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Thinking Styles and Privacy Decisions: Need for Cognition, Faith into Intuition, and the Privacy Calculus

--Manuscript Draft--

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Abstract:	Investigating cognitive processes that underlie privacy-related decisions, prior research has primarily adopted a "privacy calculus" view, indicating privacy-related decisions to constitute rational anticipations of risks and benefits connected to data disclosure. Referring to psychological limitations and heuristic thinking, however, recent research has discussed notions of bounded rationality in this context. Adopting this view, the current research argues that privacy decisions are guided by thinking styles, i.e. individual preferences to decide in an either rational or intuitive way. Results of a survey indicated that individuals high in rational thinking, as reflected by a high need for cognition, anticipated and weighed risk and benefits more thoroughly. In contrast, individuals relying on experiential thinking (as reflected by a high faith into intuition) overleaped rational considerations and relied on their hunches rather than a privacy calculus when assessing intentions to disclose information. Theoretical and practical implications of these findings are discussed.
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1 Introduction

Providing the shipping address to an e-commerce website [1], disclosing the own position to a location-based mobile service [2], or informing a health monitoring service about one’s well-being [3]: When using technology, individuals are steadily confronted with the decision to disclose, or not disclose, private information. Investigating the cognitive processes that underlie such decisions, researchers have often applied a “privacy calculus” perspective [2, 4-6], arguing that individuals anticipate and trade-off negative and positive outcomes of data disclosure, and decide to disclose personal information only if the (perceived) benefits outweigh the (perceived) risks [2]. Applying this perspective, prior studies have identified numerous factors enhancing or mitigating risk and benefit perceptions, including personalization [7, 8], privacy seals [9], or information sensitivity [10, 11].

Also, scholars have discussed notions of *bounded* rationality in this context, arguing individual decision-making to be impacted by psychological limitations, such as the attempt for immediate gratification [12], or restricted capabilities to overview and process all relevant information [13-15]. Also, the impact of emotions and affective thinking was discussed, with several studies yielding evidence on the impact of both positive and negative emotions in the context of privacy-related decisions [16-18].

Building on these propositions, the current research strives to expand the knowledge on rational and irrational processes that underlie privacy-related decisions by introducing individual differences in thinking as a precondition to the privacy calculus framework. More precisely, our study focuses on two types of cognitive preferences, or *thinking styles*, known to guide individuals' processing depth and deliberation of rational arguments – *need for cognition* and *faith into intuition* [19, 20].

In the following, we will first review pertinent research streams and introduce our conceptual model. Next, we provide an overview over the applied methodology and present the results of our empirical study. Then, we will discuss theoretical and practical implications of the findings, and provide a conclusion.

2 Conceptual Model and Hypotheses

Figure 1 depicts our conceptual model. In line with prior research, we regard privacy disclosing behavior, such as disclosing intentions, as a common outcome of individual risk and benefit valuations. In contrast to many prior studies, however, we assume (1) risk and benefit valuations to constitute interdependent rather than independent factors, and (2) privacy-valuations to differentially rely on individual thinking styles, in particular need for cognition and faith into intuition. Rationales for these assumptions are provided in the following.

2.1 Privacy Calculus

Prior research on privacy-related decision-making has primarily regarded disclosing behaviors, such as intentions to disclose private information to an e-commerce platform [1] or Internet of Things service [3], to result from a conjoint assessment of privacy-related risk and benefit perceptions. Denoted as the *privacy calculus* [1, 5, 6], research has found numerous factors enhancing or mitigating risk and benefit perceptions, such as the stakeholder requesting information [5], the perceived sensitivity of the information to provide [11], or the degree of personalization provided by the data-requesting product or service [5]. In line with this research, we expect disclosing intentions to succeed perceived risks and perceived benefits of information disclosure, and hypothesize:

H1a: Perceived risks will be negatively associated with intentions to disclose.

H1b: Perceived benefits will be positively associated with intentions to disclose.

While prior studies have primarily relied on the assumption that risk and benefit perceptions constitute independent factors, recent works discussed a potential interdependency of risk and benefit perceptions, with benefit perceptions guiding perceptions of risk [13, 18, 21]. This is in line with findings from consumer behavior research, arguing risk and benefits to be correlated negatively in individuals' minds, even if they are often correlated positively in reality [22, 23]. Regarding nuclear power, for example, individuals tend to associate high risks and *thus* attribute only *few* benefits, while nuclear power is *both* highly beneficial *and* keenly risky in reality. In line with

these findings, we expect privacy-related risk and benefit perceptions to constitute interdependent factors, and hypothesize:

H2: Perceived benefits will be negatively associated with perceived risks.

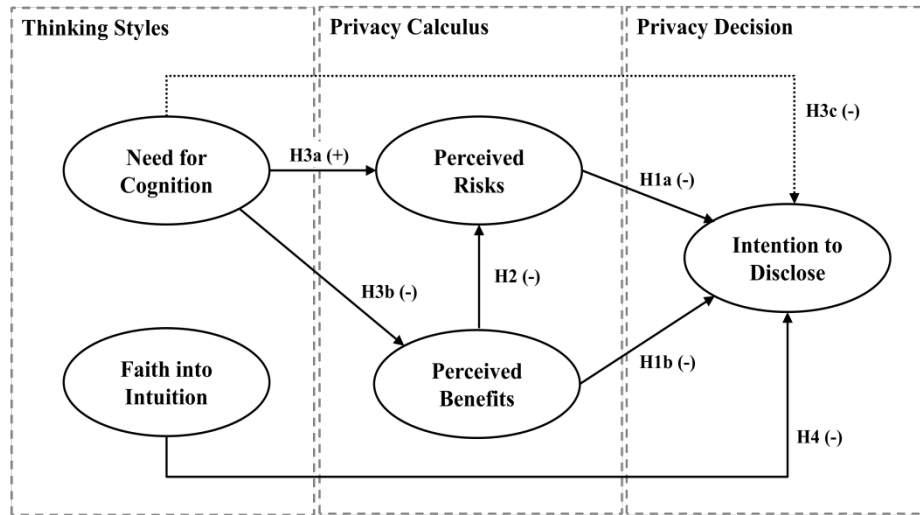


Fig. 1. Conceptual Model.

2.2 Thinking Styles

While the privacy calculus literature, at its core, assumes individuals to constitute rational decision-makers who carefully anticipate and weigh risk and benefits connected to information disclosure, a small but increasing stream of literature emphasizes the role of bounded rationality, and “gut feelings” in this context [12, 15-18]. In this regard, prior studies have associated emotions such as joy and fear with privacy risk and protection beliefs [16], or linked affect to website trust and website privacy [17]. Moreover, scholars have discussed the role of affective, intuitive thinking as opposed to rational cognitions in the context of privacy-related decisions, arguing privacy-related decision-making to constitute a partially irrational process [18].

In line with these studies, research in cognitive psychology and consumer behavior has widely adopted a dual process view on human thinking [19, 20, 24-27]. That is, individuals are supposed to possess two independent, yet interacting cognitive systems that guide decision-making processes: While the experiential system is characterized by quick, automatic responses based on emotional reactions and past experiences, the rational system embraces logical and effortful, yet slow considerations of arguments. Consequently, decisions based on the experiential system result in rough and heuristic, “intuitive” decisions, while relying on the rational system entails differentiated and deliberate, “cognitive” choices [27, 28]. While complex real-world decisions often require individuals to use both systems in steady interaction [27], differences in *thinking styles* determine preferences in approaching these problems on a trait level [20]. Stated differently, individuals with a more experiential thinking style

prefer using the experiential system when taking decisions, while individuals with a more rational thinking style mostly rely on the rational system when deciding [20]. In past research, an experiential thinking style has often been operationalized as the tendency to have *faith into intuition*, while the preference for the rational system is characterized by a high *need for cognition* [20]. Prior work has associated faith into intuition with religious beliefs [29], creative professions [30], and more careful execution of habits [31], while need for cognition was found to correlate with security and conformity needs [30], analytical professions [30], and more innovative organizational behavior [32]. With regard to decision-making, literature reports faith into intuition to more thoroughly drive heuristic judgments, while need for cognition was associated with deeper and more careful processing of information [33]. It is noteworthy, however, that experiential thinking does not necessarily lead to “worse” decisions. Rather, the fit between the decisive situation and the thinking style determines task performance. That is, individuals high in experiential thinking perform worse if a task requires strongly rational and analytical thinking. With many daily tasks, however, different approaches entail equally valuable solutions, thus not disadvantaging individuals high in experiential thinking [34].

Building on these foundations, we argue individual differences and preferences in processing may also shape privacy-related decisions. In particular, we expect individuals with a rational thinking style to more carefully weigh the risks and benefits of a data-requesting situation. An experiential thinking style, in contrast, should result in more superficial cognitive processing. That is, individuals high in experiential thinking should overleap rational considerations and decide based on their intuition. Stated differently, we expect privacy calculus variables to fully mediate the relationship between need for cognition and disclosing intentions, while, in contrast, a direct effect from faith into intuition on intentions to disclose is hypothesized. Given earlier studies that pointed to the role of heuristic thinking and emotions in the context of information privacy [12, 14, 18], it can be assumed that a higher level of faith into intuition does not necessarily entail more liberal disclosing decisions. This view is in line with research in consumer behavior stating that many tasks are equally solvable by both rational and experiential thinking [34]. Hence, we hypothesize:

H3a: Need for cognition will be positively associated with perceived risks.

H3b: Need for cognition will be negatively associated with perceived benefits.

H3c: The relationship between need for cognition and intention to disclose will be fully mediated by perceived risks and perceived benefits.

H4: Faith into intuition will be negatively associated with intention to disclose.

3 Methods

In order to test our conceptual model, we conducted an online survey with participants from the United States recruited via Amazon Mechanical Turk. Monetary incentives were provided for participation. U.S. citizens were chosen in order to prevent methodological issues potentially arising from questionnaire translation [35]. Potential participants were invited to give their opinions on an upcoming application de-

signed to measure individual driving styles and provide customized feedback on safe driving. The survey consisted of three parts:

- (1) After clicking on the survey link, participants filled out a short questionnaire covering thinking styles.
- (2) Then, the smartphone application was introduced by a screenshot and a short description of its purpose. Participants were informed that the application was designed in cooperation with an insurance company and told that the application collected certain information in order to work properly, including year of car construction, the car type, and the distance travelled. The insurance situation was chosen in order to rely on a context known to be particularly sensitive to most consumers [36].
- (3) In a second short questionnaire, participants were then asked to rate risks and benefits connected to data provision to this particular application, and provide information on their disclosing intentions. Also, relevant control variables, such as age and gender, were assessed.

3.1 Measures

To ensure construct validity, scales from previous studies were used wherever possible. In order to assess need for cognition and faith into intuition, we used four items per construct from the original Rational-Experiential Inventory [20], measuring thinking styles on a seven-point Likert scale ranging from does not apply at all (1) to fully applies (7). Perceived risks and perceived benefits were measured by four items adopted from Dinev and colleagues [21]. For these constructs, we applied a seven-point Likert scale ranging from totally disagree (1) to totally agree (7). Intentions to disclose private information was assessed by three items adopted from Anderson and Agarwal [5] and measured on a seven-point semantic differential.

4 Results

In total, 177 individuals participated in the study. In a first step, we filtered out participants who showed response patterns (e.g. zero variance in scales with reverse-coded items) and unreasonable completion times (i.e. < 5 minutes), resulting in an overall sample size of 131 individuals. Mean age was 31.47 years ($SD = 10.48$), with 58% male and 42% female subjects. The vast majority of participants stated to own a smartphone (93%), and all were residing in the U.S. at the time of the study. MPlus 6.12 [37] was used for data analysis, and an adjusted maximum likelihood estimator (MLMV) was applied to adjust results for non-normality in the data. We used the two-step methodology suggested by Segars and Grover [38] and followed established guidelines [39, 40] in all steps of analysis.

4.1 Measurement Model

We started data analysis by conducting confirmatory factor analysis (CFA) in order to investigate the psychometric properties of the underlying model. The overall model fit of the measurement model was good, indicating our empirical data to largely reflect theoretical assumptions on factor structure ($\chi^2 = 161.15$, $p = .13$, $df = 142$, $\chi^2/df = 1.13$, $RMSEA = .032$, $CFI = .98$, $TLI = .97$). We proceeded by inspecting reliability, convergent validity and discriminant validity as well as common method variance of the measurement model.

Table 1. Confirmatory Factor Analysis Statistics.

	<i>NC</i>	<i>FI</i>	<i>RISK</i>	<i>BEN</i>	<i>INT</i>	<i>t-value</i>	<i>R</i> ²	<i>CR</i>	<i>AVE</i>
Item	$\alpha = .85$	$\alpha = .90$	$\alpha = .93$	$\alpha = .87$	$\alpha = .98$				
NC1	.74					11.93	.55		
NC2	.79					17.55	.62		
NC3	.82					13.68	.66	.85	.59
NC4	.72					12.78	.52		
FI1		.91				36.49	.83		
FI2		.75				16.53	.56		
FI3		.83				24.73	.69	.90	.69
FI4		.83				30.84	.69		
RISK1			.87			40.01	.76		
RISK2			.94			71.14	.88		
RISK3			.83			29.55	.70	.93	.78
RISK4			.88			38.42	.78		
BEN1				.76		13.31	.57		
BEN2				.87		26.42	.76	.87	.63
BEN3				.73		13.02	.53		
BEN4				.80		18.39	.65		
INT1					.96	106.25	.93		
INT2					.98	159.42	.95	.98	.95
INT3					.98	142.90	.96		

Note: NC: Need for Cognition; FI: Faith into Intuition; RISK: Perceived Risks; BEN: Perceived Benefits; INT: Intention to Disclose; CR: Composite Reliability; AVE: Average Variance Extracted; α : Cronbach's Alpha.

Reliability was assessed by analyzing Cronbach's Alpha and the Composite Reliability of the deployed scales. As shown in Table 1, all scales exceeded the recommended threshold values of .70 for internal consistency, indicating good reliability

[40]. Convergent validity was examined by (1) analyzing the factor loadings and t-values of every single indicator used in the CFA and (2) calculating the average variance extracted (AVE) for every deployed scale. As illustrated in Table 1, (1) factor loadings above .70 and highly significant t-values were yielded for every indicator, and (2) AVEs exceeded the recommended threshold values of .50 for every deployed scale. Since these results indicated high convergent validity of the measurement model, we proceeded by testing for discriminant validity. For this purpose, we compared AVEs to bivariate correlations, assessing whether the square roots of AVEs exceeded correlations between the correspondent construct and other constructs in the model [41]. As illustrated in Table 2, this was the case for every single construct, implying latent constructs to sufficiently differ from each other. Also, we tested for common method variance by applying Harman's Single-Factor Test [42]. As suggested by prior literature [43], Harman's test can be conducted in a CFA framework by modeling all manifest indicators to load on a single latent factor, expecting the model to fit the data in case common method variance administrates significant influence. Since, in our case, the estimation algorithm did not achieve convergence after 1000 iterations, implying a single factor model to not accurately represent the underlying data structure, we concluded common method variance to not significantly impact our results. In sum, CFA of the measurement model revealed satisfactory psychometric properties with regard to reliability, convergent and discriminant validity as well as common method variance. Thus, we proceeded by analyzing the structural model.

Table 2. Descriptive Statistics, Bivariate Correlations and Average Variance Extracted (AVE) of Latent Constructs.

	<i>M</i>	<i>SD</i>	<i>NC</i>	<i>FI</i>	<i>RISK</i>	<i>BEN</i>	<i>INT</i>
NC	4.92	1.33	.59				
FI	5.00	1.19	-.09	.69			
RISK	4.36	1.49	.24*	-.05	.78		
BEN	4.35	1.25	-.03	.18	-.47**	.63	
INT	4.00	1.77	-.13	-.05	-.73**	.54**	.95

Note: The diagonal terms indicate the average variance extracted (AVE), non-diagonal terms indicate correlations. * $p < .05$; ** $p < .01$. NC: Need for Cognition; FI: Faith into Intuition; RISK: Perceived Risks; BEN: Perceived Benefits; INT: Intention to Disclose; M: Mean; SD: Standard Deviation.

4.2 Structural Model

The full structural model, depicted in Figure 2, showed good overall model fit ($\chi^2 = 164.36$, $p = .13$, $df = 143$, $\chi^2/df = 1.14$, $RMSEA = .032$, $CFI = .98$, $TLI = .97$), indicating theoretical assumptions on construct relationships to be largely supported by empirical data. Furthermore, a high proportion of explained variance in the main outcome variable ($R^2 = .61$) implied main predictors of intention to disclose information could be covered by the model.

With regard to H1 and H2, we have hypothesized a situational privacy calculus to drive disclosing intentions. In contrast to many prior studies, however, we modeled perceived risks and perceived benefits as interdependent, with benefits driving risk perceptions. High and significant path coefficients yielded by the structural model seem to support these hypotheses. Specifically, the relationship of perceived risks and perceived benefits was highly negative ($\gamma = -.46, p < .01$), indicating individuals to not independently weigh risk and benefits when taking privacy-related decisions.

With regard to the impact of thinking styles, our results revealed evidence that need for cognition was related to perceived risks (H3a), but not to perceived benefits in a privacy calculus (H3b). In order to test mediation effects as hypothesized (H3c), we conducted mediation tests using the delta method, a more generalized approach than the Sobel test [44]. Results revealed a slightly significant indirect effect ($\delta = -.23, p = .05$), and an insignificant direct effect ($\delta = .02, p = .77$), resulting in a marginally significant total effect ($\delta = -.20, p < .10$). Thus, the results pointed to a full mediation of the relationship between need for cognition and intention to disclose by perceived risks and perceived benefits.

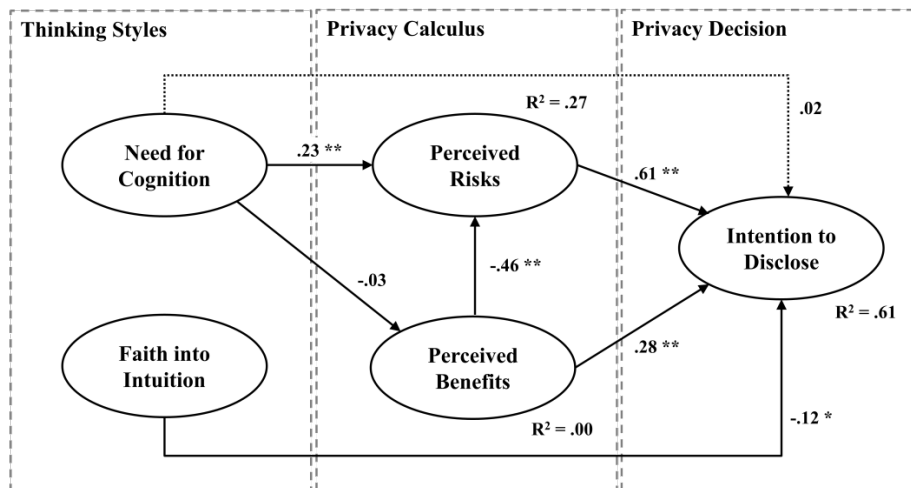


Fig. 2. Results of structural equation model analysis.

In Hypothesis 4, we predicted faith into intuition to directly impact disclosing intentions. In order to test this assumption, we employed two approaches: First, we analyzed the respective path coefficient as output by the original structural model. As depicted in Figure 2, the direct path from faith into intuition to intention to disclose was negative and significant, as hypothesized ($\gamma = -.12, p < .05$). Second, we tested an alternative model that linked faith into intuition to perceived benefits and perceived risks, and analyzed the direct as well as indirect relationships between the situational calculus variables, faith into intuition, and intention to disclose. Although the overall fit of this alternative model did not substantially differ from our original model ($\chi^2 = 161.97, p = .13, df = 143, \chi^2/df = 1.13, RMSEA = .032, CFI = .98, TLI = .97$), direct effects between faith into intuition and perceived risks ($\gamma = .05, p = .53$) as well

as faith into intuition and perceived benefits ($\gamma = .18, p = .08$) yielded insignificant effects, and mediation analysis revealed only significant direct ($\delta = -.18, p < .05$), but insignificant indirect ($\delta = .10, p = .38$) and total effects ($\delta = -.08, p = .54$). Consequently, we concluded that hypothesis 4 was largely supported by the empirical data.

5 Discussion

In this study, we designed and conducted a survey aiming to validate the role of thinking styles in the context of privacy-related decision-making. More precisely, we hypothesized individuals with highly rational thinking style to carefully weigh risks and benefits connected to information disclosure, while individuals high in experiential thinking were hypothesized to overleap a privacy calculus and more thoroughly decide based on their hunches. In general, our results supported our hypotheses: Indicating individuals high in rational thinking to more carefully weigh risks and benefits, need for cognition was positively associated with perceived risks, and effects from need for cognition on intentions to disclose were carried through privacy calculus variables. In contrast, faith into intuition was not associated with privacy calculus variables, but exerted direct impact on disclosing intentions. This result implies that individuals high in experiential thinking may less carefully weigh risk and benefits connected to data disclosure, or even overleap rational considerations.

5.1 Theoretical and Practical Implications

In psychology and consumer behavior, thinking styles are defined as consistent tendencies of how individuals think, shaping many different situations in a similar manner [30]. Given this trait character, it can be expected that an individual's thinking style exerts similar influence in diverse situations, including different situations that require data provision. As such, our findings do not only add to the understanding of privacy-related decision-making in a concrete situation, but also contribute to literature that focuses on the relationships between privacy-related constructs and personality traits, such as the big five [45], social awareness [1], or self-construal [46]. Most of these studies have focused on the moderating effect of personality traits in shaping privacy-related *perceptions*. Our work, in contrast, suggests that cognitive *processing* of privacy-related constructs may differ between individuals, and that certain individuals may even completely omit the consideration of some constructs when taking privacy decisions. Hence, the findings of our study may lay a fruitful ground for further research on individual differences in cognitive processing of privacy-related constructs.

Besides, our findings suggest that the privacy calculus, although offering a useful framework for analyzing privacy-related decisions of some individuals, may be less suited for others. Specifically, individuals who mostly rely on experiential thinking may omit or overleap rational considerations and decide based on their hunches rather than anticipating and weighing risks and benefits connected to data disclosure. As such, our findings may offer a new perspective on the privacy calculus framework,

and uniquely add to the increasing literature stream that emphasizes the role of bounded rationality, heuristic thinking, or emotional processes in this context (e.g. [12-18]). Bounded rationality, in particular, has been discussed as a potential explanation to the repeated observations of inconsistencies between stated privacy concerns and disclosing behaviors, denoted as the “privacy paradox” [8, 47-49]. In this regard, our study suggests that the severity of the paradox could be moderated by individual differences in thinking styles: Individuals who rely on rational thinking should more carefully weigh all potential risks of information disclosure, and thus also consider their own concerns more intensely. Individuals who rely on experiential thinking, in contrast, might be more easily persuaded by characteristics of the data-requesting situation (such as emotional appeals [18] or immediate benefits [12]), even if they are highly worried on potential data misuse or privacy invasions.

Against this background, our results furthermore imply that researchers and practitioners should more strongly consider individual differences and personalized solutions when building artifacts and recommender systems that aim to protect personal privacy [50, 51]. In particular, actions that target a more intense examination of privacy-related risks and benefits, such as provision of information, recommendations on privacy settings, or privacy policies, might be only helpful for individuals high in rational thinking. For individuals with a more experiential thinking style, in contrast, more subtle, “nudging” [52, 53] interventions might be more supportive.

5.2 Limitations and Future Work

Although, in general, the data supported the conceptual model, there are several limitations in this study that present useful opportunities for future research.

First, the sample for this research was recruited via Amazon Mechanical Turk, and restricted to U.S. citizens. Despite growing acceptance of survey studies conducted via this tool [54], prior research in information privacy has identified cultural differences in the perception of privacy-related constructs [4, 55]. Therefore, replicating and extending the findings of the current study using diverse samples and different cultural backgrounds might be helpful to support the generalizability of the results.

Second, our results revealed a positive relationship of need for cognition with risk perceptions. For perceived benefits, however, the correspondent hypothesis was not supported by the data. In this regard, the results of this work should be interpreted as a preliminary trial to investigate the role of thinking styles in privacy-related decision-making, and more research is needed to confirm the validity and generalizability of our findings.

Third, we have focused on the most important privacy-related constructs in this study in order to emphasize the immediate impact of thinking styles on the privacy calculus. However, many studies in the domain of information privacy have focused on privacy concerns as a central construct [49], and recently, scholars have argued for a distinctive view on privacy-related attitudes and situational privacy calculus variables [16, 18]. Hence, extending the proposed research model to cover more constructs might help to deepen the understanding on the complex relationships of thinking styles, privacy-related attitudes, perceptions, and behaviors.

Fourth, likewise most prior research in the domain of privacy-related decision-making, our research relied on intentions rather than real disclosing behaviors [49]. Differences in intentions versus behaviors have been highlighted by many scholars (e.g. [49, 56]), implying that extending our conceptual model to cover real behaviors could substantially add to the understanding of privacy-related decisions.

Fifth, our study investigated need for cognition and faith into intuition separately, focusing on individuals high on either one or the other dimension. As argued above, however, individuals possess both systems, and use them in steady interaction [27]. Therefore, a further exploration of thinking styles and dual process models of thinking in the context of privacy-related decisions could yield essential insights on when, why and how individuals disclose their information when using technology. Considering optimal versus non-optimal fit between the decisive situation and the thinking style [34], for example, could constitute a fruitful ground for future research.

6 Conclusion

In summary, this research provided insights on the role of thinking styles in privacy-related decision-making. Modeling need for cognition and faith into intuition as predictors to a privacy calculus, we found individuals high in rational thinking to more thoroughly evaluate privacy-related risks and benefits. Individuals high in experiential thinking, in contrast, seemed to overleap risk and benefit valuations, basing their decisions on their hunches rather than rational considerations. Opening a new avenue for investigation of individual differences as well as notions of bounded rationality in the context of information privacy, our study may help to deepen the understanding on when, how and why individuals disclose their private information, and how disclosing patterns differ between individuals.

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