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The Experimental Effect of Computer-mediated Negotiation on Subsequent Social Decision-making

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Abstract

The increasing prevalence of human-computer negotiation has made it a critical area of research. This paper investigates whether negotiating with a computer agent systematically shifts a person's social preferences. We specifically addressed two questions: (1) Do individual differences, measured by Social Value Orientation (SVO) and the Thomas-Kilmann Conflict Model, significantly affect negotiation outcomes? (2) Do individual differences and engagement during the process influence the subsequent stability of the participant's SVO? We conducted an experiment in which human participants acted as buyers negotiating the purchase of a laptop with automated computer agents acting as sellers. Our results demonstrate that participants' individual differences are a significant predictor of negotiation outcomes. Furthermore, our results indicate that both the participants' individual differences and their level of engagement had statistically significant effects on the stability of their Social Value Orientation following the negotiation.

Keywords: human-computer negotiation, Social Value Orientation, Thomas Kilmann Instruments, engagement, Social Value Orientation stability.

1. Introduction

Social value orientation (SVO) captures stable individual preferences for allocating outcomes between oneself and others (Collins et al., 2023). Individuals classified as "prosocial" or "altruistic" place more weight on others' welfare, whereas "proself" individuals (individualistic or competitive) prioritize their own gains (Jahan, 2024). Decades of research have shown that SVO robustly predicts cooperation and negotiation behavior: prosocial individuals tend to pursue win–win agreements, while proself negotiators often use more competitive or manipulative tactics (Collins et al., 2023; Jahan, 2024). In traditional human-to-human bargaining, SVO is generally treated as a stable personality trait with high test-retest reliability over time (De Matos Fernandes et al., 2022). Recent longitudinal studies report that continuous SVO scores remain highly correlated ($r \geq 0.66$) across months and that prior SVO strongly predicts future SVO (De Matos Fernandes et al., 2022). Nevertheless, some evidence suggests that interaction context can transiently moderate behavior: for example, emerging emotions and repeated interactions can attenuate the influence of one's baseline SVO on cooperation (Bouman & Dijkstra, 2025).

The rise of artificial intelligence has introduced new contexts for negotiation. Humans increasingly

interact with computer agents in bargaining tasks, from automated customer service agents to negotiation training simulations (Meyer & Schoop, 2025; Türkgeldi et al., 2022). These human-agent negotiations raise novel questions. For instance, does the inherently computerized partner change a person's usual social preferences? Classic SVO theory treats orientation as trait-like, but it is unclear whether negotiating with an artificial agent might shift a person's social motivations or conflict style. Moreover, digital settings may activate different psychological cues: one recent experiment found that human participants negotiated more collaboratively with a familiar (celebrity) avatar than with an unfamiliar one (Türkgeldi et al., 2022). Such findings hint that factors like agent appearance, perceived identity, or trustworthiness can influence human strategies in AI-mediated bargaining.

A further theoretical lens comes from the Thomas–Kilmann Conflict Mode Instrument (TKI), which describes five conflict-handling styles – Competing, Avoiding, Accommodating, Collaborating, and Compromising – based on assertiveness and cooperativeness. In face-to-face negotiations, individuals' TKI profiles correlate with their typical negotiation behavior. Recent digital negotiation frameworks have begun to incorporate TKI-based taxonomies when designing agent behaviors and training tools. However, little work has explored how exposure to AI partners might interact with people's inherent conflict styles.

This study asks: Will negotiating with a computer agent change one's social value orientation? To address this, we review recent literature on (1) SVO – especially its measurement, stability, and impact on negotiation outcomes, (2) human–computer (agent) negotiation and the role of individual differences therein, and (3) the use of the Thomas–Kilmann model in digital negotiation contexts. Integrating findings from the past few years, we then reframe our experimental focus in light of new insights.

2. Literature Review

The pervasive shift toward automated systems in commerce and public life necessitates a deep understanding of human psychological responses when interacting with artificial intelligence (AI). This investigation into the experimental effect of computer-mediated negotiation (CMN) is grounded in established theories of social motivation and conflict management. Specifically, this review synthesizes the literature concerning individual differences—Social Value Orientation (SVO) and the Thomas-Kilmann Conflict Model (TKI)—their role in negotiation outcomes, and the critical debate surrounding the temporal stability of SVO, particularly when exposed to novel digital contexts and varying levels of behavioral engagement.

2.1. Individual Differences in Negotiation: Social Motivation and Conflict Style

Negotiation behavior is fundamentally influenced by intrinsic motivational factors and patterned conflict-handling styles (Sequeira & Marsella, 2018). The dominant theoretical perspectives used to model these individual differences are Social Value Orientation (SVO) and the theoretical framework of the Dual Concern Theory.

2.1.1. Social Value Orientation (SVO): Foundations and Behavioral Consequences

Social Value Orientation captures stable individual preferences regarding the allocation of outcomes between oneself and others (Collins et al., 2023; McClintock, 1978). The theoretical understanding of SVO is explained through two major perspectives: Cooperation Theory (Deutsch, 1973) and the foundational Dual Concern Theory (Blake & Mouton, 1964; Pruitt & Rubin, 1986).

Dual Concern Theory posits that negotiation behavior is driven by two independent motivational dimensions: self-concern (or toughness/assertiveness) and other-concern (or cooperativeness/social motive). These dimensions establish the classic SVO typologies (De Dreu & Boles, 1998; Van Lange, 1999). Negotiators with a prosocial motive exhibit strong other-concern, striving to maximize both their own and their counterpart's outcomes, leading them to pursue win–win agreements. In contrast, proself individuals—including those classified as egoistic or competitive—prioritize their own gains, attaching

a zero or negative weight to the counterpart's outcomes (Jahan, 2024; Van Lange, 1999). Proself negotiators typically employ more competitive or manipulative tactics (Collins et al., 2023; Jahan, 2024).

Decades of research have confirmed SVO's robust predictive power in human-to-human (H2H) bargaining. For example, cooperative negotiators, often categorized as prosocial, are observed to utilize integrative strategies more frequently and achieve better individual outcomes than individualistic negotiators (Kern et al., 2005). However, the direct relationship between SVO and economic outcomes is complex, leading to inconsistencies across studies. While prosocial negotiators often lead to higher joint outcomes when coercive power is limited (De Dreu & Boles, 1998), some findings suggest that egoistic negotiators may achieve higher joint outcomes (O'Connor & Carnevale, 1997) or that social motives fail to produce differences in integrative negotiation (Weingart et al., 1996).

There is some research about individuals' negotiation results and social motives (other concerns). In an experiment, Kern et al. (2005) observed that cooperative negotiators use integrative strategies more than individualistic negotiators and also get better individual outcomes. Craver (2003), though, argues that the most effective negotiators may be those that employ a hybrid competitive problem-solving approach, incorporating traits from both classifications.

These conflicting results are often attributed to the interaction between social motives (other-concern) and the second dimension of the Dual Concern Theory: self-concern (Butler, 1994). Self-concern is intrinsically related to "toughness" and the concept of resistance to yielding, which refers to a negotiator's intransigence regarding concession making. De Dreu et al. (2000) demonstrated that resistance to yielding acts as a moderator of the effect of social motives on both negotiation behavior and joint outcome. Therefore, a comprehensive understanding of utility maximization requires examining both the social motive (SVO) and the degree of assertiveness (resistance to yielding).

2.1.2. The Thomas-Kilmann Conflict Mode Instrument (TKI)

The Thomas-Kilmann Conflict Mode Instrument (TKI) offers another widely used framework for classifying individual differences in conflict handling. Developed by Kilmann and Thomas (1975), this model (Figure 1) classifies behavior into five categories—Avoiding, Accommodating, Compromising, Competing, and Collaborating—based on the same two underlying dimensions of assertiveness and cooperativeness derived from Blake and Mouton's (1964) work. Similar constructs have been developed, such as Rahim's (1983) model (Figure 2), which includes avoiding, obliging, compromising, dominating, and integrating.

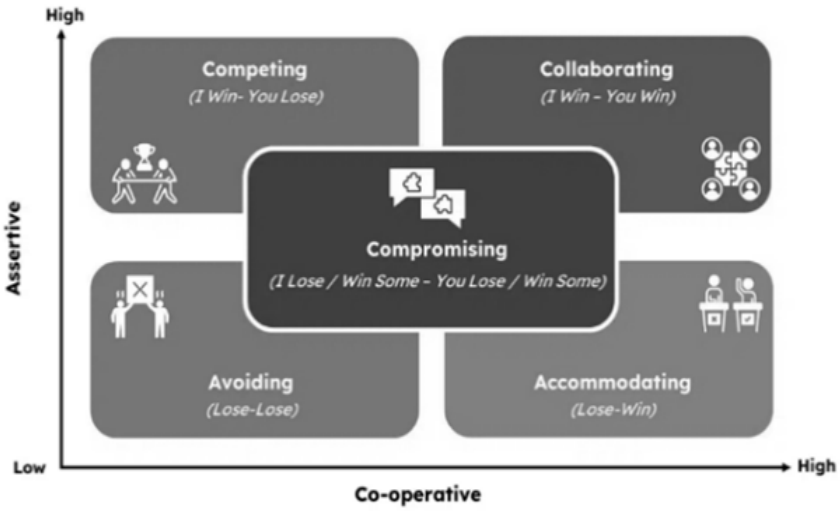

Figure 1. Thomas Kilmann conflict model

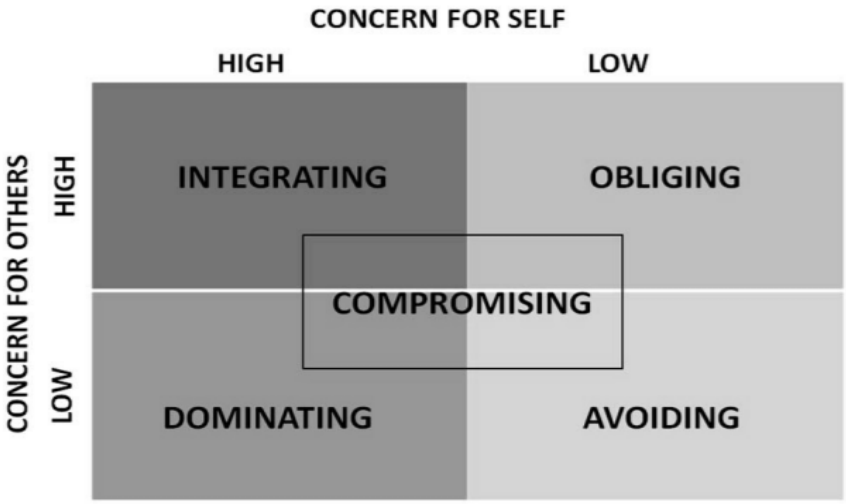

Figure 2. Rahim conflict model

Empirical studies confirm that TKI profiles correlate with general personality dimensions, such as the Big Five model (Tehrani & Yamini, 2020), and demographic variables like age and gender (Gbadamosi et al., 2014). However, the application of TKI in digital or Internet-based negotiation contexts has yielded ambiguous results. Zaremba and Kersten (2006) found that none of the five TKI dimensions had a significant influence on economic negotiation outcomes in an electronic setting. Similarly, Ma (2007) reported no statistically significant influence from the five TKI dimensions on negotiation behaviors among Chinese participants. Ma (2007) suggested that the questionnaire design of the TKI—which uses a forced-choice format to tally points for each dimension—may restrict the variability of the scores, potentially suppressing the dimensions' ability to accurately represent their true variance in statistical models. For TKI to serve as a reliable predictor of specific behaviors, it is necessary to consider the inherent limitations of its measurement design or utilize techniques, such as Principal Component Analysis, to isolate dimensions that possess independent variance, such as the compromising style.

2.2. Temporal Stability of Social Value Orientation

A critical theoretical question guiding this research is whether SVO functions as an immutable personality trait or a flexible intention influenced by context.

2.2.1. Evidence Supporting SVO Stability

Extensive early research conceptualized SVO as a stable disposition that reflects how people evaluate interdependent outcomes (Hulbert et al., 2001; Kuhlman et al., 1986; Messick & McClintock, 1968; Perugini & Gallucci, 2001; Van Lange et al., 1997). This viewpoint holds that SVO is temporally stable and not easily affected by transient situations. Recent longitudinal studies lend continued support to this stability, reporting high test-retest reliability for continuous SVO scores ($r \geq 0.66$) across periods spanning months (De Matos Fernandes et al., 2022).

2.2.2. Evidence Supporting SVO Instability and Situational Moderation

Conversely, research on longitudinal stability has also produced disappointing results, prompting debate over the trait-like nature of SVO. Bekkers (2004a) found that the stability of the SVO typology in a computerized survey over a nineteen-month period was only .19, a finding that remained low even after correcting for measurement error (Bekkers, 2004b). These low estimates suggest that SVO may be better understood as cooperative intentions that are less stable than other personality characteristics and are prone to changing from one situation to the next (Bekkers, 2004b).

Situational factors are known to affect the expression of SVO. For instance, directly instructing

participants to adopt cooperative or competitive behaviors can influence their preferences for own-other payoff combinations (Griesinger & Livingston, 1973). Furthermore, outcome framing affects cooperation: De Dreu and McCusker (1997) found that framing outcomes in terms of losses versus gains differentially affected cooperation behaviors among prosocial and individualistic participants. The classification of subjects based on SVO is also sensitive to priming effects, including semantic and evaluative primes (Hertel & Fiedler, 1998; Utz et al., 1999). This body of work suggests that while SVO may exhibit long-term stability, its expression can fluctuate acutely following a high-impact stimulus such as a negotiation process.

2.3. Human-Computer Negotiation (HCN) and Contextual Effects

The study of negotiation has traditionally focused on H2H interactions (Thompson, 1990). The growing prevalence of human interaction with computer agents—ranging from customer service bots to negotiation training simulations—introduces a novel context, Human-Computer Negotiation (HCN) (Meyer & Schoop, 2025; Türkgeldi et al., 2022).

HCN differs from traditional negotiation across several key psychological dimensions, including social perception, trust formation, and emotional engagement. Negotiations with computer agents typically do not evoke the strong emotional responses, such as empathy or guilt, that often influence concession behavior in H2H settings. This inherent emotional detachment can lead to interactions that are more task-oriented and rational.

Because computer agents are not perceived as social beings in the traditional sense, individuals may temporarily adjust their social value orientation, potentially acting more individualistically or competitively and showing less prosocial motivation than they would when interacting with a human counterpart. This adjustment indicates that negotiating with a computer agent could influence not only immediate negotiation outcomes but also the stability of underlying social preferences. Evidence already suggests that psychological cues within digital settings matter; for example, participants negotiate more collaboratively with familiar virtual agents (avatars) than with unfamiliar ones (Türkgeldi et al., 2022).

This unique context of interacting with an artificial agent provides the ideal setting to test the stability of SVO. However, to the best of current knowledge, no peer-reviewed study has systematically measured participants' SVO both immediately before and immediately after engaging in a computerized negotiation to assess potential changes and contribute to the design and development of adaptive computer agents.

2.4. The Influence of Behavioral Engagement

Engagement—defined as the intensity and duration of active participation—is a key factor driving online interactions (Voorveld et al., 2009) and particularly relevant in online shopping contexts (Han & Kim, 2017). High engagement is positively associated with a shopper's propensity to negotiate price (Levy & Gvili, 2019).

The connection between personality traits and engagement is well-documented. Many studies show that personality characteristics, such as the Big Five, proactive personality, and core self-evaluation, predict engagement in work and learning environments (Akhtar et al., 2015; O'Neill et al., 2014; Qureshi et al., 2016; Tisu et al., 2020). Furthermore, personality has been found to moderate the effect of other factors on work engagement (Liao et al., 2013) and engagement with online recommendations (Rook et al., 2018).

Despite the strong evidence linking personality and engagement, the specific relationship between SVO and engagement remains unexamined. Crucially, the literature lacks studies investigating the influence of engagement level on the stability of personality traits themselves. Given the close relationship between personality and engagement, it is hypothesized that the level of engagement during a negotiation—quantified objectively by the number of offers exchanged—acts as a measure of immersion in the competitive process, thus influencing the short-term stability of SVO.

2.5. Negotiation Outcomes: Utility and Measurement

In experimental and laboratory studies, the most common measure of performance is the economic outcome, often referred to as individual economic value or value claimed (Thompson, 1990). Within the field of agent-based negotiation, the concept of utility is frequently employed to quantify the level of satisfaction, profitability, or desirability of an offer or counteroffer (Yu et al., 2015). For multi-issue negotiations, the overall utility is typically calculated as the weighted average of issue-specific utilities. The achievement of utility outcomes is influenced by several factors, including the negotiator's concession curve. A competitive negotiator is expected to yield less, resulting in higher utility for themselves and lower utility for the counterparty (the agent), demonstrating that resistance to yielding can be an effective tactic.

Based on the theoretical structures of Cooperation Theory and Dual Concern Theory, individual differences—specifically SVO and TKI—are used to explain variance in resultant utility. As established, the two concerns of the Dual Concern Theory influence negotiation results in terms of both contentious/problem-solving behavior and joint outcome (De Dreu et al., 2000). Prior empirical findings support that motives influence outcomes, with some research showing that negotiators holding an egoistic motive achieved higher joint outcomes compared to those with a prosocial motive (O'Connor & Carnevale, 1997). Therefore, both SVO and specific dimensions of TKI are critical predictors of the economic utility achieved by the computer agent in the negotiation task.

3. Research model and hypotheses

Individual differences are critical determinants of how people behave in a conflict situation. One well-understood individual difference in the context of bargaining and negotiation is social value orientation (SVO), a personality trait that describes relatively stable individual differences for the allocation of outcomes between the self and others. Building on the seminal work of Blake and Mouton (1964), Pruitt and Rubin (1986) proposed their Dual Concern Theory, which is the foundation of Social Value Orientation (SVO). Dual Concern Theory postulates two kinds of concern, other-concern and self-concern. Other-concern is closely related to the concept of social motive. Egoistic negotiators have weak other-concern while prosocial negotiators have strong other-concern. Self-concern is closely related to "toughness" and resistance to yielding. The concept of resistance to yielding refers to the negotiator's intransigence about concession making.

Several pieces of evidence support the assumption that SVO has an influence on negotiation results in terms of contentious/problem-solving behavior and joint outcome (De Dreu et al., 2000; Sequeira & Marsella, 2018). From the previous research, we can find theoretical and practical support that SVO will significantly influence the result of negotiation. Thereby hypothesis 1:

Hypothesis 1: Participant's SVO will influence the result utility for an agent.

Another one of the individual differences is Thomas Kilmann Conflict Handling Model. Thomas and Kilmann (1975) developed a conflict model and classified people's conflict behavior into five categories: avoiding, accommodating, compromising, competing, and collaborating based on the same theory proposed by Blake and Mouton (1964). The five dimensions of TKI are divided by the participant's assertiveness and cooperativeness, which are similar concepts as self-concern and other-concern.

According to the articles investigating the influence of SVO on negotiation results, TKI should have a significant influence on negotiation too.

But few articles have conducted research on this topic and the current few articles all reported no influence from TKI to negotiation result (Ma, 2007; Zaremba & Kersten, 2006). Ma (2007) believes that the design of the questionnaire of TKI suppressed the variance of the five dimensions leaving them cannot represent their real variance. In the TKI questionnaire, each question only has two answer options. If any option is chosen, the participant's tendency to one of the five result dimensions will get one more point. This means the answer to all the questions will be located at either dimension A or dimension B depending on the options. Compared to this kind of questionnaire, in regular questionnaires, each question reflects one aspect of one dimension, and the answer will reflect the level of such aspect. This restricts the variability of the questions. Because of this reason, previous research didn't have any significant influence from TKI on negotiation results.

We conducted a Principal Component Analysis (PCA) with varimax rotation and found out that the five dimensions of TKI can be grouped into three underlying principal variables: accommodating-competing, collaborating-avoiding, and compromising. Because compromising is separated from other dimensions, we can assume that the compromising score can reflect its own variance without being influenced by other dimensions. Hence, we get hypothesis 2.

Hypothesis 2: Participant's compromising score (TKI) will influence the result utility for an agent.

In past studies, social value orientation is commonly considered as a stable disposition that reflects how people evaluate interdependent outcomes for themselves and others (Ligthart, 1995; Van Dijk et al., 2002). However, Bekkers has found that social value orientations appear to be less stable than other characteristics, and should be understood as cooperative intentions that may change from one situation to the next (R. Bekkers, 2004b, 2004a). It is reasonable to expect that cooperative intentions may shift following a negotiation process. From our first hypothesis, we believe individual personalities will affect negotiator behavior and hence negotiating results, which both can change the participant's SVO in consequence.

So, although in long term a person's personality can be stable, it still can fluctuate in a short time period after some stimuli, such as negotiation.

Hypothesis 3: Participant's individual differences will influence the stability of SVO.

Extensive research has found that personality traits and engagement have a relationship directly with each other or through a moderate effect. Some researchers found personality accounted for a relatively large degree of variance in engagement and can be used to predict engagement (Akhtar et al., 2015; O'Neill et al., 2014; Qureshi et al., 2016; Tisu et al., 2020). But most of the personalities being studied are Big Five personality traits, no study researched the relationship between SVO and engagement.

Although there are plenty of articles that studied personality's influence on engagement, no article has studied the engagement's influence on the stability of personality traits. Since engagement has a very close relationship with personality traits, we believe engagement can influence the stability of personality. We believe the participant's engagement level will affect a short-term SVO change.

Hypothesis 4: Participant's engagement will influence the stability of SVO.

4. Experimental settings

4.1. Negotiation case and system

This study simulated a laptop purchase negotiation through a responsive web-based platform. Participants bargained with automated agents over five attributes: price, CPU cores, processor type, hard drive capacity, and RAM. Price was modeled as a continuous variable, while the other issues were

discrete. Each offer consisted of value for all five issues; agents generated counteroffers using the same structure. Participants were not informed that their counterpart was computer-driven.

Utilities served as the evaluation metric. Each option within an issue was assigned a value from 0 to 100, either by participants (for their preferences) or by the experimenter (for the agent's settings). An offer's overall utility was computed as the weighted average of its issue utilities.

Before negotiations began, participants configured their preferences by allocating weights across issues and specifying option utilities. Thus, each offer reflected both issue importance and option-specific valuations.

4.2. Experimental procedure

The experiment was conducted at a large North American university with human subjects negotiating against computer agents. Agents assumed the role of sellers, while students acted as buyers. The procedure included three stages: (1) a pre-survey capturing Social Value Orientation (SVO), Thomas-Kilmann conflict style (TKI), and demographic data; (2) the negotiation task; and (3) a post-survey re-measuring SVO and capturing perceptions of the negotiation.

SVO was measured using the Slider measure (Murphy et al., 2011), chosen over the Triple Dominance Measure (Van Lange et al., 1997) and Ring Measure (Liebrand & McClintock, 1988) due to its higher reliability and continuous scoring (Bakker & Dijkstra, 2021).

Participants were students in an online IT fundamentals course. Invitations were distributed by email, and participants were randomly matched with an agent counterpart. Detailed instructions were provided prior to the task.

The negotiation interface displayed the sequence of offers. Each row represented either a buyer's or an agent's offer, including selected options and a calculated utility score. New offers appeared immediately upon submission.

Agents initiated each negotiation. Buyers could accept, counter, or terminate. Acceptance concluded the session with agreement utilities recorded for both sides. Termination ended negotiations with no agreement. When composing counter offers, buyers could review the full offer history and utility scores, as well as the projected utility of their new proposal.

To simulate realistic behavior, agents responded with a randomized delay of 60–90 seconds. They only accepted offers meeting or exceeding predefined utility thresholds; if offers were lower than threshold, they generated counteroffers. The threshold for computer agent followed an exponential decay shaped curve defined in a previous research (Carbonneau & Vahidov, 2014). Negotiations ended when participants terminated, time expired, or an agreement was reached. If no agreement occurred within the allotted time, the session closed automatically. Agents were not permitted to terminate unilaterally.

5. Experiment result

A total of 641 participants took part in the experiment and were randomly paired with agent counterparts. Data was then subjected to a multi-step cleaning procedure. Cases were excluded if they contained missing values in either the pre- or post-negotiation SVO survey, four or more missing responses in the TKI instrument, or fewer than three offers across the negotiation process. Negotiations with only one or two offers—indicating either immediate acceptance of the agent's initial proposal or a single counter offer immediately accepted by the agent—were also removed, as they did not constitute substantive negotiations.

Following these exclusions, remaining missing values were imputed using the mode of each attribute, leaving 363 valid cases. Two additional records were removed because they were classified as "altruism" types in the SVO surveys—one before and one after negotiation. As altruistic orientations are rare in practice and single instances are insufficient for meaningful statistical analysis, these observations were excluded.

The final dataset consisted of 361 negotiation sessions, of which 329 concluded with an agreement and 32 ended without settlement.

5.1. Negotiation result utility for agent

To analyze the utility of agreement, only the cases which ended up with agreement were utilized (329 observations). A two-way ANOVA was used to test the effects of SVO type and compromising level (TKI) on utility for agents. The analysis revealed that the observations were independent of each other. The distribution of standardized residual's P-P plot and histogram suggested that the errors were approximately normally distributed.

Table 1 presents the mean utilities of agreements reached by the agents. The results of the ANOVA test showed that both SVO type, as well as compromising level (TKI) had significant direct effects on the utilities achieved by the agents ($F_{SVO} = 3.58$, $p_{SVO} = 0.029$, $\eta^2_{SVO} = 0.02$; $F_{TKI} = 3.334$, $p_{TKI} = 0.037$, $\eta^2_{TKI} = 0.019$). So, hypothesis 1 and hypothesis 2 are supported. It is very easy to understand that a more competitive subject will deprive more utility from the computer agent and end up with less utility for an agent in the agreement (hypothesis 1) and a subject that is very easy to compromise will leave the computer agent more utility in the end (hypothesis 2).

Table 1. Result means of utility for agent

		Utility for agent	
		Mean	95% CI
SVO Type (Post)	Competitive	.6617	[0.595, 0.728]
	Individualistic	.6958	[0.674, 0.718]
	Prosocial	.7247	[0.704, 0.745]
Compromising Level	Low	.7556	[0.688, 0.823]
	Medium	.7132	[0.693, 0.733]
	High	.6934	[0.671, 0.716]

If we investigate the differences between all levels of SVO, the prosocial group differed significantly from the competitive group. ($p = 0.008$, *difference* = 0.063, 95% Confidence Interval [0.016, 0.109]) and individualistic ($p = 0.014$, *difference* = 0.029, 95% CI [0.006, 0.514]). Because usually competitive orientation and individualistic orientation are put together and called proself in research, we can say prosocial and proself are significantly different in the agreement utility for an agent. For TKI compromising, a participant who has a high level in compromising will end up with a significant difference in agent utility than a participant who is low in compromising ($p = 0.014$, *difference* = 0.062, 95% CI [0.013, 0.111]).

5.2. Change of SVO

To test if individual differences and engagement will influence the change of SVO, we ran a linear regression. We also checked the distribution of standardized residual's P-P plot and histogram. Results suggested that the residuals were normally distributed.

The regression model yielded an R^2 of 0.199, indicating that approximately 19.9% of the variance was explained. And ANOVA test shows the model is significant ($F_{model} = 17.653$, $p_{model} = 0.000$).

In a lot of studies, self-reported surveys were used to test the user's engagement. But that kind of survey may include bias and is a subjective measure. In our study, we adopted the number of offers during the negotiation to represent the user's engagement. The number of offers generated during the whole negotiation process is an objective measure and it doesn't need the user to report it in a survey. Also, the data is easier to gather. In a negotiation process, if the user and agent have a large number of offers exchange, we can assume the user is engaged in the process. On the contrary, if the user accepted or terminated the negotiation very fast, it is reasonable to assume that the user is not engaged in the negotiation. On the other hand, there could be potential correlation between engagement and the time

spent on the negotiation. In specific, when the participant is more engaged in the experiment and produces more offers, they usually will spend a longer time on the negotiation. But on the other hand, spending longer time on the negotiation process won't represent higher engagement. The negotiator could be absent-minded and didn't focus on negotiating.

To prove our assumption, we used both the number of offers and time spent as input to our linear regression. The results show that number of offers has a significant influence on the change of SVO (t_{offer} = -2.549, p_{offer} = 0.011) while time spent during the negotiation has no statistically significant influence (t_{time} = 0.331, p_{time} = 0.741). Therefore, Hypothesis 4 was supported. From the linear regression result, the unstandardized coefficient of engagement is -0.468. This indicates that higher levels of user engagement during the negotiation are associated with smaller changes in SVO.

Figures 3 and 4 depict the relationship between SVO and the number of offers made before and after the negotiation, respectively. An SVO value of 0 represents a competitive type, characterized by a desire to maximize the difference between one's own and others' outcomes, even at a cost of one's personal outcome. An SVO value of 1 reflects an individualistic orientation, where participants seek to maximize their own gains. In contrast, an SVO value of 2 denotes a prosocial orientation, indicating a preference for maximizing joint outcomes for both parties. The results demonstrate a clear association between engagement and SVO: as participants became more engaged in the negotiation process (i.e., made a greater number of offers), their SVO values tended to decrease, suggesting a shift toward more competitive behavior.

Figure 3. SVO vs. number of offers before negotiation

Figure 4. SVO vs. number of offers after negotiation

As for individual differences' influence on SVO change, we used SVO degree generated from Slider measure (Murphy et al., 2011) and one dimension of TKI: competing. Because the way TKI questionnaire is designed, all the five dimensions of TKI are correlated. Among all the five dimensions, competing is most related to negotiation. Our result shows that both SVO and TKI competing have significant influence on the change of SVO (t_{SVO} = -8.503, p_{SVO} = 0.000, B_{SVO} = -0.264; t_{TKI} = -2.697, p_{TKI} = 0.007, B_{TKI} = -0.463). As a result, hypothesis 3 is supported. From the regression result, the unstandardized coefficient of SVO and TKI competing is -0.264 and -0.463 respectively. The coefficient of SVO is negative, representing that the more a participant cares about the counterparty's benefit, the less the participant's SVO will change after the negotiation process. Also, the coefficient of competing represents that a more competitive participant will have less SVO change during the negotiation process.

In a negotiation process, some other factors may also influence the change of user's social value orientation, such as the user's satisfaction with the result. It is reasonable to assume that a satisfactory negotiation result will end up with a happier user, which will have a positive influence on the user's psychology features such as SVO. So, we used user satisfaction as input and the result shows that satisfaction has no statistical influence on SVO change ($t_{satisfaction}$ = 1.358, $p_{satisfaction}$ = 0.175).

6. Conclusion and discussion

The purpose of this paper was to investigate the impact of individual differences, engagement and satisfaction on the change of social value orientation. To this end, an experiment has been conducted featuring the case of laptop purchase. Agents acted as sellers, while human users were given the task of fulfilling the buyer part.

The results have shown that both SVO and competing (one dimension from TKI) had statistically significant effects on the change of SVO. In particular, the more a participant cares about the counterparty's benefit, the less the participant's SVO will change after the negotiation process. For the competing dimension of TKI, a more competitive participant will have less SVO change during the negotiation process.

We also found that engagement has a significant influence on the change of SVO. Our result shows that the more the user is engaged in the negotiation, the less their SVO degree will change after the negotiation.

One limitation of the present study concerns the use of undergraduate students as participants. Although this group reasonably represents the demographic segment that frequently purchases computer

products—given that students and younger consumers constitute a substantial share of this market—their characteristics may not fully generalize to the broader population. In particular, students typically exhibit higher familiarity with digital environments and greater acceptance of AI-based interactions. Nonetheless, it remains uncertain whether their behavior in an experimental setting accurately reflects that of individuals engaged in real-world negotiation scenarios. To mitigate this limitation, we imposed a threshold on the number of offers exchanged during each negotiation and employed a large sample size, with the expectation that generalizable behavioral patterns would emerge.

The findings of this study have meaningful implications for the design of intelligent negotiation systems and AI-driven bargaining platforms. Understanding how individual differences——such as social value orientation, conflict-handling style, and engagement——shape negotiation behavior can guide the development of adaptive agents capable of personalizing their strategies to user traits. For instance, agents could dynamically adjust their concession patterns or communication styles based on the user's detected social orientation or engagement level. Incorporating such adaptive mechanisms could help enhance negotiation efficiency, improve user satisfaction, and foster trust in human-AI interactions.

References

1. Akhtar, R., Boustani, L., Tsivrikos, D., & Chamorro-Premuzic, T. (2015). The engageable personality: Personality and trait EI as predictors of work engagement. Personality and Individual Differences, 73, 44–49.
2. Bakker, D. M., & Dijkstra, J. (2021). Comparing the Slider Measure of social value orientation with its main alternatives. Social Psychology Quarterly, 84(3), 235–245. https://doi.org/10.1177/01902725211008938
3. Bekkers, R. (2004a). Giving and Volunteering in the Netherlands: Sociological and Psychological Perspectives [PhD Thesis]. Utrecht University.
4. Bekkers, R. (2004b). Stability, Reliability and Validity of Social Value Orientation. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2274560
5. Blake, R., & Mouton, J. (1964). The managerial grid: The key to leadership excellence. Houston: Gulf Publishing Co, 350.
6. Bouman, L., & Dijkstra, J. (2025). Social value orientation and learning in repeated step-level public goods games: An experimental investigation. Rationality and Society. https://doi.org/10.1177/10434631251369684
7. Butler, J. K. (1994). Conflict styles and outcomes in a negotiation with fully-integrative potential. International Journal of Conflict Management, 5(4), 309–325. https://doi.org/10.1108/eb022749
8. Carbonneau, R. A., & Vahidov, R. M. (2014). A utility concession curve data fitting model for quantitative analysis of negotiation styles. Expert Systems with Applications, 41(9), 4035–4042. https://doi.org/10.1016/j.eswa.2013.12.029
9. Collins, D., Houghton, C., & Ajmeri, N. (2023). Social Value Orientation and Integral Emotions in Multi-Agent Systems. In Coordination, Organizations, Institutions, Norms, and Ethics for Governance of Multi-Agent Systems XVI (pp. 118–138). Springer-Verlag. https://doi.org/10.1007/978-3-031-49133-7_7
10. Craver, C. B. (2003). Negotiation Styles: The Impact on Bargaining Transactions. Journal of Dispute Resolution, 48. https://ssrn.com/abstract=1003448
11. De Dreu, C. K. W., & Boles, T. L. (1998). Share and Share Alike or Winner Take All?: The Influence of Social Value Orientation upon Choice and Recall of Negotiation Heuristics. Organizational Behavior and Human Decision Processes, 76(3), 253–276. https://doi.org/10.1006/obhd.1998.2806

12. De Dreu, C. K. W., & McCusker, C. (1997). Gain–loss frames and cooperation in two-person social dilemmas: A transformational analysis. Journal of Personality and Social Psychology, 72(5), 1093–1106. https://doi.org/10.1037/0022-3514.72.5.1093
13. De Dreu, C. K. W., Weingart, L. R., & Kwon, S. (2000). Influence of social motives on integrative negotiation: A meta-analytic review and test of two theories. Journal of Personality and Social Psychology, 78(5), 889–905. https://doi.org/10.1037/0022-3514.78.5.889
14. De Matos Fernandes, C. A., Bakker, D. M., & Dijkstra, J. (2022). Assessing the test-retest reliability of the social value orientation slider measure. Judgment and Decision Making, 17(1), 31–49. https://doi.org/10.1017/S1930297500009013
15. Deutsch, M. (1973). The Resolution of Conflict: Constructive and Destructive Processes. American Behavioral Scientist, 17(2), 248–248. https://doi.org/10.1177/000276427301700206
16. Gbadamosi, O., Baghestan, A. G., & Al-Mabrouk, K. (2014). Gender, age and nationality: Assessing their impact on conflict resolution styles. Journal of Management Development, 33(3), 245–257. https://doi.org/10.1108/JMD-02-2011-0024
17. Griesinger, D. W., & Livingston, J. W. (1973). Toward a model of interpersonal motivation in experimental games. Behavioral Science, 18(3), 173–188. https://doi.org/10.1002/bs.3830180305
18. Han, M. C., & Kim, Y. (2017). Why Consumers Hesitate to Shop Online: Perceived Risk and Product Involvement on Taobao.com. Journal of Promotion Management, 23(1), 24–44. https://doi.org/10.1080/10496491.2016.1251530
19. Hertel, G., & Fiedler, K. (1998). Fair and dependent versus egoistic and free: Effects of semantic and evaluative priming on the 'Ring Measure of Social Values'. European Journal of Social Psychology, 28(1), 49–70. https://doi.org/10.1002/(SICI)1099-0992(199801/02)28:1%253C49::AID-EJSP845%253E3.0.CO;2-H
20. Hulbert, L. G., Corrêa da Silva, M. L., & Adegboyega, G. (2001). Cooperation in social dilemmas and allocentrism: A social values approach. European Journal of Social Psychology, 31(6), 641–657. https://doi.org/10.1002/ejsp.53
21. Jahan, N. (2024). Unraveling the Tapestry of Deception and Personality: A Deep Dive into Multi-Issue Human-Agent Negotiation Dynamics. International Conference on Autonomous Agents and Multiagent Systems.
22. Kern, M. C., Brett, J. M., & Weingart, L. R. (2005). Getting the Floor: Motive-Consistent Strategy and Individual Outcomes in Multi-Party Negotiations. Group Decision and Negotiation, 14(1), 21–41. https://doi.org/10.1007/s10726-005-3874-7
23. Kilmann, R. H., & Thomas, K. W. (1975). Interpersonal conflict-handling behavior as reflections of Jungian personality dimensions. Individual differences in social orientation. Experimental Social Dilemmas, 3, 151–176.
24. Levy, S., & Gvili, Y. (2019). Online shopper engagement in price negotiation: The roles of culture, involvement and eWOM. International Journal of Advertising, 39, 1–26. https://doi.org/10.1080/02650487.2019.1612621
25. Liao, F.-Y., Yang, L.-Q., Wang, M., Drown, D., & Shi, J. (2013). Team–member exchange and work engagement: Does personality make a difference? Journal of Business and Psychology, 28(1), 63–77. https://doi.org/10.1007/s10869-012-9266-5
26. Liebrand, W. B., & McClintock, C. G. (1988). The ring measure of social values: A computerized procedure for assessing individual differences in information processing and social value orientation. European Journal of Personality, 2(3), 217–230. https://doi.org/10.1002/per.2410020304
27. Ligthart, P. E. M. (1995). Solidarity in economic transactions: An experimental study of framing effects in bargaining and contracting.
28. Ma, Z. (2007). Chinese Conflict Management Styles and Negotiation BehavioursAn Empirical Test. International Journal of Cross Cultural Management, 7, 101–119. https://doi.org/10.1177/1470595807075177

29. McClintock, C. G. (1978). Social values: Their definition, measurement and development. Journal of Research & Development in Education, 12(1), 121–137.
30. Messick, D. M., & McClintock, C. G. (1968). Motivational bases of choice in experimental games. Journal of Experimental Social Psychology, 4(1), 1–25. https://doi.org/10.1016/0022-1031(68)90046-2
31. Meyer, M., & Schoop, M. (2025). Framework of Behaviour Training in Digital Negotiations. Group Decision and Negotiation, 1–25. https://doi.org/10.1007/s10726-025-09951-y
32. Murphy, R. O., Ackermann, K. A., & Handgraaf, M. (2011). Measuring social value orientation. Judgment and Decision Making, 6(8), 771–781.
33. O'Connor, K. M., & Carnevale, P. J. (1997). A nasty but effective negotiation strategy: Misrepresentation of a common-value issue. Personality and Social Psychology Bulletin, 23(5), 504–515. https://doi.org/10.1177/0146167297235006
34. O'Neill, T. A., Hambley, L. A., & Chatellier, G. S. (2014). Cyberslacking, engagement, and personality in distributed work environments. Computers in Human Behavior, 40, 152–160.
35. Perugini, M., & Gallucci, M. (2001). Individual differences and social norms: The distinction between reciprocators and prosocials. European Journal of Personality, 15(1_suppl), S19–S35. https://doi.org/10.1002/per.419
36. Pruitt, D. G., & Rubin, J. Z. (1986). Social conflict: Escalation, stalemate, and settlement. New York: Random House.
37. Qureshi, A., Wall, H., Humphries, J., & Balani, A. B. (2016). Can personality traits modulate student engagement with learning and their attitude to employability? Learning and Individual Differences, 51, 349–358.
38. Rahim, M. A. (1983). A measure of styles of handling interpersonal conflict. Academy of Management Journal, 26(2), 368–376. https://doi.org/10.2307/255985
39. Rook, L., Sabic, A., & Zanker, M. (2018). Engagement in proactive recommendations. Journal of Intelligent Information Systems, 54(1), 79–100. https://doi.org/10.1007/s10844-018-0529-0
40. Sequeira, P., & Marsella, S. (2018). Analyzing Human Negotiation using Automated Cognitive Behavior Analysis: The Effect of Personality. Proceedings of the 40th Annual Meeting of the Cognitive Science Society, 1055–1060.
41. Tehrani, H. D., & Yamini, S. (2020). Personality traits and conflict resolution styles: A meta-analysis. Personality and Individual Differences, 157, 109794. https://doi.org/10.1016/j.paid.2019.109794
42. Thompson, L. (1990). Negotiation behavior and outcomes: Empirical evidence and theoretical issues. Psychological Bulletin, 108(3), 515–532. https://doi.org/10.1037/0033-2909.108.3.515
43. Tisu, L., Lupșa, D., Vîrgă, D., & Rusu, A. (2020). Personality characteristics, job performance and mental health: The mediating role of work engagement. Personality and Individual Differences, 153, 109644.
44. Türkgeldi, B., Özden, C. S., & Aydoğan, R. (2022). The Effect of Appearance of Virtual Agents in Human-Agent Negotiation. AI, 3(3), 683–701. https://doi.org/10.3390/ai3030039
45. Utz, S., Bovina, I., Green, E., & Waldzus, S. (1999, June). Effects of priming on social value orientations. German Conference of Social Psychology.
46. Van Dijk, F., Sonnemans, J., & Van Winden, F. (2002). Social ties in a public good experiment. Journal of Public Economics, 85(2), 275–299.
47. Van Lange, P. A. M. (1999). The pursuit of joint outcomes and equality in outcomes: An integrative model of social value orientation. Journal of Personality and Social Psychology, 77(2), 337–349. https://doi.org/10.1037/0022-3514.77.2.337
48. Van Lange, P. A. M., De Bruin, E. M. N., Otten, W., & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. Journal of Personality and Social Psychology, 73(4), 733–746. https://doi.org/10.1037/0022-3514.73.4.733

49. Voorveld, H. A. M., Neijens, P. C., & Smit, E. G. (2009). Consumers' responses to brand websites: An interdisciplinary review. Internet Research, 19(5), 535–565. https://doi.org/10.1108/10662240920998887
50. Weingart, L. R., Hyder, E. B., & Prietula, M. J. (1996). Knowledge matters: The effect of tactical descriptions on negotiation behavior and outcome. Journal of Personality and Social Psychology, 70(6), 1205–1217. https://doi.org/10.1037/0022-3514.70.6.1205
51. Yu, B., Vahidov, R., & Saade, R. (2015, August 12). Agents and E-commerce: Beyond Automation.
52. Zaremba, R. A., & Kersten, G. (2006). Effectiveness of electronic negotiation styles using the Thomas-Kilmann model. IFAC Proceedings Volumes, 39(4), 301–306. https://doi.org/10.3182/20060522-3-FR-2904.00048