made before starting the journey, and though the choice may be an informed one, it is only clear after the fact which was best.

PS (Evans, 2007) suggests that the processing type used is chosen prior to processing, just like the choice between car and train, and can be illustrated as below:

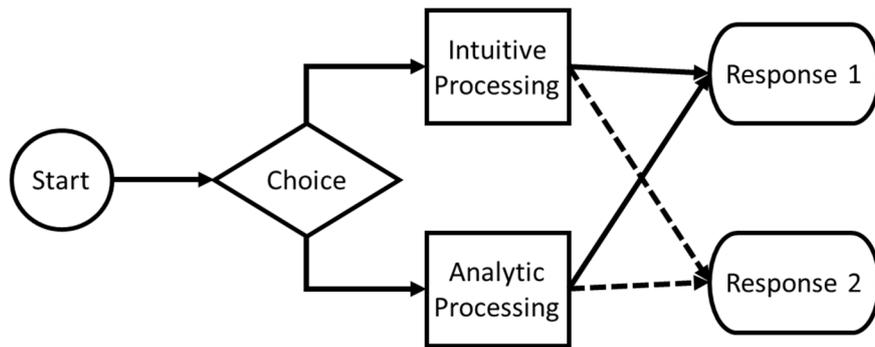


Figure 1: Simple PS process

Parallel-Competitive (PC)

Two people choose to travel together. Neither is sure of the route. Whenever they need to choose a direction, they select based on which of them is most confident.

PC suggests that Intuitive and Analytic processing occur in parallel; a response is chosen after both processes are complete based on the relative merits of each (Evans & Stanovich, 2013; Sloman, 1996), corresponding to the two co-drivers each suggesting the route. The idea that Analytic processing is always “on” aligns with the human experience of almost continuous conscious awareness and control while awake.

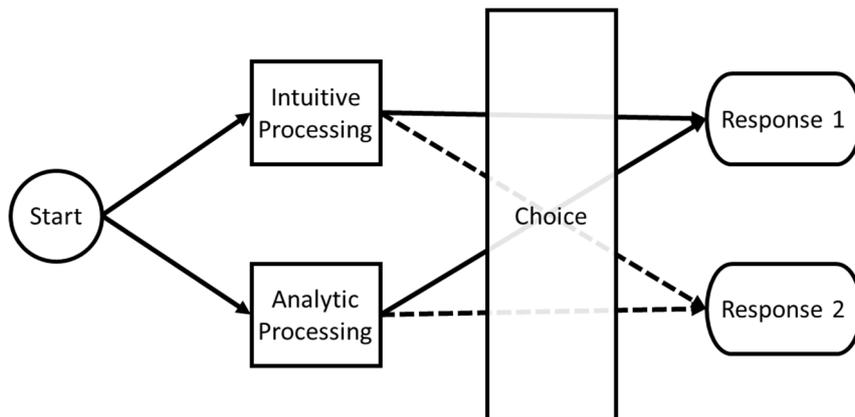


Figure 2: Simple PC process

Default-Intervention (DI)

Another traveller has bought a vehicle that can drive itself using AI. The system doesn't support all roads, and the law demands a human driver in case of emergencies. The car drives itself most of the time, with the human taking control when necessary.

DI suggests that intuitive processing generates rapid responses upon which subsequent analytic processing may or may not intervene, corresponding to human driver in the Automated vehicle. Epstein (2003) suggests that the slower Analytic processing, as it arrives later, is in a position to over-rule inappropriate results generated by Intuition.

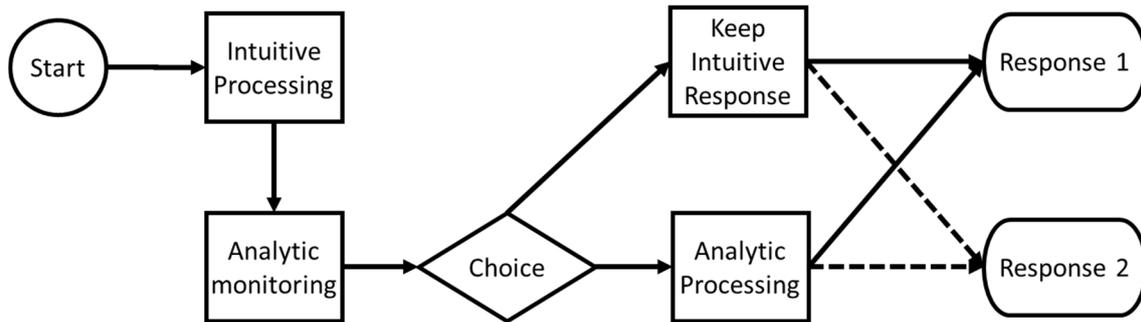


Figure 3: Simple DI Process

Proposed new model: Default-Supplementary

Evidence in support of conflicting models suggests that an alternative or hybrid may better explain the dynamics involved. We offer default-supplementary as a variant of dual-processing which helps to resolve various contradiction and controversies (Hodgkinson & Sadler-Smith, 2018).

Consider a fourth traveller, who has a satellite navigation system providing route and traffic information. When the journey is familiar, they don't turn the system on, but when uncertain or it is important, they use it. As they drive, they receive instructions from the navigation system which they can choose to follow or ignore based on how they feel.

A simple process is shown below. As can be seen, this process includes features of PS, PC and DI. Intuitive processing is always on and evaluates all situations. If Analysis is required, either because there is strong motivation at the start of the process, or because Intuitive processing sees a need, it is triggered. When this happens, both Intuitive and Analytic responses are available and can be selected based on their relative merits.

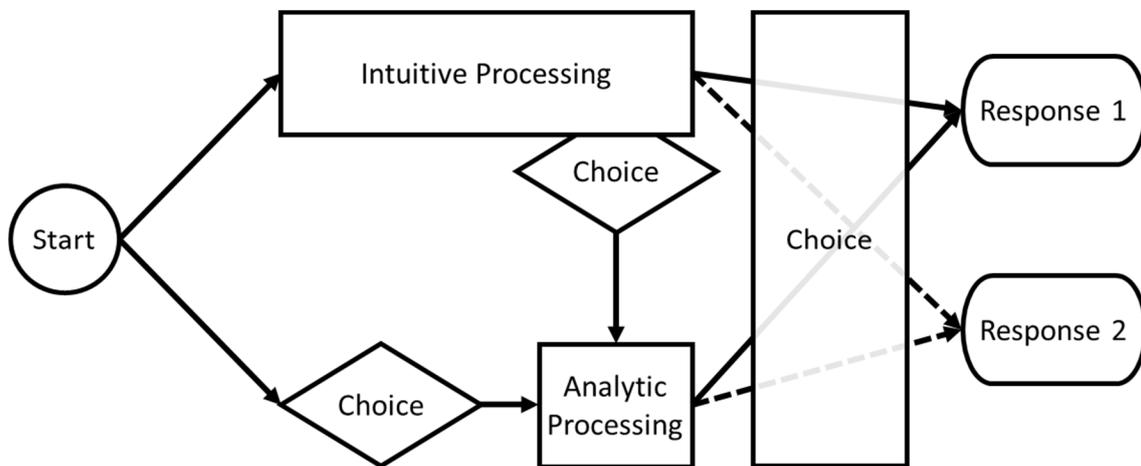


Figure 4: Simple DS Process

Research Design

The objective of this research is to better understand the role of Intuitive and Analytic processing in real world decision making, and the relationships between them. The following research questions are of interest:

Question 1: Can intuitive and analytical information processing activities be identified in real-world decision making

Question 2: in these processes how do intuition and analysis interact?

Question 3: Do these activities align with any of the proposed dynamic models or suggest an alternative?

Question 4: If any models appear to be valid, do any contextual factors affect the validity?

Method

The information processing activities in question are mental, and thus not available for direct observation. Qualitative methods are thus most appropriate to obtain a suitable dataset.

Cognitive Task Analysis (CTA) (Klein, Calderwood, & Clinton-Cirocco, 2010) will be used in order to identify detailed mental processes. More specifically, research will utilise Critical Incident Technique (CIT) (Akinci, 2014), a form of CTA that improves recall by focussing on significant positive or negative events that are more memorable. Semi-structured interviews will be used to add consistency to the data. Recognising the difficulties in obtaining reliable introspective reports, especially in the possible absence of awareness (Wilson & Bar-Anan, 2008) interviews need to make clear that lack of awareness is entirely acceptable. To fill gaps, a basic process as defined by Witte, Joost, and Thimm (1972) will be assumed: (1) Identification of a problem; (2) Obtaining information; (3) Production of possible solutions; (4) Evaluation of solutions; (5) Selection of a strategy; (6) Performance. This model is widely used in the field of marketing in relation to consumer behaviour (Solomon, 2010), and may help to identify stages that have been completed outside of the subject's awareness, i.e. are completely intuitive.

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