

Cognitive states in analogue and digital consumer decision making-scenarios: empirical investigations of emotions and cognition during information search and evaluation

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Abstract/summary

This paper outlines the research imperative for a contemporary understanding of cognitive and emotional elements of information search and evaluation under conditions of digitally supported consumer decision-making (exogenous cognition – Smith et al., 2021) and without computational support (endogenous cognition). It also considers pathways to delegating information search or the final decision to AI (surrogate cognition). After outlining the basic conceptual structure it briefly describes two key stages of the research; a national representative survey of the UK population (n=500) and a neuroscience supported experimental stage (n=90). It offers some initial findings from the survey as well as a description of expected insights from the experimental stage.

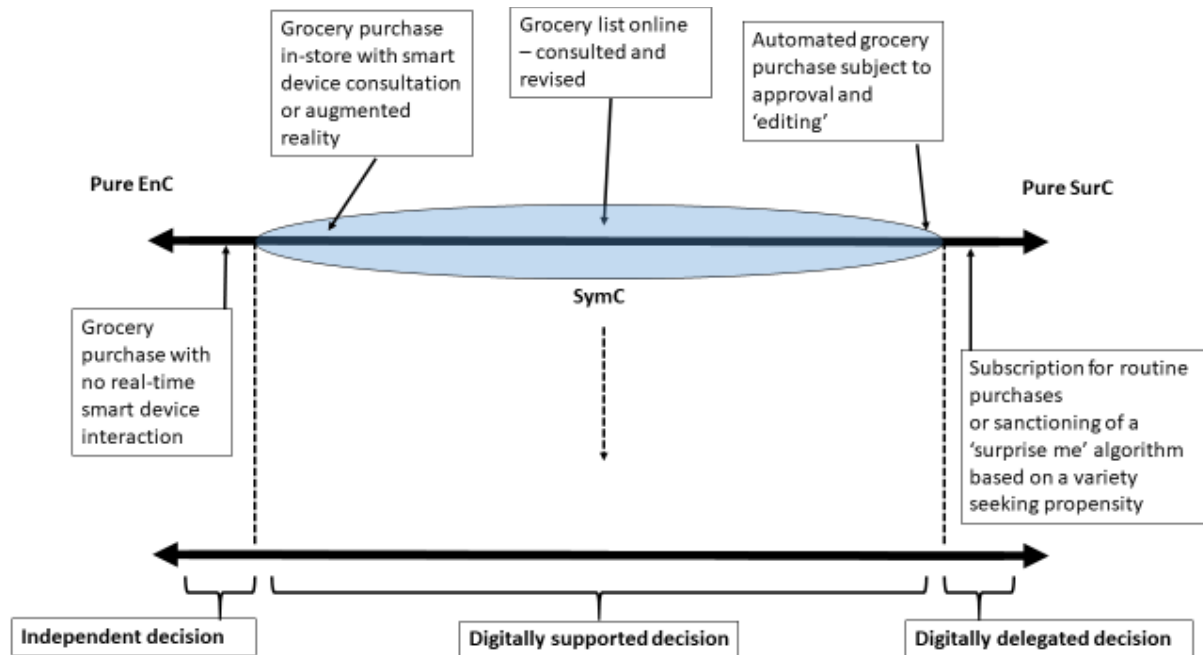
The research imperative

There is research relevant to the differential effects of online vs. online (or blended) decision-making scenarios. However, much of this work is: **a)** now quite dated (e.g. Badrinarayanan et al., 2012; Mathwick and Rigdon, 2004); **b)** uses methods that are somewhat distanced from the actuality without attempting consilience with other methods (e.g. surveys based on imagined scenarios, for example Xu et al., 2022); or **c)** is based on transactional/purchase data alone with no explicit insight into the differential decision-making process, for example Chu et al. (2010). Some of this extant research displays a combination of a) and b).

A contemporary and comprehensive study of the underlying cognitive and emotional state of a consumer during information search and evaluation remains elusive. Mathwick and Rigdon (2004) is an example of work attempting to explore this area but once again, the study is 20 years old and the method relies on highly simplistic/reduced scenarios (indeed, the paper is quite opaque in terms of the specifics of the experiment). There is a dearth of more sophisticated experimental research and structured observational research with notable exceptions. For example, Horr et al. (2022) use neuroscience methods to explore the cognitive signals during information search, evaluation and purchase (although their results are observational, atheoretical, descriptive and not experimental). Chu et al. (2010) among others have established that for the same household or individual decision outcomes can vary according to the channel (online or offline). What we lack is a cogent and thorough understanding of the differential cognitive and emotional states when a given individual shops online or in-store. Smith et al. (2021) provide a theoretical framework, structure and lexicon (see Figure 1) that could inform empirical work in this area but their work has not been empirically actioned and their description of how their ideas might be tested is

speculative. Here we amend their structure to include decision support and delegation specifically.

Figure 1: Cognitive states during various purchase scenarios (after Smith et al., 2021)



There are three proposed states of cognition/decision-making – endogenous ‘EnC’ (someone thinking without the help of technology e.g. in-store), symbiotic – ‘SymC’ - (thinking with the help of a smart-phone or computing) and surrogated cognition ‘SurC’ (where the decision is ceded or completely delegated to machines e.g. an app that autonomously invests money on your behalf). During SymC the consumer is utilizing digital decision support. The ongoing research aims to establish the cognitive and emotional variations between EnC and SymC. In cases of SurC, cognition is exogenous and performed by machine learning and AI after the consumer has consented to this (so, a decision is still being made, namely to cede the decision or not). The realm of SymC is broad and encompasses various scenarios as Fig 1 illustrates. It should be acknowledged that when a decision is supported by analytics and AI other forms of delegation or partial ceding/delegation are likely. For example, a subject may delegate the information search in part or entirely. The relationship between cognitive and emotional drivers and outcomes and delegation is therefore an additional focus of this ongoing research programme.

The research programme reported here aims to address the deficiencies and opportunities identified above. It aims to enhance our understanding by operationalizing the structure proposed by Smith et al., (2021). The research is conducted in a contemporary context by employing various forms of data capture and analysis (see subsequent section). The anvil of this research programme is an experimental study with behavioural economics and neuroscience ‘layers’.

Methods and data

National survey

The nationally representative survey (by age, geography, gender, educational achievement and ethnicity) of UK consumers aimed to answer some discrete research questions and inform the experimental stage of the research; as discussed above, a survey on its own is not adequate. Specifically the survey explores the relationship between decision enjoyment, product characteristics, person specific factors (e.g. knowledge levels).

A comprehensive set of products and services was coded by the research team to create a balanced set of enjoyable, neutral, and aversive purchase decisions, coupled with medium to high levels of involvement. This reduced list was derived from a long list of products and services used in relevant studies and was also cross-checked for representativeness and breadth with UK and Canadian product categories used to consumer spending. An expert panel was also tasked with coding an intermediate list (20 products and services) in terms of the enjoyment levels associated with product use or consumption and the potential enjoyment of the information search (from the perspective of their interpretation of the typical UK consumer). The results of the team and panel coding was remarkably consistent and subsequently borne out by initial analysis of the survey.

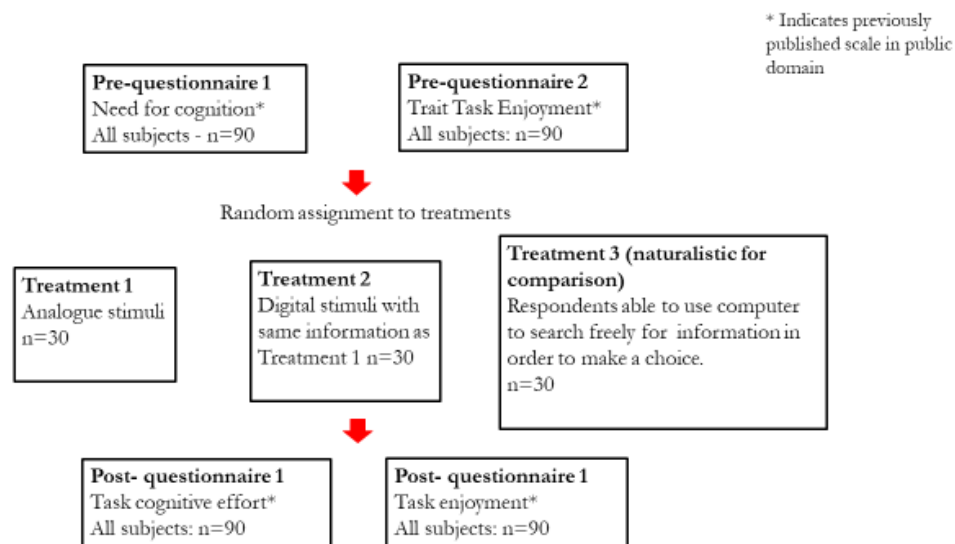
The final set of 12 purchase scenarios/vignettes was used in a survey administered to a representative sample of the UK population (N = 500). Participants expressed their opinions on the enjoyment of information search for each vignette using one item scale (Diamantopoulos et al., 2012; Davidson et al., 2023). Their responses then dictated a pathway with additional questions for the three (enjoyable, neutral, and aversive) information search scenarios (as opposed to the all products in the original vignettes). Additional one-measure items included intention to use an assisting app (Morris, 2000) and the importance participants attached to having control over the final purchase decision (Shapiro, 1994). For participant-specific (enjoyable, neutral, and aversive) scenarios, respondents indicated their likelihood of choosing online shopping and rated factors influencing the decision to use an app, including time available to search (Pentina et al., 2018), the complexity of the search task (Steffel & Williams, 2017), and trust in the decision support app described to them (Glikson & Woolley, 2020).

Neuro-behavioural experiment

In Figure 1, treatment 1 relates to EnC, treatment 2 to SymC, treatment 3 provides a structured observation under strict conditions consistent with the other treatments. SurC is investigated via any subjects who delegate the decision (via a post experiment questionnaire/task). We will employ eye-tracking and may record emotional and cognitive indicators/artefacts via Electroencephalography (EEG). We will also deploy the standard measures and psychographics outlined below. This study follows in the footsteps of other relevant neuroscience based work (e.g., Zhou et al., 2023; Bigne et al., 2024). Neuroscience methods have their limitations but we will associate the findings with psychographics. There are essentially two tiers of dependent variables: 1. (Secondary) Delegation or not if no decision can be reached. 2. (Primary) Perception of task cognitive effort/difficulty. Specifically, respondents will be sent established measurement scales for Trait Task Enjoyment (TTES) after Czikmanti, Hennecke and Brandstätter (2021) and Need for Cognition (NfC) after de Holanda Coelho et al. (2020) prior to the lab session. These will be

sent two days before to avoid ‘contamination’ of the task. After the experiment we will record, via a post experiment questionnaire task enjoyment/emotional outcomes (via the ENJOY scale Davidson et al. 2022) and via the two item measure used by Czikmanti et al (2021) and cognitive factors via the NASA task difficulty scale Fritz et al. (1024) and/or a recall task (see Bouringa & Olive 2021). Although eye-tracking and EEG will also provide measurements for these (e.g. Victor et al. 2005).

Figure 1: Simple schematic of experiment structure



Subjects will be asked to choose a product for someone else, a medium level involvement consumer durable selected from the list used in the survey (probably a coffee machine). Three variants will be made available at a very similar price and from the same brand (to negate any enduring differential brand effects). The sample will be 18-30 year olds (much of the legacy research such as Mathwick and Rigdon, 2004 is frankly of little relevance to the emerging consumer bought up in the age of pervasive smart technology). It will be gender balanced with 30 for each scenario/treatment – total n=90 (max). These sample numbers are consistent with comparable studies (e.g., Horr et al., 2022; Zhou et al., 2023; Bigne et al., 2024) and other relational/comparative research (Kwam and Vidakovic, 2007) and typically provide robust statistical comparators. Respondents will be screened to ensure that they do not currently own/have not recently bought the product/s in question to avoid any recency effects of an actual search.

Initial results and anticipated outcomes

Survey

The study revealed a strong correlation between product enjoyment and the enjoyment derived from information search. Furthermore, the positive relationship between the enjoyment of information search and the intention to use decision support was pronounced for hedonic, less so for neutral, and absent for aversive scenarios. Online shopping preference for scenarios involving choosing a vacation or an energy provider, compared to the preference of in-store shopping for groceries. Trust in the fictionalized app emerged as the most important factor influencing usage. The robustness of these findings held across

demographic variations. The questionnaire included some open responses on app use/site use for information search and this is being analysed via topic modelling and machine learning. More complex analysis is ongoing at the time of writing and will be presented at the conference.

Experimental stage

The initial results of the experimental stage will also be presented at the conference and will include neuroscience signatures and psychographics metrics to examine any differential cognitive and emotional variations between the treatments and in relation to delegation of the information search and/or the actual decision.

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