Utilitarian or Relational? Exploring Indicators of User Orientation Towards Intelligent Agents

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Abstract. When interacting with an agent, some users with utilitarian orientation tend to treat an agent as an instrumental tool, while others with relational orientation find the design of humanlike features more pleasing. Along with technological advances in user modeling and prediction algorithms, intelligent agents nowadays can personalize their interaction by identifying such orientation of users towards them. While prior work has revealed several behavioral signs resulting from such difference in orientation, little attention is directed to more fundamental cues that precede the occurrence of actual interaction. In light of this issue, this study explores intrinsic properties of users related to their utilitarian or relational orientation towards intelligent agents. Qualitative analysis of responses revealed three user propensities contributing to individual differences in orientation: tolerance to unpredictability, sensitivity to privacy, and sensitivity to an agent's autonomy. We discuss future directions for leveraging our findings to design personalized interaction in intelligent agents.

Keywords: Intelligent agents · Personalization · Orientation · Interaction design

1 Introduction

Intelligent agents promise personalization, or "a process of changing a system to increase their personal relevance" [3]. The trend in personalization has accelerated along with technological advances in user modeling and prediction algorithm. Channels for personalization have also been diversified as intelligent agents are appearing in forms of various products and services, ranging from smart thermostats to movie recommender systems. Accordingly, how to design more sophisticated personalization in intelligent agents has become a key research interest.

Among many important user characteristics to be considered in such personalization is orientation, or a mental schema [1], of users towards intelligent agents. Although the Computers are Social Actors (CASA) paradigm points to the need for social interaction between users and agents [13], there exist individual differences in the level of preference for such sociality. It has been suggested that when interacting with an agent, some users with utilitarian orientation tend to treat an agent as an instrumental tool, while others

with relational orientation find the design of agent sociality more pleasing. Even given with the same visible form factor of an agent, these individual differences exist [5].

Previous research has shown a potential of personalizing interaction strategies of agents based on such user orientation. For example, prior studies suggested that different recovery [8] and politeness [9] strategies of robots were appropriate for users with different orientation. More recently, Liao et al. [11] showed interaction with intelligent agents should be designed differently considering user orientation. For a user with high social-agent orientation, an agent should improve conversation and present a personality. For a user with low social-agent orientation, an agent should convey features from conventional information-search tools, avoid humanized features, and improve its transparency and affordance. These findings all point to opportunities for user-orientation-based personalization of an agent's behavior styles and service contents.

For this to occur, an agent should first be able to infer the user's orientation. A collection of studies has identified several user behaviors as possible predictors of orientation, such as greeting [7], pronouns [14, 15], as well as socializing questions, politeness, or agent-grounding questions [11] of users. While these factors add valuable insights to the design of personalized interaction, they are resultant behavioral "phenomena" evoked by user orientation and therefore can only be captured throughout interaction. To support personalization irrespective of the actual occurrence of interaction, it is necessary to know more fundamental properties of users that are potentially associated with different orientation toward agents. For example, Lee et al. [10] showed a user's tendency for parasocial interaction can be used to infer his or her attitude towards hedonic and utilitarian robots. More relevant to our research is Kim and Lim's work [6] which illustrates the differences in user perception on adaptive services that produce varied orientation of users.

Advancing this line of work, this research explores inherent properties of users that can be used as cues for their orientation towards agents. Our questionnaire-based study reveals three types of user propensity that can be used to infer orientation: tolerance for unpredictability, sensitivity to privacy, and sensitivity to an agent's autonomy. We conclude by discussing how designers of intelligent agents can utilize these findings to design personalized service and interaction style.

2 Study Method

We designed a scenario-based online questionnaire to explore user characteristics associated with either utilitarian or relational orientation of theirs towards intelligent agents as in Fig. 1. Our aim was to investigate what inherent tendencies of users shape their high-level orientation in general, irrespective of particular contextual subtleties. This means that we needed to minimize any influence that would create context-dependent differences when experiencing two distinct types of agents. Therefore, instead of observing people in separate cases, we decided to let all participants read the same predefined scenarios. Also, the aim of this study was not to categorize participants according to the pre-defined user characteristics, but rather to deductively discover those characteristics and how they are associated with user orientation. We therefore designed our study to be exploratory and collected qualitative data, letting participants freely articulate their

visceral preference on each scenario. Instead of interview, therefore, we asked the same open-ended questions to all participants, as we wanted to minimize intervention or biases introduced by an interviewer which might affect participants' perception, but also to give them enough freedom to answer the rationales behind their preference for scenarios [12, 16]. We recruited participants who experienced using at least one AI-infused product or system (e.g. intelligent personal assistant, AI speakers) to ensure they had a basic understanding of intelligent agents. Participants were recruited via social media and our university's networks.

We designed these agents and scenarios as in Fig. 1, based on Kim and Lim's [6] findings on two initial mental models of users toward intelligent agents which parallel utilitarian and relational orientations respectively, namely Getting-Things-Done (GTD) Agent and Companion Agent mental models. Their findings identified two key factors that determine services to be provided by the GTD Agent and the Companion Agent. The two factors are: (1) the main value that each agent pursues (i.e., efficiency-centered support by the GTD Agent vs. personally nuanced support by the Companion Agent); and (2) the scope and the processing logic of data used (i.e., factual-level interpretation of only essential data by the GTD Agent vs. semantic interpretation of diverse data by the Companion Agent).

In the questionnaire, participants were first provided with a short introduction, an informed consent, and questions for basic demographic information. After this, participants were presented with two agents simultaneously in the form of two different scenarios (Fig. 1) that included common everyday situations that an agent could provide its support, expecting participants could intuitively grasp the characteristics of each and the differences between both. After scrutinizing the scenarios of both agents, participants rated their preference for the agents and explain the reasons. They rated preference for each agent using a slider scale from "0: not preferred at all" to "100: most preferred" and described in detail the reasons for each score (B-Q1 and B-Q2 in Fig. 1, presented in random order). Then, they were asked to rate relative preference between two agent types using a 7-point scale with "strongly prefer the GTD Agent" and "strongly prefer the Companion Agent" on each side, also describing in detail the reasons for the score (B-Q3 in Fig. 1). This item was to ask participants to rate their orientation, i.e. those who preferred the GTD Agent were deemed to hold utilitarian orientation, and vice versa.

For the analysis, among a total of 309 participants, we aimed to focus on participants who had more firmly set orientation, in expectation of gaining clearer predictors. We chose to only analyze participants who preferred (i.e., chose "2" or "6" in Q3) or strongly preferred (i.e., chose "1" or "7" in Q3) either the GTD Agent (N = 130) or the Companion Agent (N = 69). This resulted in keeping 199 participants in total (Female = 100) with an average age of 27.4 (SD = 8.63, MIN = 20, MAX = 60).

The data were analyzed by five researchers. The lead author initially scrutinized all 199 participants' open-ended answers and wrote memos. After this, four other researchers also participated in the discussion and conducted thematic analysis [4] to derive key themes. We then developed initial codes, focusing on the underlying reasons for preference and hence factors contributing to the shaping of orientation, rather than user needs and behaviors in consequence of differences in orientation. We iteratively conducted coding until we reached a consensus on emergent themes.
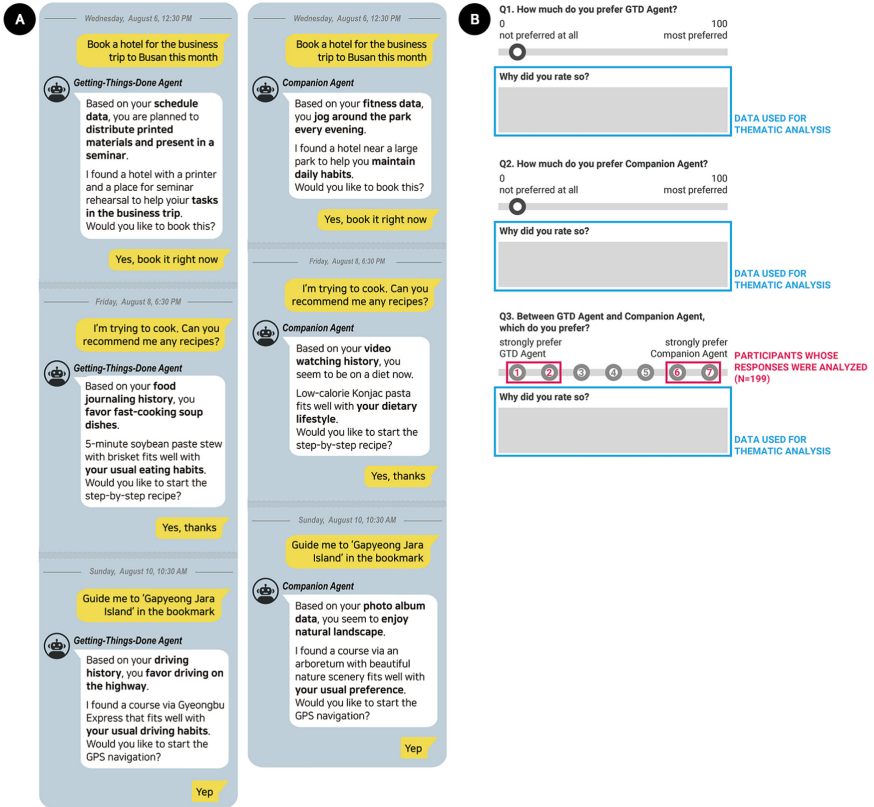
Fig. 1. (A) Service scenarios for GTD Agent (left) and Companion Agent (right); (B) Items in the questionnaire and data used for analysis.

3   Findings

From the analysis, we found three key factors that can be used as indicators of individual differences in user orientation to agents. The detailed findings are as follows.

3.1   Tolerance for Unpredictability

We found that participants differed in to what extent they were tolerant for unexpected service contents. Participants who preferred the GTD Agent considered an intelligent agent as an extremely advanced computer after all, expecting it to do better what computers could usually do: "What I want from an agent is not to understand me and empathize with me, but to save my time and effort by searching on behalf of me for the information I really need (P90)." As a result, these participants expected logicalness, speed, accuracy, and efficiency as the primary values pursued by an agent, being reluctant to get unpredicted and novel services that did not match their mental model of agents. Preferring "suggestions that are not exceptional (P116)," some participants even mentioned that overly creative suggestions were perceived as suspicious "advertisement (P3,

P26)." These participants wanted services reasonable enough so that they could infer and understand the rationale behind all the time.

On the contrary, participants who preferred the Companion Agent appreciated more collective advice and care for overall lifestyle, thereby supporting self-reflection and self-improvement: "The Companion Agent is more likely to help me get to know new things about myself (P153)." For example, they preferred the Companion Agent because it would "help discover hidden disposition (P167, P171)" or "have a positive impact on daily habits (P160)." These participants thought the services provided by the GTD Agent as "passive (P134)," "shallow (P188)," or "tactless (P151)." They thought that while the GTD Agent seemed to merely predict the next most likely behavior by learning patterns, the Companion Agent was the one that truly understands users. Accordingly, these participants welcomed suggestions of unexpected nature that help them reflect on and discover interesting facts about their life as a whole.

3.2 Sensitivity to Privacy

Participants differed in their sensitivity to privacy issues as well. Those who preferred the GTD Agent were extremely defensive against their personal data being shared. These participants believed an agent should have minimum access to personal data. Especially, what mattered was their subjective feeling of privacy invasion. For example, some participants perceived the GTD Agent as more protecting their privacy even though they were aware that the same data were used: "[The GTD Agent] seems like it is using the necessary data only (…) although I know there is no difference. [The Companion Agent is] unpleasing because it gives a feeling of seeing through everything in me (P125). "Overall, those who preferred the GTD Agent showed strong needs for maintaining proper distance between an agent so that personal data were less likely to leak and the agent could not grasp everything about them, criticizing the Companion Agent as "creepy (P15, P101)" and "stalker-like (P53)."

On the other hand, participants who preferred the Companion Agent believed an agent utilizing personal data to tailor services as beneficial and even "interesting (P157)." Service contents based on a wide scope of personal data were more appreciated as well: "I would think 'wow, can it even do that?' when the agent takes many factors into account instead of only using information related to a certain task (P199)." Furthermore, these participants even believed that disclosure of personal information was a catalyst for the relationship between an agent and them. An agent with a comprehensive understanding of users was perceived as friendly, far from being creepy. Participants appreciated the Companion Agent knowing more deeply about them and paying attention to trivial preferences and interests of theirs. Positive words such as "a best friend (P143, P147)" or "a family member (P135, P198)" were frequently used when participants were describing the Companion Agent.

3.3 Sensitivity to an Agent's Autonomy

Participants' orientation was also associated with the level of willingness to allow an agent to have autonomy. Participants who preferred the GTD Agent were vigilant in that an agent might think and judge on behalf of them, eventually taking away "free

will (P27)" of humans: "I do not want to delegate my right of decision-making to a computer. After mobile phones were invented, few people possess the ability to memorize phone numbers. Just like that, I am afraid my ability to judge and decide by myself will degenerate if the Companion Agent takes over. (P36)" For these participants, the main body of the decision should always be themselves. Also, it was important for them to have the feeling of control in the overall relationship. They insisted an agent should not "cross the line (P53, P85, P96)" and stay as a tool.

Participants who preferred Companion Agent, conversely, were willing to delegate their decision-making process to an agent: "Utilizing data to generate suggestions is a job that I cannot do, so I think I can get something [from the Companion Agent] that I could not come up with (P180)." These participants hardly cared about whether or not they are having the feeling of control, and they even considered an agent which decides and behaves on their own to be convenient and smart. Also, these participants were relatively less concerned with an agent having overall autonomy. Instead, they even emphasized the expected role of an agent as, literally, an "equal (P193)" companion and not a "master-servant (P135)" relationship.

4   Discussion

Unpredictability, privacy, and autonomy have been central topics of discussion regarding the design of intelligent agents, but to our knowledge, this is to the first study explicitly identifying these factors are associated with user orientation to agents. Our findings open up opportunities for more human-centered personalization with users' orientation to intelligent agents taken into consideration. Coming back to the motivation of this study, we suggest that designers apply our findings to designing an agent's personalization services based on user orientation. For users with utilitarian orientation, an agent should (1) exploit essential data only, (2) generate results within the boundary of users' expectation, and (3) ensure users feel in control by, for example, ensuring them to make the final decision. For users with relational orientation, an agent should (1) strengthen the feeling of intimacy by communicating that it is utilizing diverse data, (2) think on behalf of users to unfold the possibilities rather than narrowing down, and (3) proactively take care of users and shepherd them to become better selves. Figure 2 shows an example with these suggestions applied.

With this in mind, in future, it remains to be explored how individual differences in propensity can be detected. One way is to find out relevant user traits that an agent can simply identify. For example, studies investigated an individual's phone-use behavioral features and traits associated with propensity to trust [2] or cooperation [17], demonstrating ways to unobtrusively infer users' qualitative characteristics. In a similar vein, we encourage future researchers to investigate observable behavioral signals that can imply an individual's tendency to embrace unpredictability, protect privacy, and value autonomy. Another way is to let users self-report their propensity. For instance, without seeming to pry, intelligent agents can ask purposeful questions during an onboarding stage to inquire desired levels of access to personal data or autonomy of an agent. Also, designers can let users directly customize such levels. While providing specific design guidelines for this goes beyond the purpose of this paper, we underscore the necessity of

tactically designed probing interaction to unveil a user's propensity to unpredictability, privacy, and agent autonomy.
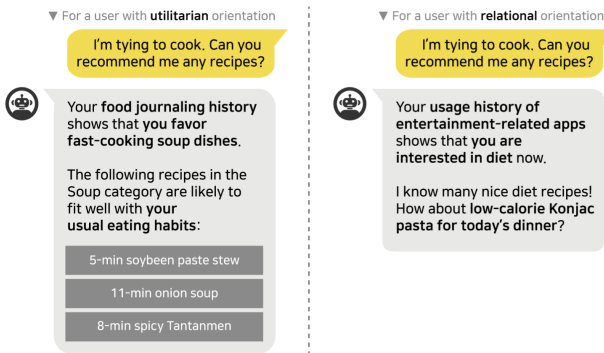
Fig. 2. Example of personalized recommendations for users with different orientations.

Meanwhile, we note that we probed properties of users that affect their general orientation towards intelligent agents as a whole. Users' orientation might be associated with other situational factors, such as the type of information provided. Also, a user's orientation might evolve over time [6, 11]. We hope our work motivates longer-period exploration in a less controlled study environment as future research.

5   Conclusion

In this paper, we investigated possible indicators of users' orientation towards intelligent agents. Our scenario-based questionnaire study shows individual differences in users' tolerance for unpredictability, sensitivity to privacy, and sensitivity to an agent's autonomy are associated with such orientation. We suggest considering them into the design of personalized service and interaction style, supported by further investigation of methods for eliciting them. We hope our study will be a step toward a deeper exploration of human-centered personalization in intelligent agents.

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