Scientific Report

Global Science Organization, Ipsos

Ipsos Dynamic Decision Making Model

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Overview

The latest science shows that the dominant System 1/System 2 narrative in the marketing and policymaking is an over-simplified view -- human psychology is more complex. This matters because in a disruptive digital world, individuals are bombarded with influences and the cost of getting marketing wrong is massive.

The Global Science Organization at Ipsos (GSO) along with Science Team A academic partners has developed a **new model of how people experience the world, make decisions and guide behavior**. The science behind this model provides practical methods to produce sharper insights and smarter decisions. It will help us make sense of data, understand behavior better and help our clients become more effective marketers and policymakers. The purpose of this report is to lay out the model and its scientific basis.

The model is based on a four-month immersion by the GSO team into the latest developments in behavioral, neuro and affective science in collaboration with Prof. Olivier Houdé, Gregoire Borst and their colleagues at LaPsyDE at Sorbonne University and Prof. Vinod Venkatraman, Ipsos Fellow and Associate Professor at Temple University Fox School of Business.

The model challenges the prevailing “dual process” System 1 (automatic) /System 2 (deliberative) approach on the following key points:

1. The most recent evidence shows that the traditional “System 1, then sometimes System 2” sequence is not supported by the data. But rather, a **cascade of multiple mental processes** unfolds.
2. The conventional wisdom that cognitive processing is binary is not accurate, but rather they fall along a continuum or **gradient of cognitive effort** from fast/automatic to slow/deliberative.
3. There is a regulatory or **adaptive control process** in the brain that modulates or guides this cascade of processes to come to a response that is adapted to the context.
4. All of this is deeply influenced by the **context**, **goals**, prior associations and experiences stored in **memory**, and bodily sensations that combine with those associations to create **emotions**.

These findings are transformative because they rebut a host of myths dominating the marketing world including the assertion that gut or System 1 responses will always dominate; that System 1, emotions, and non-conscious processes are all the same; that surveys can detect only System 2/conscious processes and passive neurophysiological measures can only detect System 1/non-conscious process, etc.

New Scientific Findings

The Prevailing Narrative

The idea that there are two distinct modes of thinking, System 1 and System 2, has been very influential in marketing and marketing research since Daniel Kahneman won the Nobel Prize in Economics in 2002 and published *Thinking Fast and Slow* in 2011 [1]. This idea has a longer history in cognitive and social psychology where it is known more generally as Dual Process Theory (DPT) [2]. Kahneman popularized a version of the theory called **default interventionist DPT** that argues that, when making a decision, people will first rely on the more automatic, System 1 (the default), then sometimes switch to System 2 (intervening on the default response).

This approach has spawned a wide array of myths and misconceptions in marketing about the primacy of automatic processing and the role of emotion, and confusion about the relevance and utility of various research methods, including surveys and neuroscience methods. At its most extreme, the presumption among some clients, sparked by some consultants who rely more on popular science, is that consumer decisions are dominated by a cluster of conflated processes that includes System 1, emotions, all presumed to be non-conscious in nature.

Over the years, several researchers have criticized DPT pointing to variability in dual-processing accounts, the vagueness of definition and lack of coherence and consistency in the cluster of attributes for each "system" [3, 4]. Similarly, parallel developments in cognitive neuroscience and developmental psychology have also challenged the core tents of DPT [5, 6]. We focus on some of the core findings in the following sections.

New Behavioral Science Evidence

Cognitive psychologists (including de Neyes) and neuroscientists (including Houdé and Borst) at Sorbonne's Laboratory for the Psychology of Child Development and Education (LaPsyDE) have engaged in a series of systematic studies that seek to challenge the prevailing DPT narrative [7]. A workshop was held with Wim de Neyes and Gregoire Borst of LaPsyDE to explore this literature more deeply. We focus on two key challenges to DPT here:

Conflict Detection: There is new evidence that suggests that people detect conflict and recruit additional processes even when engaged in biased automatic reasoning. Experiments in this area typically ask people to solve problems that are designed to look easy, but in fact are a little more difficult to solve. See for example, the "bat and ball" problem in the box. The common (incorrect) response of $0.10 is often used to illustrate the default interventionist idea as the biased automatic response. However, this implies that participants are ignoring key aspects of the problem and providing a fast response.

> **Bat and Ball Problem**
>
> **Hard Question** (used in most experiments):
>
> *"A bat and a ball together cost $1.10. The bat costs $1 more than the ball. How much does the ball cost?"*
>
> *Answers*: The "automatic" but incorrect response often quickly provided is $0.10. The correct answer is $0.05
>
> **Easy Question**:
>
> *"A bat and a ball together cost $1.10. The bat costs $1. How much does the ball cost?"*
>
> *Answers*: The "automatic" but now correct response quickly provided is $0.10.

To get better insight into the dynamics in these decisions, more recent experiments add an easy version of the bat and ball question and compare response patterns between the two questions. According to DPT, the quick $0.10 response should engage identical processes in both versions of this problem. However, across a range of problems from different labs, research shows that people answering the hard question take longer to solve it, fixate their eyes on the "harder" parts of the problem, recall the hard parts better, express less confidence in the response, exhibit more autonomic nervous system response (increased skin conductance), and show more activation in the areas of the brain associated with conflict detection [8, 9]. Together, these findings challenge DPT both in terms of the sequential "System 1, then System 2" argument, as well as the engagement of regulatory processes in System 1 response.

Multiple paths to "System 1" response. Another implication of DPT is that there is often a single biased System 1 response, which could get overridden by a deliberative System 2 response. However, across the experiments, findings suggest that people are able to get the correct (unbiased, System 2-like) response ($0.05 in the hard bat and ball problem above) very quickly, a response referred to as "logical intuition". To explore this further, experimenters also ask participants to provide a fast response first and a second more deliberative response after a delay. Traditional DPT argues that majority of responses during the early stage should be incorrect ($0.10), which then shifts to the correct response ($0.05) after deliberation. However, a significant proportion of people arrive at the correct response even without deliberation, through logical intuition. These effects persist even when System 2 processing resources are "knocked out" by engaging people in a demanding memory task (e.g., remembering spatial patterns presented on the screen) [9].

Together, these findings suggest that multiple threads of processing (biased heuristic, logical intuition, deliberative) get activated in parallel and that regulatory control processes are engaged fairly early in the decision processing pipeline, presenting serious challenges to default interventionist DPT.

The Role of Control in Adaptive Processing: Neuroscience Evidence

A central dogma in much of the early work in decision neuroscience argued that **rational and irrational behaviors result from the activation of distinct and independent systems for cognition and emotion respectively**. Many of the early highest-impact papers in the neuroscience of decision making reflected this viewpoint; e.g., *moral decision making* [10]; *ultimatum game* [11]; *intertemporal choice* [12]; and *framing effects* [13]. However, subsequent papers started challenging this dogma [6], with evidence in favor of a more distributed and integrated processing across emotional and cognitive regions; e.g., intertemporal choice [14]; loss aversion [15]; and risk strategies [16]. Similar findings also began to emerge in the developmental literature challenging the view that logical reasoning and mathematical cognition were distinct and independent [5]. Instead, the ability of humans to detect conflict, inhibit responses, and shape behavior in a flexible manner was attributed to the adaptive use of cognitive control [17].

Nearly all models of cognitive control posit an important role for regions within the prefrontal cortex [18], which in turn shapes processing in other cortical and subcortical brain regions. In recent years, there has been substantial interest in the dorsomedial prefrontal cortex (dmPFC) – which includes the dorsal anterior cingulate cortex (ACC) - as playing a key role in assessing and/or shaping behavior adaptively based on context [19, 20]. Specifically, dmPFC activation is evoked by task contexts that involve conflict between competing response tendencies or choosing between decision options that are evenly matched [21]. The dmPFC also plays a key role in coordinating activation in other regions [22]. For example, deviations from preferred strategies were associated with increased activity in the dmPFC and differential functional connectivity with regions in the brain associated with implementing these strategies [16].

In summary, the current view argues that irrationality and biases do not necessarily reflect a failure of brain systems for cognitive control; instead, control systems may potentiate distinct choices adaptively depending on context. **In other words, the extent of deliberative**

versus automatic processing is an adaptive function of cognitive control and executive processing.

The Core Model

We have integrated these findings to develop a more adaptive model of human decision making that better reflects this growing accumulation of scientific data.

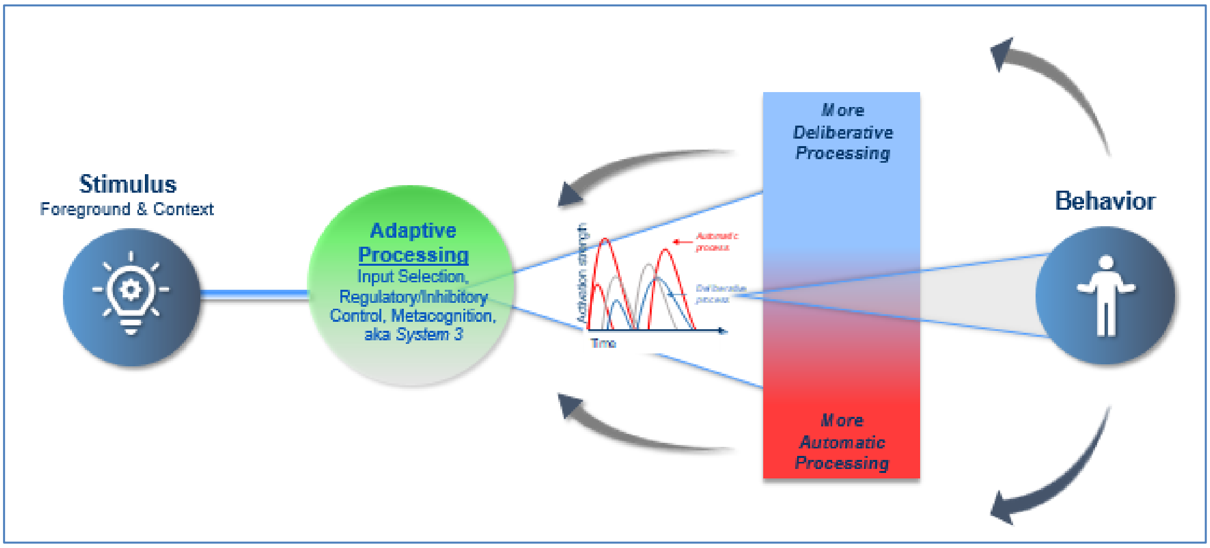

Figure 1 Core Decision Making Model

This model makes three important advances over the prevailing "System 1, then sometimes System 2" idea:

1. New behavioral science evidence shows that when confronted with a decision to be made, **multiple processes** are launched and operate in parallel. These threads unfold, cross-feed, are abandoned, resumed, and iterated across the course of time…from milliseconds to days, depending on the context and the need for action.
2. These cognitive processes fall along a continuum or **gradient of cognitive effort** from fast/automatic to slow/deliberative.
3. There is a regulatory or **adaptive process** in the brain[1] that modulates or guides this cascade of processes to come to a response that is adapted to the context.

The Ipsos Dynamic Decision Making Model

The Core Model (Figure 1) reflects recent decision science research conducted in the lab, but for decisions made in the real world, there are other forces that can profoundly influence these processes, expanding the Core Model into our broader Dynamic Decision Making Model (Figure 2).

[1] Houdé sometimes refers to this as System 3, a label we prefer not to use because it suggests that decision making is binary (only System 1 and System 2). A key insight of our model is that decision processes fall on a continuum of cognitive load, a point endorsed by LaPSyDE.

Contextual Factors in Adaptive Processing

Rationality often assumes that individuals have stable well-defined preferences that pervade across all contexts. Under this view, each option or choice is associated with a fixed subjective utility that depends entirely on the option and the ability of the individual to compute it. Yet, **the limitations of human processing often lead to bounded rationality, where preferences are often constructed in making a decision, and not merely revealed** [23]. An important implication of constructed preference is that choices are often highly contingent on a variety of factors characterizing the decision environment – decision context, task framing, goals, knowledge, attitudes, and states.

Context plays a critical role in decision making by influencing how individuals perceive and process the choice options. For example, the same option (e.g., dictionary with 10,000 words in brand new condition vs. dictionary with 20,000 words that has a torn cover) may be evaluated differently based on whether it is presented in isolation or in the presence of the other alternatives within the choice set [24, 25]. Another classic example is the attraction effect [26], where the inclusion of an irrelevant and dominated "decoy" option (print only subscription to Economist at $129) influences the relative preference between two other choice alternatives (online subscription for $69 versus a combined online and print subscription for $129). In these studies, 68% of the people prefer the $69 online-only subscription in the absence of decoy, but only 16% prefer this option in the presence of the decoy [27]. Finally, preferences are also influenced by how the question is framed – strategically equivalent methods for eliciting preferences (e.g., do you like an item versus how much will you pay for an item) can lead to systematically different decisions [28].

Preferences also depend critically on the goals of the decision maker [29]**.** These goals could be related to minimizing the effort needed to complete the task, maximizing the accuracy of the decision, minimizing the possibility of regret associated with the decision, or a combination of these. **Goals can directly influence the attention paid to stimuli**, making some information more salient than others [30]. **Goals can also influence the interpretation** and meaning associated with the input information, particularly through the explicit integration of prior knowledge and experience [31]. Finally, **goals also influence the degree of control and effort**, leading to differences in the processing strategies and behavioral outcomes [23, 32]. Critically, goals can also be manipulated experimentally (e.g., asking individuals to make decisions under time pressure, or emphasizing accuracy).

Preferences are also influenced by knowledge, long-term memory and self. Preferences are not always constructed, and individuals are likely to have well-formed and stable preference especially when they are familiar with the choice option or have made similar decisions in the past [33]. **Past knowledge or schemas influence the degree of processing** and control associated with different choice scenarios. Additionally, **individual attitudes and traits also play a key role in influencing the degree of effort, salience of goals and framing of input information** [34]. Integrating these into the decision model is therefore critical for understanding the decision process.

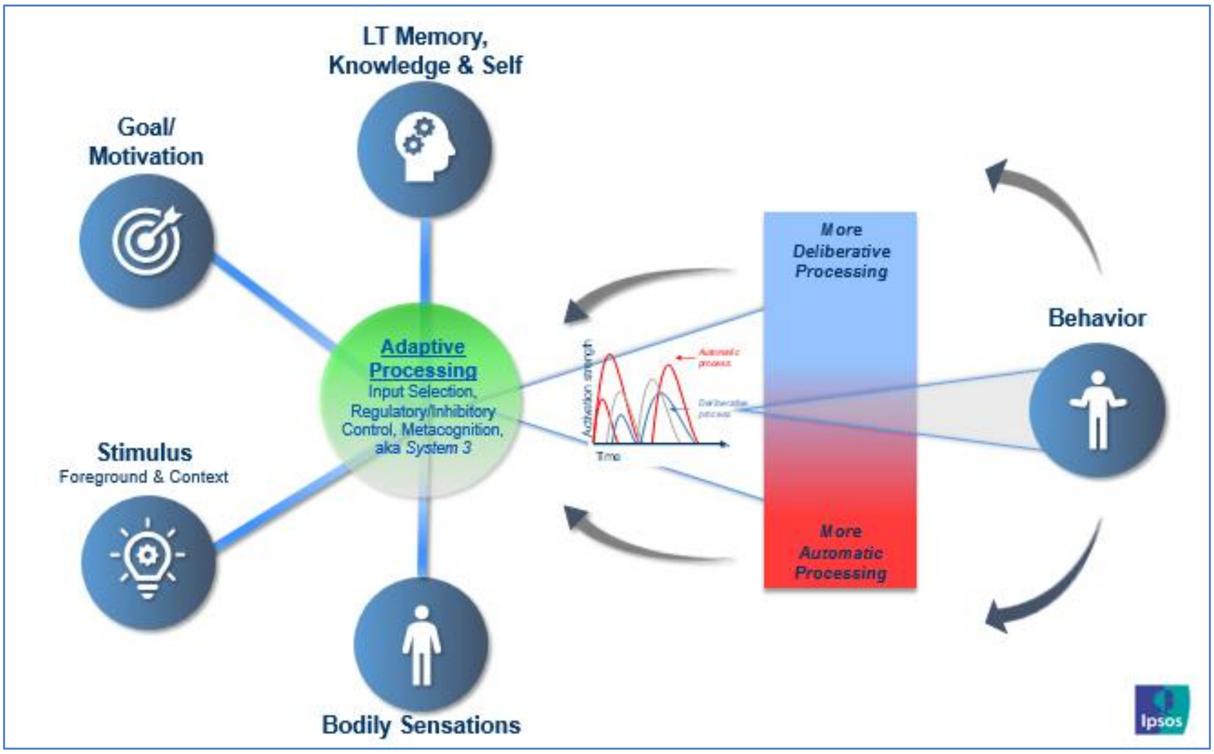

Figure 2 Ipsos Dynamic Decision Making Model

Emotions and Body States

Emotions play a key and integrated role in decision making. In the words of Herbert Simon, "*In order to have anything like a complete theory or rationality, we have to understand what role emotion plays in it".* Emotions can be classified into three broad categories – ambient or incidental emotions which are not directly related to the task, task-integral emotions arising from the nature of the task itself and affective reactions related to the outcome (both experienced and anticipated). These different emotions can then influence goals, beliefs, and cognitive effort [35].

A particularly important framework is the *Somatic Marker Hypothesis* formulated by Antonio Damasio and his associates, which proposes that emotional processes guide (or bias) behavior [36]. "Somatic markers" are feelings in the body that are associated with emotions, such as the association of rapid heartbeat with anxiety or of nausea with disgust. According to the hypothesis, these somatic markers or body states are generated by past associations or by anticipating future outcomes, and can strongly influence subsequent decision-making strategies.

Social Influence on Adaptive Processing

Social cognitive factors refer to "how people make sense of other people and themselves in order to coordinate with their social world" [37]. So social influence is fundamentally a consequence of the **motivation** to succeed in the social environment. In the context of decision making, consumers may use social information to understand the costs and benefits of various choice options (e.g., reading online reviews), to maintain positive relationships (e.g., when deciding based on spouse's preferences) or to maintain self-identity (e.g., identifying with certain groups) [38]. Social influence can be triggered by social **stimuli** (e.g., another person) or the social **context**, it can queue social **associations** in memory, and the emotional displays of other people can deeply affect our own **bodily states** and emotional experience. Therefore, social factors can have a pervasive influence on decision making, resonating multiple components in the model.

The Extended Model

We extend the core model in Figure 1 by integrating context, preference construction, long-term memory and emotions to build a more comprehensive dynamic decision-making model (Figure 2). In this model:

- Stimulus context, goals/motivation, long-term memory/knowledge/self and body states all influence the nature of adaptive processing and cognitive control, leading to engagement of different strategies that lie along the continuum of automatic and deliberative processing.
- These different factors also interact and influence each other (e.g., specific goals can be influenced by long-term memory and lead to different body sensations)
- These factors are also updated based on the outcome of decisions and may have differential influence on similar decisions in the future

Implications for Ipsos and Our Clients

There are three key implications of the new model:

1. Recognize and **challenge the myths and oversimplifications** underlying marketers' and researchers' assumptions about what drives consumer behavior and the role of various forms of consumer measurement in delivering insight.
2. **Change the narratives** around research services and value propositions to fit this more accurate and differentiating representation of the flow of consumer experience and decision making processes.
3. **Update the design of our services and spark the development of new ones** to leverage the model and our neuro, behavioral and data science tools to better understand consumer behavior and provide more actionable insights (total understanding) for our clients. This could include:
   - New methods for detecting where and how marketing actions can disrupt consumer decision making by triggering adaptive processing and inhibitory control, slowing an automatic response and sparking more deliberative thinking to change minds and behavior.
   - Approaches to assess how goals and motivations color decision making and behavior and this can be used to design more persuasive communications
   - Approaches that do a better job linking emotional processes to decision making and behavior.

The GSO is converting these implications into action, engaging internal stakeholders to transform our thinking, services, client solutions, and narratives. In the short-term, the GSO is working on an experimental prototype that could serve as the foundation of a possible service that leverages some of the more central insights from the model. In the longer term, we will be working with Ipsos Service Lines to identify new opportunities to inject broader insights and measurement approaches from the model into current service offerings and to spark new offerings.

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