

Intuition or deliberation – How do professionals make decisions in action?

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ABSTRACT

Despite intense research on decision-making in action, we still know little about when decision-makers rely on deliberate vs. intuitive decision-making in decision situations under complexity and uncertainty. This paper studies decision-making modes (deliberate vs. intuitive) in complex task environments contingent on perceived complexity, experience, and decision style preference. We find that relatively inexperienced decision-makers respond to increases in subjective complexity with an increase in deliberation and tend to follow their decision style preference. Experienced decision-makers are less guided by their decision preference and respond to increases in subjective complexity only minimally. Our paper contributes to a developing stream of research linking decision-making with intra-personal and environmental properties and fosters our understanding of the conditions under which decision-makers rely on intuitive vs. deliberate decision modes. In doing so, we go one step further towards a comprehensive theory of

decision-making in action.

Keywords

Decision-making, intuition, deliberation, dual processing, experts.

INTRODUCTION

Decision-making in complex, high-stake task environments such as aviation and firefighting has been the focus of much research regarding whether a deliberate or intuitive decision mode leads to better decisions – findings indicate that proficient decision-makers often benefit from using their intuition (e.g. Bingham & Eisenhardt, 2011; Eisenhardt, 1989). Yet, do decision-makers actually rely on intuition in important, real-life decisions under uncertainty and complexity? If so, under which conditions? In order to predict the outcome of a decision process, it is critical to understand the reasons for deliberation vs. intuition, as deliberate and intuitive decision-making modes differ substantially in terms of their respective advantages and disadvantages regarding decision quality (Dane & Pratt, 2009; Tversky & Kahneman, 2000).

Previous research on decision-making in action typically modeled decision-making in complex environments under uncertainty as intuitive pattern-recognition (e.g. Klein et al., 2010). However, various conceptual and empirical insights raise doubts regarding the generalizability of such findings. Dual process theories (e.g. Evans, 2008) imply that individuals approach decisions with varying degrees of deliberate thinking, depending on the amount of cognitive resources they are willing and/or able to invest in a particular decision. Individual

preferences for certain decision-making modes affect decision strategies (Epstein et al., 1996). There is also evidence that key decision-makers often tend to favor deliberation over intuition when making real-life decisions (Klingebiel & Meyer, 2013).

Intuitive decision-making produces quick solutions based on pattern-matching or other experience-based evaluations (Klein, 1995) and allows access to information that would not be accessible through conscious thought (Hogarth, 2010). However, intuition cannot be used to generalize beyond a specific context, does not involve the acquisition of outside information, and suffers from various biases (Dane & Pratt, 2007; Kahneman & Frederick, 2002; Tversky & Kahneman, 2000) that could lead to dangerously inaccurate perceptions of reality.

Deliberation offers advantages over intuitive decision-making, such as abstract thinking and generalizations as well as the inclusion of additional information in the decision-making process (Söllner et al., 2013). This is particularly beneficial if the task at hand requires the application of complex rules (Kahneman & Frederick, 2002). However, deliberation is costly with regard to both time and cognitive effort. Cognitive resources are limited, which implies that deliberation imposes opportunity costs, as those resources cannot be committed elsewhere (Kurzban et al., 2013). Decision-makers will, therefore, have a tendency to avoid deliberate reasoning if intuition appears sufficient to make a good decision.

The decision-making mode used to make a particular decision might depend on the decision-maker's personality and experience as well as characteristics of the decision situation. The first aspect to address is decision preferences, which are "learned, habituated response patterns exhibited by an individual when confronted with a decision situation" (Scott & Bruce, 1995, p.820) that are relatively stable and predict how a person processes information in order to arrive at a decision (Epstein et al., 1996). A preference for intuition implies that a decision-maker tends to rely on sub-conscious processing, trusting his or her feelings in a decision situation, whereas a preference for deliberation suggests that a person will tend to thoroughly search for information and evaluate options based on deliberate reasoning. Thus, we hypothesize the following:

H1: Decision-makers with a preference for intuitive decision-making apply less

deliberation.

Subjective environmental complexity, i.e. the perceived complexity of the context in which a decision takes place, is the second aspect to consider. Two dimensions of subjective environmental complexity are of particular importance: the perceptibility of cues and the degree of uncertainty (Kahneman & Klein, 2009; Shiloh et al., 2001). Under low environmental complexity, i.e. if cues are easily perceivable and uncertainty is low, both intuitive and deliberate decision modes are feasible, although routine-based intuition is the more likely choice for decision-makers with expertise in the task at hand, as it requires limited cognitive effort and is likely to provide good solutions based on pattern matching and sub-conscious cue identification (Betsch & Glöckner, 2010). Because deliberation is costly (Kurzban et al., 2013), it will likely only be applied when the degree of subjective environmental complexity requires the use of additional cognitive resources in order to make a good decision.

However, under growing uncertainty (Snow, 2010) and when cues are increasingly difficult to perceive, decision-makers should be more inclined to acquire external information and consciously develop and evaluate a mental model on which a decision could rest. Increases in subjective environmental complexity should, therefore, increase the likelihood that a proficient decision-maker turns to more deliberate decision-making compared to decision situations with low subjective environmental complexity.

The capacity to consciously process cues under conditions of high complexity, however, is limited (Dijksterhuis, 2004). With increasing subjective environmental complexity, the ability to apply deliberate decision modes will eventually diminish up to a point at which the decision-maker is no longer able to process information in a deliberate manner. Intuition will still suffer from limitations regarding the development of reliable mental models due to uncertainty and difficulties in obtaining cues (Kahneman & Klein, 2009). However, the disadvantages of deliberate decision-making should eventually take predominance. In such situations, decision-makers might return to intuitive decision strategies based on recognition-primed decision making (Klein et al., 2010) or at least be less willing or able to apply a deliberate decision mode. These considerations result in the following hypothesis:

H2: The relationship between subjective environmental complexity and deliberation is inverted U-shaped.

The third aspect to consider, experience, plays a key role for decision-making in complex task environments. Through exposure to comparable situations in a specific domain, experienced decision-makers develop action scripts (Lieberman, 2000), expert schemas (Dane & Pratt, 2007), and contextualized insights (Dijkstra et al., 2013) into situations that occur in their field. This domain-specific knowledge helps decision-makers link sensory inputs to possible courses of action and likely outcomes and serves as a means to develop mental simulations of decision options (Dane & Pratt, 2007; Evans, 2006). Experience also increases the ability to perceive and select relevant cues that might be relevant for a given situation (Klein et al., 2010), which act as inputs into mental models – their relevance to a specific situation affects how good a decision based on that particular model will be.

In this sense, experience might moderate the effects of personality and subjective environmental complexity. Experienced decision-makers should be better able to understand when a routine-based intuitive decision mode is appropriate as well as when this is no longer the case (Betsch & Glöckner, 2010). In particular, experienced decision-makers should understand when they need to seek additional information and are about to fall prey to oversimplification biases as well as when their information processing capacity tends to be overwhelmed (Plessner et al., 2008). Thus, experienced decision-makers should respond more strongly to changes in subjective environmental complexity than less experienced decision-makers. Decision style preferences, on the other hand, obstruct the adjustment of decision modes to situational demands. If experienced decision-makers are more effective in determining the appropriate decision mode, they should also be less likely to follow their decision style preference. These considerations result in the following hypotheses:

H3: Experience moderates the relationship between decision preference and decision mode such that the effect of decision preference on decision mode is weaker for experienced than less experienced decision-makers.

H4: Experience moderates the relationship between situational complexity and

decision mode such that the effect of subjective complexity on decision mode is stronger for experienced than less experienced decision-makers.

EMPIRICAL ANALYSIS

We studied decisions made by proficient individuals under varying degrees of environmental complexity, professional experience, and decision style preferences in maritime search and rescue (MSAR). As day-to-day operations are mostly routine, we focused on one of the world's largest MSAR exercises – the annual Baltic SAREX – which brings together MSAR professionals from the Baltic region for a three-day exercise with numerous large-scale assignments. The exercise involves dozens of vessels and several helicopters who together practice complex coordination, ship handling, and MSAR tasks such as mass evacuation in combination with search-and-rescue, firefighting, and medical treatment. The organizers provide a realistic, open-water training environment, with volunteers acting as distressed or injured persons on vessels or drifting in the water as well as simulated and real fires.

We distributed a questionnaire capturing personality traits and experience the day before the first open-sea exercise and collected those directly before the first open-sea exercise began. We then distributed our second questionnaire, addressing decision characteristics for up to three decisions made by each individual during that day's scenario, immediately before the vessels left port each training day and collected those questionnaires the following morning. Anonymous personal identifier codes linked the questionnaires of each individual. In this way, each participant contributed data on up to nine decisions (i.e. a maximum of three decisions for each training day). Participation was voluntary.

Our final sample contained 398 decisions reported by 103 individuals. We calculated all analyses using two-level, hierarchical linear regression models in which decisions on level 1 are nested within individuals on level 2 (ICC=.36).

Measures

Decision-level

Decision mode, our dependent variable, was measured with a 6-item scale (table 1) reflecting how quick, conscious, and cognitively demanding a decision-making process was (Dane & Pratt, 2007).

Complexity was measured as the sum of a series of dichotomous variables displayed in table 1.

Task type: To control for specific effects of the type of task within which a decision was made, we included a dummy variable capturing whether a decision was related to leadership/coordination tasks or primarily involved carrying out a specific action.

Standard procedure: To control for decisions for which codified knowledge prescribes a specific solution, thus nullifying the need to choose the degree of deliberation, we employed a dummy variable indicating whether respondents rated the statement “we followed standard procedures for such situations” as being “very true” for a given decision.

Individual-level

Experience was measured as the number of years a respondent has worked at sea professionally. It is important to note that “novices” (Baylor, 2001) are not present in our sample.

Preference for intuition: To capture how strongly a person is inclined to trust his or her intuition, we employed the respective five-item sub-scale of the GDMS questionnaire (Scott & Bruce, 1995; Cronbach’s alpha=0.75).

Education was entered as a dummy variable indicating whether a decision-maker had earned at least a secondary school degree.

Nationality: Because decision-making and tolerance for uncertainty are potentially culturally biased (Kirkman et al., 2006), we included dummy variables indicating participants’ nationality.

Decision mode (Cronbach’s alpha = .694)

Before we made the decision, we tried to collect all information that may have been important when making a decision.
 When we saw the situation, we had to think for a long time before we knew what to do.
 We made the decision very quickly (reverse coded)
 We had to put a lot of effort into making the decision.
 We had to give the decision serious thought.
 We carefully compared the options that we had.

Complexity

Was the swell favorable for completing the job? [yes/no]
 How was visibility while completing the job? [good/bad]
 Were you familiar with the local hazards? [yes/no]
 Did you know the position of the disabled vessel/location of the scene? [yes/no]
 Did you have the necessary resources to do the job? [yes/no]
 While doing your job, did you and your colleagues find it easy to predict what would happen next? [yes/no]

Table 1: Decision mode and complexity items

Results

The results of the hierarchical regression models are displayed in table 2. Disconfirming hypothesis 1, we failed to find a significant direct effect of preference for intuition on decision mode. The results of model 2 indicate that an increase in complexity leads to an increase in deliberation (figure 1).

The slope related to this effect decreases at higher levels of complexity, as indicated by the negative coefficient of the squared complexity term. Thus, we found partial support for hypothesis 2. As predicted by hypothesis 3, we found a much stronger effect of decision preference on decision mode for less experienced decision-makers compared to more experienced decision-makers (figure 2). Experienced decision-makers follow their preference for intuition to a lesser degree than decision-makers with less experience.

Variable	Model 1		Model 2		Model 3		Model 4	
	Coeff	s.e.	Coeff	s.e.	Coeff	s.e.	Coeff	s.e.

Germany	-.81*	.41	-.94*	.43	-1.0*	.42	-.98	.40
Lithuania	-.35	.61	-.36	.62	-.24	.61	-.14	.59
Poland	.02	.20	-.12	.23	-.08	.22	-.07	.22
Estonia	.03	.21	-.02	.21	.11	.22	.10	.21
Finland	-.26	.18	-.26	.20	-.21	.20	-.20	.19
France	-.15	.18	-.26	.21	-.18	.21	-.19	.20
Latvia	-.16	.24	-.23	.27	-.11	.27	-.14	.26
Education	.03	.14	-.03	.15	-.04	.15	-.04	.14
Task type	.07	.10	.07	.10	.07	.10	.10	.10
Standard procedure	-.25*	.09	-.24*	.09	-.23*	.09	-.21*	.09
Preference for intuition			-.02	.09	-.08	.09	-.05	.09
Experience			-.003	.01	-.00	.01	-.01	.01
Complexity			.30*	.14	.27+	.14	.23	.15
Complexity squared			-.04+	.02	-.03	.02	-.02	.02
Pref. f. int.*experience				.03*	.01	.03*		.01
Complexity*experience						-.02+		.01
Complexity squared *						.01*		.00
	<i>N</i>	398(103)	398(103)	398(103)	398(103)	398(103)		

Table 2: Hierarchical regressions, dependent variable: decision mode
 Continuous variables are grand-mean centered.
 Reference category for nation dummies: Denmark
 + $p < 0.10$; * $p < 0.05$

We found no support for hypothesis 4. Instead, we found that experienced decision-makers adjust their decision-styles considerably less to varying degrees of subjective environmental complexity than inexperienced decision-makers (figure 3).

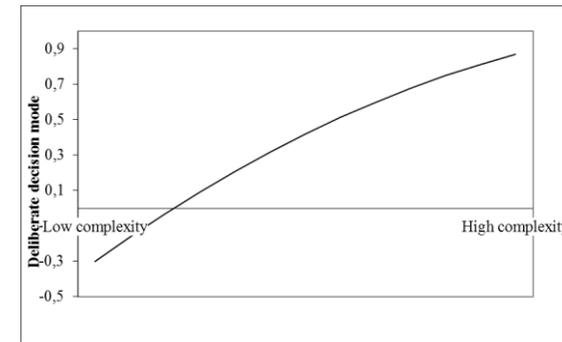


Figure 1: Deliberate decision-making under varying complexity

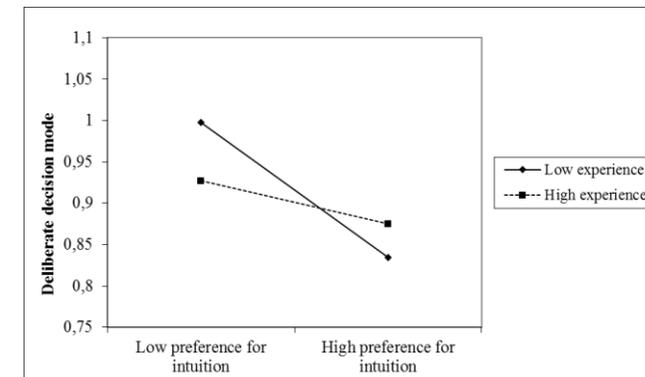


Figure 2: Interaction between preference for intuitive decision-making and experience

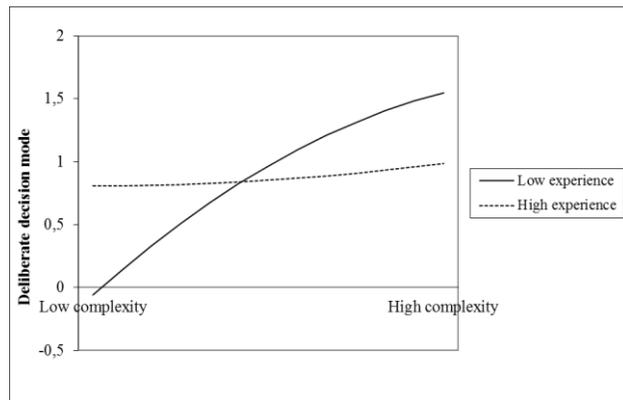


Figure 3: Interaction between environmental complexity and experience

DISCUSSION

We examined decision-making in complex task environments under varying degrees of environmental complexity in a maritime search and rescue setting. We found that less experienced professional decision-makers, in particular, adjust their decision modes based on perceived changes in environmental complexity. Specifically, their decision-making becomes more deliberate with increasing environmental complexity. We also found that less experienced decision-makers tend to decide in a manner consistent with their personal preference for intuition. That is, individuals with a strong preference for intuition tend to make intuitive decisions. More experienced decision-makers, on the other hand, show a relatively constant use of deliberation largely irrespective of their decision preferences and subjective environmental complexity. This might be due to reduced flexibility in thinking patterns, which has been shown to be a disadvantage of greater professional experience. Overall, our results reflect critically on mainstream decision-making in action research, which suggests that decisions in complex task environments under uncertainty are predominantly intuitive (Klein, 1995). We suggest that such studies may have overestimated the range of situations in which intuitive decisions are actually made. In particular, the importance of varying

degrees of complexity might have been overlooked, a notion that has been suggested in previous research (Klein et al., 2011). Our findings indicate that the choice of an appropriate level of deliberation follows a sufficing strategy. Deliberate decision strategies are costly in terms of cognitive effort and opportunity costs (Kurzban et al., 2013). Therefore, decision-makers deliberate only as much as necessary in a given decision situation based on experience, decision preference, and perceptions of the decision environment. For decisions in which deliberation is not prohibited by extreme time pressure such as those examined in this study, our findings indicate that intuitive decision-making is the exception rather than the rule (see also Newell and Shanks, 2014).

These findings open new paths for decision-making in action research, as we link experience to situational and intra-individual contingencies. Predicting decision modes is critical to understanding the behavior of decision-makers in high-reliability organizations; our study offers new insights into this issue.

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