REDEFINING EMOTION

A Scientific Report by Ipsos

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GAME CHANGERS

REDEFINING THE ROLE OF EMOTION IN DECISION-MAKING

The current report aims at clarifying the meaning of emotion and its implication for the understanding of societies, markets and people. Here we cover the main dimensions of emotion, the classification of discrete emotional constructs, and the methods for empirical measurement. We also reflect on the role emotion plays in human decision-making.

CONTENTS

EXECUTIVE SUMMARY

- Emotion refers to a *relatively brief episode of coordinated brain, autonomic and behavioral changes that facilitate a response to an event of significance for the organism* [1]. Emotional constructs are also defined by the meaning we attribute to them.
- The primary dimensions of meaning for emotional constructs are:
    - **Valence/Pleasantness**, which categorizes the positive versus negative dimension of an emotional response.
    - **Arousal**, referring to the physiological and psychological degree of alertness, excitement or engagement.
    - **Control/Dominance**: the degree of power or sense of control over the affect.
    - **Emotional constructs**, such as happy, angry and sad, are also defined by the meaning we attribute to the emotional response. These are strongly dependent on the context and the culture, and are sometimes unique to a culture and language. Emotional constructs can be mapped onto emotional dimensions and integrated with the measurement of the emotional experience to address empirical questions.
- There are four levels at which emotion impacts dynamic decision-making:
    - **Incidental emotions** that are not directly related to the decision.
    - **Task-integral emotions** that are directly related to and triggered by the current decision.
    - **Affective reaction to the experienced outcome**, as a result of the decision made.
    - **Affective reaction to the anticipated outcome**, that will strongly impact the decision itself.

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.

1. WHAT IS EMOTION?

A. DEFINITIONS

Everyone thinks they know what emotion is. However, the multiple definitions of the term found in respected dictionaries show that the understanding of the concept is so variable that it can be confusing. The Oxford English Dictionary defines emotion as "*a natural instinctive state of mind deriving from one's circumstances, mood, or relationships with others*". Merriam-Webster defines it as "*a conscious mental reaction (such as anger or fear) subjectively experienced as strong feeling usually directed toward a specific object and typically accompanied by physiological and behavioral changes in the body*". The Cambridge English Dictionary says emotion is "*a strong feeling such as love or anger, or strong feelings in general*". Therefore, even across these three highly respected dictionaries, emotion is defined as an instinctive state of mind, a conscious mental reaction, and directly as a feeling—three very different constructs.

These challenges around the concept of emotion are only exacerbated further in the research industry by confusion from earlier thinking that oversimplifies the distinction between emotion and cognition and the popularization of the distinction between System 1 and System 2 processing following the publication of Nobel Prize-winning Kahneman's book Thinking Fast and Slow.

A commonly accepted definition from Davidson, Scherer and collaborators states that emotion refers to a relatively brief episode of coordinated brain, autonomic/interoceptive and behavioral changes that facilitate a response to an external or internal event of significance for the organism [1]. Feeling is defined more narrowly as the subjective representation of an emotional experience. Influential theories of emotion in the history of psychology and neuroscience proposed that we first experience a physiological response to a stimulus (emotion), and then interpret that emotional experience as a feeling or emotional construct [2]. For instance, you may notice an increase in heart rate and sweaty palms, and then interpret those sensations as fear [3].

Over the past decade, there has been an increased interest in the research industry on measuring emotion and its effects on behavior; this is why consumer researchers could benefit from a comprehensive approach and framework around the emotional experience.

B. THEORY OF CONSTRUCTED EMOTION

A recent prominent theory of emotion, the Constructionist approach, claims that that emotions are defined not only by physiological or psychological experiences, but also because we evaluate and attribute some kind of meaning to them. Part of the reason emotions are so difficult to define is because they are constructed of more basic psychological elements, such as physiological sensations, that are not specific to any one emotion and may be common across several emotions. For example, changes in the autonomic nervous system, such as increased heart rate, may be similarly present in the emotional experience of fear or surprise. The intensity of autonomic changes reflects variations in dimensionality of the emotional experience or core affect [4]. The evolution of the theories around the concept of emotion has led to empirical evidence supporting the Constructionist Approach [5]. At Ipsos, we align with these empirical evidences and embrace this theory.

According to Constructionism, emotion is not one definable experience across individuals or even within one individual. Rather, it is a constant stream of different processes that contain different elements, which the brain continues to interpret and adapt within the context of a specific situation [5]. While a Basic Emotions Approach suggests that each emotional construct (happiness, fear, anger, etc.) is independent of the others in its behavioral, psychological, and physiological manifestations (commonly recognized in Paul Ekman's research [6]), the neural and physiological correlates of basic emotions have not been validated [5]. Researchers exploring the subjective experience of emotion have also noted that different emotional constructs are highly intercorrelated both within and between the subjects reporting them [7, 8]. Subjects rarely describe feeling a specific positive emotion without also claiming to feel other positive emotions [8].

Emotional constructs are strongly dependent on context and culture [5]. The construction of emotion is so connected to the cultural experience that, even for emotional constructs that were once believed universal, such as fear and anger [6], it is not even clear whether they have similar meanings across languages [9]. In addition, some constructed emotional concepts, such as "schadenfreude" in Germany, "awumbuk" in Papua New Guiden, "gezelig" in Netherlands, etc. are known to be unique to a culture and a language. Interestingly, Jackson et al. [9] found supporting evidence for significant variation in networks of emotional concepts, predicted by proximity of language family; moreover, they showed a universal structure in emotional networks with all language families differentiating emotions primarily on the basis of dimensions, the main ones being valence, arousal and control/dominance.

Dimensional models regard affective experiences as a continuum of highly interrelated and often ambiguous states.

C. DIMENSIONS OF EMOTIONS

Extensive efforts have been conducted to map emotional constructs onto measurable dimensions. The study of the intercorrelations among emotional experiences, using statistical techniques such as multidimensional scaling and factor analysis of subjective reports of emotional words, faces, and experiences, has often yielded two-dimensional models of affective experience [10]. However, the representation of complex emotions on two-dimensional spaces has been proven to be insufficient, while a 3D framework is best suited to represent a large number of emotions [11].

Furthermore, Osgood et al. [12] evaluated the ratings of several human experiences on fifty different bipolar scales for both English and non-English speaking cultures. Factor analysis showed that the primary dimensions of the meaning of human experience, both semantic and affective, are valence/pleasantness, arousal, and control/dominance [12, 13]. Since dimensional models are the predominant format for emotion-related lexicons, there are multiple datasets available for a wide range of languages [14, 15].

These three main dimensions are defined as follows:

1. **Valence/Pleasantness** categorizes the positive versus negative direction of an emotional response, ranging from extreme pain or unhappiness at one end to extreme happiness or ecstasy at the other end. The “mesolimbic system” in the brain has long been associated with pleasure and reward, but this system also plays a significant role in the experience of negative emotions. It may therefore represent a neural substrate a brain region linked to the valence dimension [16].
2. **Arousal** refers to the physiological and psychological degree of alertness, excitement or engagement. This ranges from sleep through intermediate states of drowsiness and then alertness to frenzied excitement at the opposite extreme. The reticular formation in the brainstem is thought to regulate arousal levels of the central nervous system through its connections with the limbic system and thalamus [16].
3. **Control/Dominance** relates to the degree of power or sense of control over the affect, ranging from feelings of total lack of control or influence on events and surroundings to the opposite extreme of feeling influential and in control.

According to these definitions, “emotion” does not merely include occasional passionate states. Rather, a person is viewed as being in some emotional state at all times, a state that can be described as a region within a three-dimensional space. Emotional experiences, states and constructs can be mapped onto these three dimensions.

2. MEASUREMENT AND CLASSIFICATION OF EMOTIONS

To achieve a total understanding of such complex and multidimensional emotional experience, we can benefit from the triangulation of different types of data, such as self-reported discrete emotional constructs, behavioral observation and passive neurophysiological measures.

A. CLASSIFICATION OF EMOTIONAL CONSTRUCTS

While neural and physiological correlates of Ekman's basic emotions [6] have not been found [5], several models across academic and industry organizations have attempted to classify discrete emotional constructs and map them onto different dimensions [17-21]. As an example, the Geneva Emotion Wheel 3.0 [18] portrays 20 emotional constructs tentatively mapped onto the dimensions of valence and control. Interestingly, extensive efforts have been conducted to map these emotional constructs, showing by means of factor analysis that the primary dimensions of meaning are valence, arousal, and control/dominance [12]. Mohammed, S. M., [14] presented a lexicon with ratings of these three dimensions for more than 20,000 English words. Interestingly, this showed statistically significant differences in the shared understanding of valence, arousal, and control/dominance across demographic variables such as age, gender, and personality. Similarly, Buechel, S. and Hahn, U., [15] developed EMOBANK, a corpus of 10,000 English sentences balancing multiple genres with dimensional classification. Interestingly, they distinguished between writer's and reader's emotions.

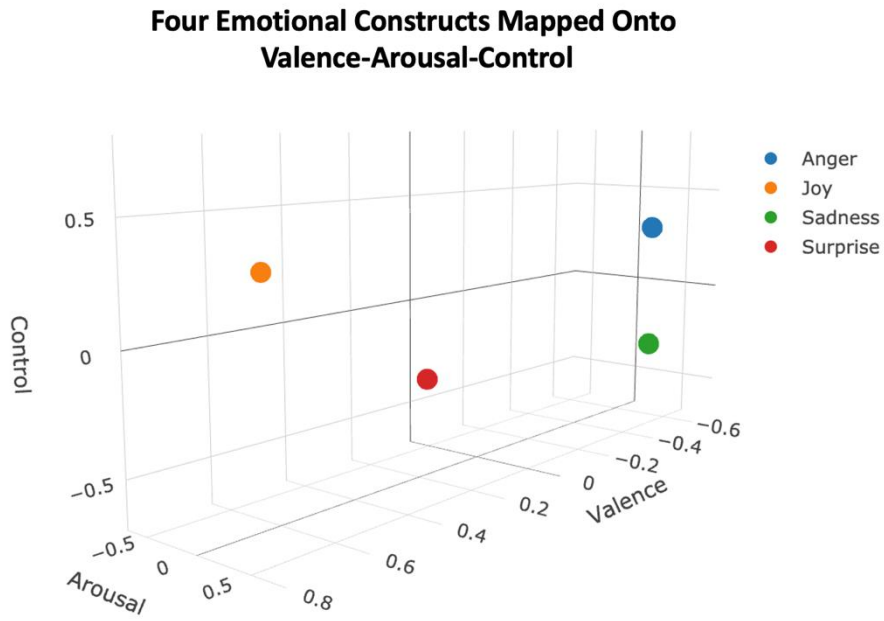
Since emotional constructs are heavily driven by context and culture, we are not aiming to present here an exhaustive list of emotional constructs. However, we consider it critical to map constructed emotional labels onto more empirically measured emotional dimensions. This classification of emotional constructs provides a good understanding of the resulting emotion and an empirical framework where different complex emotional constructs can be measured and compared. The measurement of valence-arousal-control is comparable to a zip code; while it might present some variability on the exact location of the emotional construct, it does provide an accurate picture of an area.

For instance, some examples of commonly used emotional constructs are sadness, joy, anger and surprise. These emotional constructs were first mapped onto these three dimensions by Russell and Mehrabia [22] through the rating of two independent samples of n=200 and n=300 in the United States (Figure 1). For example, while joy was rated as high in valence (mean = 0.76, SD = 0.22), arousal (mean = 0.48, SD = 0.30) and control (mean =

0.35, SD = 031), *anger* scored negative on valence (mean = -0.42, SD = 0.22), high on arousal (mean = 0.28, SD = 0.41) and medium in control (mean = -0.03, SD = 0..33). Complex emotional constructs can also be mapped onto this framework for empirical measurement.

Figure 1

Four emotional constructs (anger, joy, sadness, surprise) mapped onto three emotional dimensions (valence, arousal and control).



Source*: Russell and Mehrabia [22] mapped these emotional constructions onto these three dimensions by through the rating of two independent samples in the United States.*

B. MEASUREMENT OF EMOTION

Measuring a person's emotional experience is one complex problem in affective sciences. Regarding emotion, the accuracy of self-reported emotional experience depends on the type of self-report [23]. For example, self-report of current emotional experiences tends to be more accurate than those made somewhat distant in time from the relevant experience. In addition, there are individual differences in awareness and willingness to report on emotional states that are potentially compromising; for instance, individuals with high social desirability may be less willing or capable of reporting negative emotional states [24].

However, it is quite clear that self-reported dimensions, such as valence, arousal and control, capture the largest portion of variance [25]. The dimensional nature of self-reported emotion is so substantial that it is suggested that they are examined before making any legitimate claim to emotion specificity [26].

For the acquisition of these dimensional values from participant's self-perception, several scaling approaches have been employed. The Self-Assessment Manikin (SAM; [27, 28]) became a common instrument that displays dimensional differences by a set of anthropomorphic cartoons on a multi-point scale. However, other assessment systems, such as annotating valence-arousal-control dimensions via Best-Worst Scaling [30], has shown some evidence of higher reliability and discrimination in their scores than rating scales does [31].

Some neurophysiological signals have been accounted in the literature, and employed in the industry, as indirect proxies of some emotional dimensions, namely valence and arousal:

- **Galvanic Skin Response** occurs when the skin transiently becomes a better electrical conductor due to increased activity of the eccrine (sweat) glands, which are in turn related to changes in the sympathetic branch of the autonomous nervous system. It does not reflect a single psychological process but an array of processes such as attention, habituation, arousal, anticipation, and cognitive effort, making it a valuable tool for behavioral and neuroscientific research in many subdomains of psychology and related disciplines. In consumer neuroscience, it has been primarily used as a measure of emotional arousal [32].
- **Facial Affective Response**: While the ability to associate specific facial movements to specific discrete emotional constructs may be controversial if context is not being controlled and kept constant, there is broad consensus that a person's face still provides high quality information about the valence of the experienced emotion with high temporal precision In fact, valence ratings have been correlated with facial electromyographic measurements of the corrugator and zygomatic musculature [33, 34]. Corrugator activity increases incrementally with negative valence ratings regardless of the specific affective state described by the subject. Conversely, zygomatic muscle activity increases incrementally with positive valence ratings.
- Similar to valence, **action tendencies** (approach/avoidance) are also frequently referred to in the consumer neuroscience industry

regarding the role of emotion in decision-making. It refers to whether the emotional experience impacts behavioral drive in an approaching or avoiding manner. One particularly popular measure in decision-making and market research is the Frontal Alpha Asymmetry (FAA), extracted from the electroencephalogram (EEG) spectrum. It refers to difference between frontal alpha activity in the left and right hemispheres [1].

C. INTEGRATION OF EMOTIONAL MEASURES

Recently, Balan et al. [35] conducted a comparative analysis between different machine learning and deep learning techniques for classification of emotional constructs into categories using the physiological recordings and subjective ratings of valence, arousal, and control from a database of emotional pictures and videos. Inspired by academic efforts of the past decades, Ipsos developed a database of audiovisual emotional stimuli classified according to the three main emotional dimensions: valence, arousal and control/dominance [36]. Multichannel data has been collected on this ground truth database as a reference for construct validation [37]. This classification approach could advance affective computation, potentially leading to groundbreaking applications within Ipsos.

3. THE ROLE OF EMOTION IN DECISION-MAKING

Research has shown that emotions have great influence on multiple cognitive processes. These include attention [38], perception [39], memory encoding (encoding, storage and retrieval of information; [40, 41], and associative learning [42]. Importantly, emotion is key for the activation of a motivational system of action tendencies (such as approach or withdrawal behaviors [43]). In fact, the word emotion comes from Latin “emovere”, which means to stir up, or to move. The origin of the word emphasizes action and thus the relevance of emotion in driving behavior. Therefore, exploring the role of emotion in decision-making is a crucial and complex task that involves several elements.

A. MISCONCEPTIONS AROUND EMOTION IN DECISION-MAKING

The popularization of the default interventionist dual process theory (DPT) of decision-making has generated an oversimplified view of the role emotion plays in making decisions throughout the market and opinion research industry. The dichotomy of System 1 and System 2 processes posits that there are two streams that process information and make decisions: a fast, automatic process reliant on heuristics and biases (System 1), and a slow, deliberative process based on rational logic (System 2 [44]). However, it’s unclear how these processes interact and what triggers System 2 to intervene.

Given that emotion has been often regarded as fast and automatic, this seemed to fit well with the notion of System 1 which represents fast and automatic processing. The two have therefore become synonymous with several classifications of System 1 vs. System 2 as a proxy for emotions vs. cognition. This is a misconception.

In the rest of this document, we outline how the misclassification of emotion is linked to DPT and provide a new framework for a more adaptive role of emotions in the decision-making process.

B. THE IPSOS DYNAMIC DECISION-MAKING MODEL

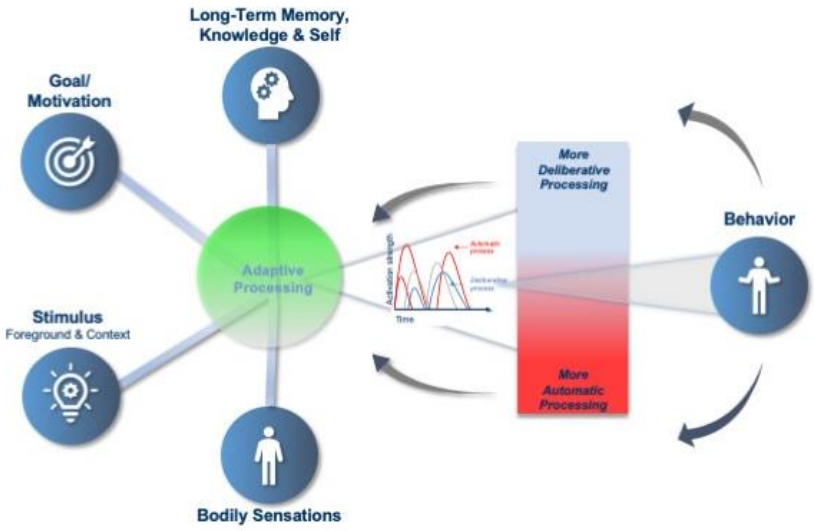
The Ipsos Global Science Organization, working closely with experts from LaPsyDÉ in La Sorbonne, Olivier Houde and Gregoire Borst, and Temple University, has developed a new model of human decision making that reflects growing accumulation of scientific evidence against the DPT narrative [45]. The Ipsos Dynamic Decision-Making Model (DDMM) makes three important advances over the prevailing DPT:

- Automatic and deliberative processes occur not as two separate and distinct processes in a dichotomy, but rather on a continuum [46, 47].
- Context is a critical factor in understanding how decision-making happens. The prevailing DPT theory fails to contemplate the mechanism that governs whether automatic or deliberative processing is engaged. There is a regulatory or adaptive process in the brain (Houdé calls this System 3 [48]) that modulates or guides this cascade of processes to come to a response that is adapted to the context. This is regulated by four different elements:
    1. Stimulus and context
    2. Goals/motivations
    3. Long-term memory /knowledge
    4. Body states

These 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.

Figure 2



Visual depiction of the Ipsos Dynamic Decision-Making Model

C. CATEGORIES OF EMOTION IN DECISION-MAKING

Decisions led by emotion-based decisions have traditionally been portrayed in popular culture as non-adaptive relative to reasoned ones. However, the nature of integral emotion as a guide for adaptive decisions has been shown to be adaptive itself [49]. Decisions led by emotions are commonly shaped by the outcome of previous experiences. This is therefore adaptive by nature and reflected in the Adaptive Processing element of the DDMM. In the words of Herbert Simon [50], “In order to have anything like a complete theory of rationality, we have to understand what role emotion plays in it”. Emotion and cognition are very closely intertwined: they are like the two sides of the same coin.

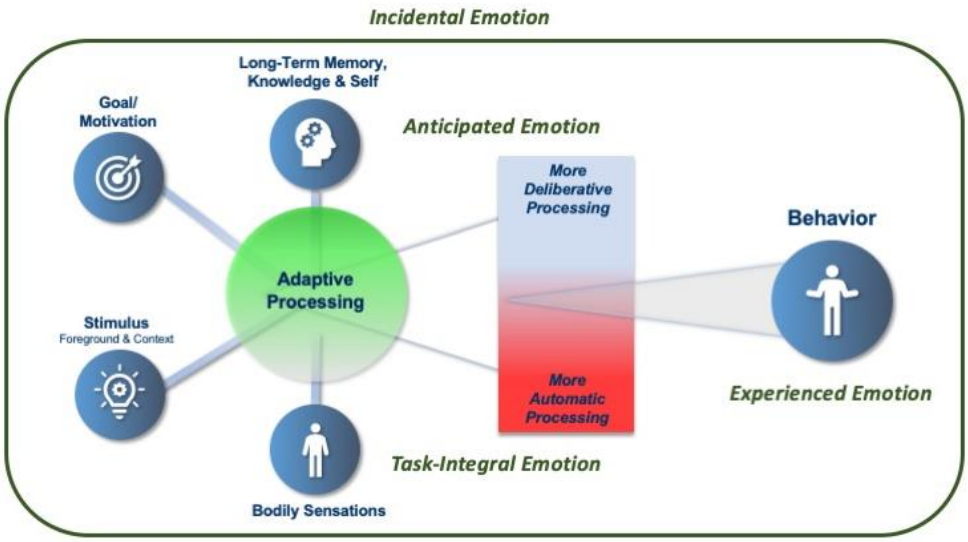
In DDMM, we argue for a broader influence of emotions on decision-making. Borrowing from Lerner, we first classify emotions into four categories [49]:

1. **Ambient or incidental emotions** that are not directly related to the decision. While incidental emotions can be triggered by one situation, those emotions can impact the decision made in a next situation even if that situation is unrelated to the previous one. This carryover effect of incidental emotions occurs without awareness. While not related to the decision itself, incidental emotions impact all elements of DDMM. Mood is an example of incidental emotions. For instance, when the Covid-19 pandemic was prevalent, it can be seen to have impacted a wide range of unrelated decisions made by individuals operating within this context. Some studies have shown that mood, even if unrelated to the shopper experience, has an impact in purchasing behavior. An Ipsos study showed how an unrelated mood-lifting event influenced shopper behavior, and it was also reflected in an increase in physiological arousal [41].
2. **Task-integral emotions** arise from the nature of the decision itself and deeply shape decision-making processes over time. These effects can occur with or without awareness. Task-integral emotions are engrained in adaptive processing of the decision itself, and therefore on all four elements (stimulus/context, goals/motivations, long-term memory and body sensations) feeding into it. In the case of Covid-19, these include decisions involving trade-offs like following social distancing to stop the spread of the virus while weighing up the impact on local businesses and economic consequences. An Ipsos study explored these decision trade-offs in markets at different stages of the pandemic across markets [52].
3. **Affective reactions that occur in relation to the actual experienced outcome**, which will influence similar decisions. If the affective response, or the assessment of such response, is positive, adaptive processing in the same

situation will lead us toward an automatic decision in the same direction. This is reflected in DDMM as the emotional experience following the decision and as a consequence of the behavioral outcome. This would refer to the emotions elicited by a received service in reference to the decision of acquiring that service.

4. **Affective reactions that occur in relation to the expected anticipated outcome**, often based on previous experienced emotions during similar situations, which will have a very strong influence in the strategy and direction of the decision, whether this reaches awareness or not. Emotions linked to anticipated outcomes are deeply engrained into the adaptive processing, particularly to previous experiences and long-term memory, and bodily sensations elicited by the memory of similar previous events. The capacity to detect or measure anticipated emotion is very insightful when evaluating communication effectiveness. This refers to the emotion experienced at the point of purchase or during exposure to marketing communication in the expectation of the use/consumption of a product.

Figure 3



Representation of the different roles of emotion in DDMM

In summary, we contend that emotions play a more distributed role in DDMM, influencing core processing strategies at various levels [53]. For example, certain incidental emotions like fear and sadness increase the amount of vigilance and attention, leading to more deliberative decision strategies [54, 55]. Similarly, some decisions like choosing a car seat for the first child are inherently more emotional than others and lead to differences in degree of effort and processing [54]. Emotions can also influence goals and motivations. For example, given that anxiety is characterized by the appraisal theme of facing uncertain existential threats [56], it is often associated with the motivation to reduce uncertainty. Sadness, by contrast, is characterized by the appraisal theme of experiencing irrevocable loss and motivates one to change the current circumstances, perhaps by seeking rewards [57]. Finally, one of the most profound ways emotion can affect decision-making is via counterfactual thinking [58]. Research in this area has demonstrated that a possible expectation of regret often triggers the kind of inhibitory control that supports more deliberative processing during decision making [59].

CONCLUSION & IMPLICATIONS

It is important to align on the meaning of emotion as a relatively brief episode of coordinated brain, autonomic and behavioral changes that facilitate a response to an event of significance for the organism. Importantly, emotional constructs are also defined by the meaning we attribute to them, and they can be mapped onto three independent dimensions:

- Valence/Pleasantness, which categorizes the positive versus negative direction of an emotional response.
- Arousal, which refers to the physiological and psychological degree of alertness, excitement or engagement.
- Control/Dominance - the degree of power or sense of control over the emotional experience.

The role of emotion in the dynamic decision-making process is crucial to understand human behavior at different levels. There are four levels by which emotion impacts dynamic decision making:

- Incidental emotions that are orthogonal and not directly related to the decision.
- Task-integral emotions that are directly related to and triggered by the current decision.
- Affective reaction to the experienced outcome, as a result of the decision made.
- Affective reaction to the anticipated outcome, that will strongly impact the decision itself.

The capacity to measure these emotional processes and integrate this measurement with other relevant data places Ipsos at the cutting-edge of research.

When it comes to measuring the emotional experience, the consumer research industry often uses the dual process theory dichotomy to differentiate self-reported research methods, both quantitative and qualitive, as measures of System 2 processes, and neuroscience, biometrics, implicit or response time data as “System 1 tools”. However, although surveys rely on respondents’ conscious answers to questions, automatic and heuristic processes are at play and captured in the response, and Ipsos surveys are designed to capture those more automatic processes as well.

On the other hand, while neurophysiological data is able to capture processes that the respondent is not aware of, it also captures responses that have reached awareness.

Cognitive processes are involved in all these different data sources, and emotion plays a relevant role in dynamic decision making at several levels.

Ipsos is proud to combine different data sources, including behavior, neurophysiological measures, survey, and qualitative research for the true and total understanding of markets, societies and people. Some studies have attempted to quantify the predictive value of combining measurement of emotion and other data sources. Venkatraman et al. [60], in collaboration with New York University and the Advertising Research Foundation showed that the combination of neurophysiological measures and self-reported survey data in response to creative executions increases predictive power significantly.

A recent study conducted by the Ipsos GSO Lab [37] suggested that the integration of multiple neurophysiological signals, specifically the combination of GSR and heart rate provides richer and complementary insights. While GSR is effective in measuring emotional arousal, preliminary data seems to indicate that heart rate provides additional information on emotional valence and memory encoding. However, the self-reported interpretation of physiological changes elicited by an event is key to understanding the emotional experience. This self-reported data mapped onto the three aforementioned dimensions with physiological metrics is the path towards a holistic view of the emotional experience.

The promising applications of affective neuroscience constructs are now being prototyped across the Ipsos organization for a wide range of applications, from improving our understanding and prediction of voter turnout, to inducing conflict on a purchase decision through appropriate interventions. We would like to encourage the reader to collaborate with the GSO and apply this framework into specific use cases across the organization.

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