INPLASY

A Meta-Analysis on Divergent Drivers of Commitment in Human–AI Relationships: A Systematic Review and Meta-Analysis

INPLASY2025120059

doi: 10.37766/inplasy2025.12.0059

Received: 17 December 2025

Published: 17 December 2025

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ADMINISTRATIVE INFORMATION

Support - No financial support was received for this research.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2025120059

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 December 2025 and was last updated on 8 July 2026.

INTRODUCTION

Review question / Objective The aim of this systematic review and meta-analysis is to synthesize quantitative evidence on the antecedents of relational commitment in human–AI relationships. Drawing on the Three-Component Commitment Model and Social Penetration Theory, this review examines how 19 theoretically defined antecedent categories are associated with three forms of human–AI relational commitment: continuance commitment, affective commitment, and normative commitment. Specifically, this review addresses two questions: (1) How do drivers related to instrumental rationality, interaction quality, and social connection differentially shape continuance, affective, and normative commitment? (2) How do these divergent patterns reveal the psychological mechanisms through which human–AI collaboration shifts from instrumental use to relational commitment?

Rationale Artificial intelligence (AI) is increasingly becoming embedded in daily life and work, shifting the human-AI dynamic from simple tool use to long-term synthetic relationships. While extensive research has focused on the initial adoption and acceptance of AI technologies (e.g., based on utility and ease of use), there is a critical lack of comprehensive evidence regarding the factors that motivate sustained, long-term collaboration. As AI agents acquire greater autonomy and social presence, it is essential to understand not just why people start using AI, but what drives them to maintain and deepen these relationships over time. Current literature is fragmented regarding which technological, psychological, and social factors facilitate this transition from acceptance to symbiosis. Therefore, this study is necessary to systematically synthesize empirical evidence, identify the key determinants of long-term orientation toward human-AI collaboration, and explore how these factors vary across different stages of the relationship. This will provide a theoretical framework for future human-AI symbiosis.

Condition being studied The condition being studied is sustained human–AI engagement and relational commitment in contexts where humans interact, collaborate, communicate, or rely on AI systems. The review focuses on the motivational basis on which human–AI relationships are maintained. Specifically, it examines continuance commitment, affective commitment, and normative commitment as three forms of relational commitment in human–AI relationships. These forms correspond to functional dependence, emotional or relational attachment, and internalized obligation.

METHODS

Search strategy We plan to conduct a systematic literature search restricted to publications from January 2020 to the present. The search strategy will employ a combination of Boolean operators (AND/OR) to link terms across three core dimensions: (1) Human participants (e.g., 'user', 'consumer', 'employee'); (2) AI technologies (e.g., 'artificial intelligence', 'chatbot', 'LLM', 'robot'); and (3) Interactional outcomes (e.g., 'collaboration', 'continuance intention', 'relationship', 'engagement'). Specific search strings will be adapted for each database interface.

Participant or population The review will include human participants of any age, gender, or ethnicity who interact, collaborate, communicate, engage with, or evaluate AI systems. Eligible populations may come from diverse application fields, including business, healthcare, education, commercial services, entertainment, industry, and daily life contexts. Studies involving only simulated users, non-human subjects, or purely technical AI evaluations without human participants will be excluded.

Intervention The exposure of interest is human interaction, collaboration, communication, or sustained engagement with AI systems. Eligible AI systems include, but are not limited to, chatbots, conversational agents, virtual assistants, virtual agents, social robots, recommendation systems, autonomous systems, generative AI systems, large language model-based systems, and other AI-enabled interactive systems. The review focuses on users' perceptions, experiences, and relational orientations toward these systems.

Comparator This review synthesizes associations between antecedents and human–AI relational commitment. A traditional comparator is not applicable.

Study designs to be included Eligible studies will include empirical quantitative studies that provide primary data. These may include survey studies, experimental studies, quasi-experimental studies, cross-sectional studies, and longitudinal studies. To be included in the meta-analysis, a study must report sufficient statistical information to calculate or transform an effect size for the association between an eligible antecedent and an eligible human–AI relational commitment outcome. Qualitative studies, theoretical reviews, narrative reviews, editorials, opinion pieces, and non-empirical commentaries will be excluded.

Eligibility criteria Inclusion criteria:
1. The study is an empirical quantitative study involving human interaction, collaboration, communication, engagement, or evaluation of an AI system.
2. The study focuses on human–AI interaction, collaboration, sustained engagement, or relational commitment.
3. The study reports the quantitative association between at least one a priori defined antecedent and at least one eligible human–AI relational commitment outcome.
4. The study provides sufficient statistical information to calculate or transform an effect size, including Pearson's r, t values, F values, Z values, odds ratios, Cohen's d, regression coefficients when convertible, or other convertible statistics.
5. The study was published in English.
6. The study was published between 1 January 2020 and 1 May 2026.

Exclusion criteria:
1. Qualitative studies, theoretical reviews, narrative reviews, opinion pieces, editorials, and non-empirical commentaries.
2. Studies that do not involve human participants interacting with, collaborating with, evaluating, or reporting perceptions of AI systems.
3. Studies focusing only on technical AI performance, algorithmic accuracy, or system benchmarking without human relational, attitudinal, or behavioral outcomes.
4. Studies that do not report an eligible antecedent or an eligible relational commitment outcome.
5. Studies that lack sufficient statistical information to calculate or transform an effect size.
6. Studies published outside the eligible publication window or not published in English.
7. Duplicate effects from the same sample and construct; in such cases, the most appropriate or complete effect size will be retained according to the coding rules.

Information sources Electronic databases to be searched include Web of Science, Scopus, IEEE

Xplore, and the ACM Digital Library. Additional records will be identified through citation searching and other relevant sources when appropriate. These sources are selected to cover research from computer science, information systems, human–computer interaction, psychology, communication, and social science.

Main outcome(s) The primary outcomes are quantitative measures of human–AI relational commitment reported in the included studies. Guided by the Three-Component Commitment Model, outcomes will be coded into three pre-specified commitment domains: continuance commitment, affective commitment, and normative commitment. These domains are used as established theoretical categories for classifying dependent variables extracted from primary studies, rather than as new constructs generated by this review.

Continuance commitment refers to users' motivation to maintain interaction or collaboration with an AI system because continuing the relationship is perceived as useful, necessary, efficient, or difficult to replace. Affective commitment refers to users' motivation to actively maintain or deepen interaction or collaboration with an AI system because they want to continue the relationship, based on emotional attachment, trust, relational closeness, identification, or a felt sense of being understood and responded to by the AI. Normative commitment refers to users' motivation to maintain interaction or collaboration with an AI system because they feel that they ought to continue, reflecting role responsibility, social or institutional expectations, professional norms, or perceived obligations.

Outcomes will be extracted at the measurement point reported in each primary study. Pearson's correlation coefficient r will be used as the primary effect-size metric, with convertible statistics transformed to r where necessary.

Data management Search results will be imported into reference management software (e.g., EndNote) to remove duplicates. Two independent reviewers will screen titles and abstracts, followed by a full-text review against the eligibility criteria. Disagreements regarding study inclusion will be resolved through discussion or consultation with a third reviewer. Data extraction will be conducted using a standardized data extraction form (e.g., using Microsoft Excel). We will extract information regarding study characteristics (author, year, country), independent variable, dependent variable, sample size, AI types, application field, and statistical effect sizes (e.g., Pearson's r). All statistical syntheses will be recorded and analyzed using the R statistical environment (meta package).

Quality assessment / Risk of bias analysis The methodological quality and robustness of the evidence will be assessed through a combination of eligibility-based screening, study-characteristic coding, and statistical diagnostics. Because this review synthesizes heterogeneous quantitative associations rather than clinical intervention effects, a single clinical risk-of-bias tool will not be uniformly applied. Instead, studies will be required to report primary quantitative data, involve human participants, and provide sufficient statistical information to calculate or transform an effect size. Research design characteristics, including survey versus experimental method, will be coded and examined as potential moderators where sufficient data are available.

The reliability of the synthesized evidence will be further assessed through outlier, influence, publication-bias, and sensitivity analyses. Effect-size distributions will be inspected to identify extreme values, and influence diagnostics, including leave-one-out analyses, will be used to assess whether individual studies or effect sizes disproportionately affect pooled estimates. Publication bias will be examined using funnel plots, Egger's regression test, Begg and Mazumdar's rank correlation test, and Duval and Tweedie's trim-and-fill procedure where appropriate. Sensitivity analyses will compare estimates across alternative model specifications and assess whether results are robust to influential cases, extreme effect sizes, and study precision.

Strategy of data synthesis The primary synthesis will use three-level random-effects meta-analytic models to account for dependency among multiple effect sizes extracted from the same study. Pearson's correlation coefficient r will be used as the common effect-size metric. Other convertible statistics, including t values, F values, Z values, odds ratios, Cohen's d, regression coefficients when convertible, and other convertible statistics, will be transformed into r using standard meta-analytic conversion formulas.

Correlations will be Fisher's z-transformed for model fitting and back-transformed to r for interpretation and reporting. Models will be estimated using restricted maximum likelihood. Heterogeneity will be assessed using Q, I^2, τ^2, and H^2. Where sufficient data are available, analyses will be conducted overall and separately by commitment domain, including continuance commitment, affective commitment, and normative commitment. Analyses will be conducted in R using the metafor package.

Subgroup analysis Moderator analyses will examine whether antecedent–commitment associations vary across study-level characteristics. The planned moderators are:
1. Application field
2. AI technology type
3. Country or region
4. Research method
5. Sample identity
6. Publication year

Moderator analyses will be conducted when there are sufficient studies and effect sizes within categories. Multiple-comparison correction will be applied to reduce false-positive interpretation across moderator tests.

Sensitivity analysis Sensitivity analyses will be conducted to assess the robustness of the meta-analytic findings. These will include inspection of effect-size distributions, analyses with and without extreme effect sizes, influence diagnostics such as leave-one-out analyses where feasible, and comparisons across alternative model specifications or estimators. Where sufficient data are available, we will also examine whether results are consistent across larger- and smaller-sample studies. These analyses will evaluate whether the main findings are driven by outliers, influential studies, study precision, or analytic decisions.

Country(ies) involved China; Australia.

Other relevant information

Affiliations involved in this research:
1. Tsinghua University, Beijing, China (Main contributing institution)
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Keywords Human–AI relationship; relational commitment; continuance commitment; affective commitment; normative commitment; systematic review; meta-analysis.

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