Automated Social Exchanges: Aligning Robot Actors and Exchange Relationship Type

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Abstract

Service robots are increasingly deployed in organizational and service contexts, yet user acceptance remains highly variable. Drawing on Social Exchange Theory, this research proposes that acceptance of and engagement with service robots depend on the alignment between a robot's actor type (social vs. functional) and the exchange relationship type (social vs. economic). Using a field experiment in an educational setting and two experimental studies in healthcare contexts, we show that this alignment significantly increases both engagement and user acceptance. We further demonstrate that employees and clients engage with the same robot through different exchange relationship types, creating a mismatch that can hinder acceptance. Importantly, our findings reveal that positive client experience can compensate for this mismatch, offering a practical pathway to improve robot acceptance in complex service environments.

Keywords: human–robot interaction; social exchange theory; acceptance.

Track: Service Marketing & Service Innovation.

1. Introduction

The deployment of service robots throughout the service sector is growing, driven by labor shortages and declining interest in service occupations (International Federation of Robotics, 2023). In hospitality and tourism, robots are widely used for reception, guidance, information provision, and delivery tasks (Jiang & Wen, 2020; Seyitoglu & Ivanov, 2020). In health and elderly care, service robots support autonomy, and reduce loneliness and social isolation (Pirhonen et al., 2020). Despite these benefits, acceptance of and engagement with service robots, by both consumers and employees, remains a central challenge.

Prior research on service robot acceptance has largely focused on dyadic interactions, such as robot–consumer or robot–employee encounters (e.g., Longoni et al., 2019; Paluch et al., 2022). Real-world service contexts, however, are often triadic, involving simultaneous interaction among employees, clients, and robots. Emerging research on triadic interactions reports mixed outcomes, from positive effects such as increased repatronage intentions (Odekerken-Schröder et al., 2022) to negative reactions when robots assume leading roles (Shanks et al., 2025) or are involved in service failures (Choi et al., 2021).

A central challenge remains underexplored: employees working with ongoing organizational contexts tend to engage with robots through social exchange relationship types, whereas consumers more often engage through economic exchange relationship types. This divergence increases the risk of misalignment between the robot's actor type and the exchange relationship type in the triadic service environment. Drawing on Social Exchange Theory (SET; Homans, 1958), we propose that acceptance of and engagement with service robots depend on alignment between the robot's actor type (social vs. functional) and the dominant exchange relationship (social vs. economic). We test this framework across multiple service contexts using field and online studies.

2. Theoretical Background and Hypothesis Development

2.1 Social exchange theory and automated social exchange

Social Exchange Theory (Homans, 1958) provides a foundational framework for understanding how actors exchange resources within organizational and social systems (Blau, 1964). SET conceptualizes relationships as existing along a continuum. At one end of this continuum are economic exchange relationships governed by explicit, short-term obligations and evaluated through immediate, tangible returns. At the other end are social exchange relationships, which unfold over time and are grounded in trust, reciprocity, and socio-

emotional investment. In these relationships, obligations remain diffuse, and value emerges through accumulated reciprocity, gratitude, and expectations of future exchange (Cropanzano & Mitchell, 2005; Rupp & Cropanzano, 2002).

As service robots become increasingly embedded in frontline service environments, these relational logics extend beyond purely human interaction. Robots increasingly participate in automated exchange relationships, in which users interpret and evaluate them through relational expectations typically reserved for human partners. Human–robot interactions can therefore be meaningfully situated along the same economic–social exchange continuum.

In professional contexts, employee–robot interactions are often ongoing, interdependent, and embedded in longer-term workflows. These conditions tend to produce social exchange–like dynamics, emphasizing trust development, mutual adaptation, and socio-emotional considerations (De Visser et al., 2020). In contrast, consumer–robot interactions are more frequently short-term and goal-oriented, aligning more closely with economic exchange logics that prioritize efficiency, speed, and clearly defined outcomes (Mende et al., 2019).

2.2 Actor-exchange alignment and hypothesis

Building on the SET, we argue that the acceptance of and the engagement with service robots in service contexts depends on the fit between the type of exchange relationship (social vs. economic) and the way the robot is framed (social vs. functional) as an actor in the interaction (see Figure 1).

		Type of Robot Actor	
		Social Actor	Functional Actor
Type of Relationship	Social Exchange	**Cell 1: Match** Robot as Social Actor in Social Exchange Relationship	**Cell 2: Mismatch** Robot as Functional Actor in Social Exchange Relationship
	Economic Exchange	**Cell 3: Mismatch** Robot as Social Actor in Economic Exchange Relationship	**Cell 4: Match** Robot as Functional Actor in Economic Exchange Relationship

Figure 1: Actor-Exchange Alignment Framework

Social actors are robots that are presented as relational partners, emphasizing qualities such as warmth, empathy, and collaboration. They are most effective in social exchange relationships, where trust and ongoing interaction are central (De Graaf et al., 2016). One

example are robots in the workplace, where human-robot interactions occur in repeated, interdependent, and relationship-based workflows. Then, alignment is more likely when robots are framed as social actors. In contrast, functional actors are robots framed as tools, emphasizing efficiency and task performance, and are most effective in economic exchange relationships characterized by transactional, goal-oriented interactions. For instance, in certain consumer-robot interactions that are episodic, goal-driven, and transactional, alignment is more likely to occur when robots are framed as functional actors. When the robot's actor type aligns with the exchange relationship, acceptance and engagement are enhanced. Conversely, a misalignment (e.g., a social actor in an economic exchange context) undermines these outcomes. Formally speaking:

Hypothesis 1: Acceptance of, and engagement with, a service robot will be higher when the robot's perceived actor type (social vs. functional) aligns (vs. misaligns) with the dominant exchange relationship (social vs. economic).

We test the actor–exchange alignment framework across three complementary studies that vary service context, type of robot actor, and exchange relationship type: an educational setting characterized by a dominant social exchange relationship type (Study 1), reflected in ongoing, interdependent interaction; a healthcare setting governed by a dominant economic exchange relationship type (Study 2), reflected in brief, task-oriented interaction; and a triadic healthcare setting (Study 3), which tackles the challenge of different users engaging with the same robot through different exchange relationship types, allowing us to examine relational mismatch and identify conditions under which such mismatch can be mitigated.

3. Study 1: Social Exchange Relations- Field Study in Educational Setting

Study 1 employed a two-condition between-subjects field experiment manipulating the robot actor framing (teammate vs. tool) to investigate the effect in social exchange within the education context. It involved 129 pre-Master's students at a large European university, organized into 34 teams across 13 tutorial groups. The objective was to examine how students collaborated with a robot introduced either as a teammate (social actor) or as a tool (functional actor) during a team assignment. We used the humanoid robot *Pepper*, which displayed a ChatGPT-based interface on its tablet trained on the course material.

3.1 Method

Students worked in teams of four on two coursework assignments over five weeks. Each

team interacted with the robot in a separate room for 12 minutes (see Figure 2). Students were randomly assigned to one of two robot actor framings. In the teammate condition, Pepper was introduced as a collaborating member who "joins the team and contributes to the assignment." In the tool condition, the same robot—referred to as P100—was presented as a device teams could "operate to access course material." Interaction transcripts were recorded automatically. Afterwards, students completed a survey individually. We measured behavioral engagement as the number of course-related questions asked during the 12-minutes interaction and administered a manipulation check for anthropomorphism (Bartneck et al., 2009).

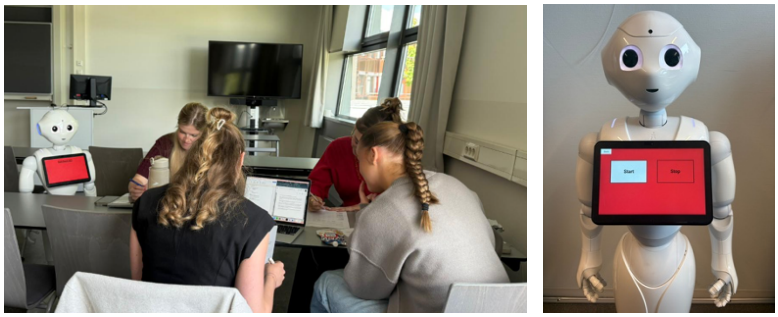

Figure 2: Set up for study 1

3.2 Results

A one-way ANOVA reveals that that teams where the robot was introduced as a teammate rather than as a tool asked significantly more questions to the robot ($M_{teammate} = 4.63$, $M_{tool} = 2.94$; $F(1,32) = 4.33$, $p = .045$, $\eta p^2 = .119$; Figure 3). Participants also perceived the robot introduced as a teammate as more anthropomorphic ($M_{teammate} = 3.14$, $M_{tool} = 2.30$; $F(1,127) = 22.17$, $p < .001$, $\eta p^2 = .109$).

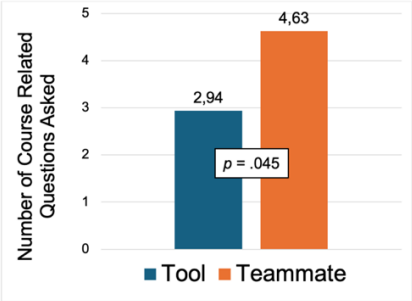

Figure 3: Number of course-related questions asked in Study 1

3.3 Discussion

Study 1 shows that student asked significantly more course-related questions when the robot was introduced as a teammate rather than a tool. This supports our hypothesis 1: in a social exchange context, presenting the robot as a social actor aligned with the relational structure and increased engagement.

4. Study 2: Economic Exchange Relations - Online Experiment in Healthcare Setting

Study 2 employed a 2-cell (robot actor framing: colleague vs. tool) between-subject design to investigate the effect in economic exchange within a healthcare context. After excluding one participant due to a failed manipulation check, the final sample consisted of 199 Prolific participants (105 males, M_{age} = 47.32, SD_{age} = 12.74).

4.1 Method

Participants were asked to imagine going to a healthcare center for a routine blood draw. In the colleague condition, they read that "a new robot colleague named Alex has joined the blood collection team. Alex contributes to support tasks by welcoming clients, guiding them through the intake process, responding to questions, and coordinating information with the medical staff." In the tool condition, participants read that "a new robotic tool named XT1000 has recently been added to the blood collection team. XT1000 is programmed to perform support tasks by welcoming clients, guiding them through the intake process, answering questions, and transmitting information to the medical staff." Robot acceptance was measured using a four-item Technology Acceptance Model (TAM) scale (Davis 1989), rated on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree).

4.2 Results

An ANOVA showed a significant effect of robot actor framing on acceptance (F (1,127) = 4.53, p = .035, ηp^2 = .022). Participants, taking the perspective of a client, reported higher acceptance when the robot was introduced as a tool rather than as a colleague (M_{tool} = 4.57 vs. $M_{colleague}$ = 4.18; p = .035, ηp^2 = .022; Figure 4).

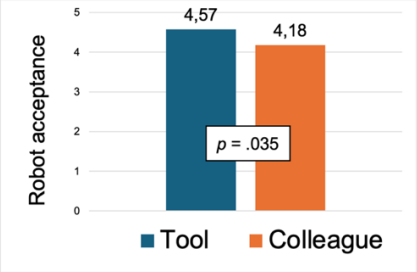

Figure 4: Robot acceptance in study 2

4.3 Discussion

Study 2 shows that participants were more accepting of the robot when it was introduced as a functional tool rather than as a social colleague. This outcome again supports our hypothesis 1: When clients engage in brief, one-off interactions to complete a clearly defined task (i.e., having blood drawn), presenting the robot as a functional actor fits the economic exchange relationship and therefore enhances acceptance.

5. Study 3: Social and Economic Exchange Relations: Online Experiment in Healthcare Setting

Real-world service environments often involve simultaneous interaction among employees, clients, and robots. To capture this tryadic structure, Study 3 employs a 2 (robot actor framing: colleague vs. tool) × 2 (client experience: positive vs. negative) between-subjects design in a healthcare context where employees and clients engage with the same robot through different exchange relationship types. This design allows us to examine how relational mismatches can be mitigated. After excluding 15 participants that failed the manipulation check, the final sample consisted of 185 Prolific healthcare workers (52 males; M_{age} = 34.30, SD_{age} = 11).

5.1 Method

Respondents imagined working in a healthcare institution and caring for clients. A new team member was introduced as either a colleague named Alex or a tool named XT1000 (Mende et al., 2019). Participants then read about clients' experiences with the new colleague/tool, which was manipulated as positive (clients described the interactions with the robot as enjoyable and engaging) or negative (clients described the interactions with the robot as repetitive and unpleasant). Robot acceptance was measured using the same four-item Technology Acceptance Model (TAM) scale (Davis, 1989) as in Study 2.

5.2 Results

A two-way ANOVA revealed a significant interaction between robot actor framing and client experience ($F(1,181) = 6.66$, $p = .011$, $\eta_p^2 = .035$) and a main effect of client experience ($F(1,181) = 207.07$, $p < .001$, $\eta_p^2 = .534$).

When client experience was negative, caregivers showed significantly higher acceptance when the robot was framed as a colleague rather than a tool ($M_{colleague}$ = 3.34 vs. M_{tool} = 2.56; $p = .003$, $\eta p^2 = .047$). When client experience was positive, caregivers showed no significant

difference in robot acceptance ($M_{colleague}$ = 5.53 vs. M_{tool} = 5.71; p = .496), indicating that positive client feedback mitigates actor–exchange misalignment and enables acceptance of robots across role in triadic service contexts (Figure 5). Positive client experience increased acceptance for both the tool condition ($M_{positive}$ = 5.71, $M_{negative}$ = 2.56; $F(1,181) = 148.04$, $p < .001$, $\eta_p^2 = .450$) and the colleague condition ($M_{positive}$ = 5.53, $M_{negative}$ = 3.44; $F(1,181) = 67.88$, $p < .001$, $\eta_p^2 = .273$).

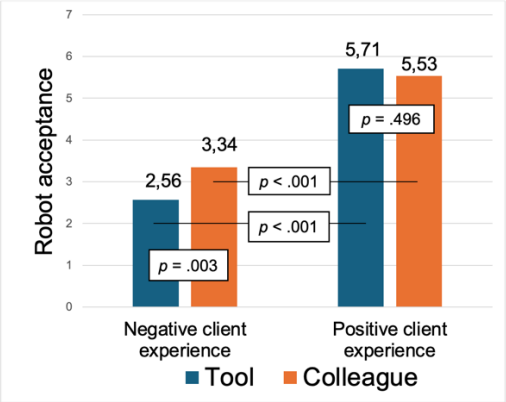

Figure 5. Robot acceptance in study 3

5.3 Discussion

Study 3 tackles the challenge that caregivers and clients engage with a robot through different types of exchange relationships. Caregivers, as employees, typically engage with the robot through a social exchange, making a colleague-like social actor more fitting, whereas clients often relate to the robot through more economic, task-oriented exchanges, where a functional tool is preferred. Our findings show that positive client experience can compensate for this mismatch: when client feedback was positive, caregivers accepted the robot equally, regardless of whether it was framed as a social or functional actor, whereas under negative client experience, acceptance depended on the actor-exchange alignment.

6. General Discussion

Drawing on SET, this research validated the actor-exchange alignment framework in the context of human-robot interaction, demonstrating that acceptance and engagement are higher when the robot's perceived role (social vs. functional) aligns with the dominant exchange relationship (social vs. economic).

6.1 Theoretical contributions

This research makes several theoretical contributions. First, it extends Social Exchange Theory to the domain of human–robot interaction by demonstrating that service robots function as relational actors embedded within exchange structures. Second, it shows how actor–exchange alignment operates in complex service settings: for instance, employees benefit from socially framed robots in social exchange contexts, whereas consumers respond more positively to functionally framed robots in economic exchange contexts. Importantly, this research identifies a mechanism to address this tension: positive client experiences with the robot, eliminate differences in acceptance between social and functional robot actor.

6.2 Managerial implications

For managers and service designers, the findings offer concrete guidance. Robots should not be introduced with a one-size-fits-all identity. Instead, their framing should be strategically matched to the relational structure of the context: socially framed robots for employee-facing and relationally intensive settings, and functionally framed robots for customer-facing, transactional tasks. In complex triadic environments, organizations can mitigate tensions by actively cultivating positive client experiences, which can indirectly increase employee acceptance even when actor–exchange misalignments exist.

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