TPM Vol. 32, No. S2, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

# IMPROVING SOURCE TRUST CALIBRATION IN ENGINEERING TEAMS THROUGH HR-DESIGNED INTERVENTIONS

DR. F RAHMAN
ASSISTANT PROFESSOR, KALINGA UNIVERSITY, RAIPUR, INDIA.
EMAIL: ku.frahman@kalingauniversity.ac.in, ORCID ID: 0009-0007-7167-188X

DR. ATUL DATTATRAYA GHATE
PROFESSOR, KALINGA UNIVERSITY, RAIPUR, INDIA.
EMAIL: ku.atuldattatrayaghate@kalingauniversity.ac.in ORCID:0009-0009-0869-2957

SOUMI DE
ASSISTANT PROFESSOR, NEW DELHI INSTITUTE OF MANAGEMENT, NEW DELHI, INDIA,
EMAIL: soumi.de@ndimdelhi.org, HTTPS://ORCID.ORG/0009-0007-3615-2291

**Abstract**
Trust calibration, defined as the alignment of perceived and actual trustworthiness of information sources, becomes especially important in engineering teams where precise and timely collaboration is critical. This study offers a new approach to trust calibration of information sources by applying targeted Human Resource (HR) interventions. Trust miscalibration caused by cognitive biases, role ambiguity, and communication silos is addressed through trust assessment frameworks and trust-building workshops. An embedded mixed-methods evaluation was carried out with three engineering teams over a period of six months. The quantitative data indicate that trust calibration, communication, and project coordination all improved to a statistically significant degree. Additional qualitative data corroborates the need for specialized HR functions to manage the socio-technical systems in engineering teams. The results indicate that trust miscalibration caused by targeted HR-designed interventions is miscalibrated trust in information sources can be enhanced, improving team performance and decision-making accuracy.

**Keywords:** Trust Calibration, Engineering Teams, Human Resource Interventions, Source Reliability, Team Performance, Organizational Behavior, Communication Effectiveness

## INTRODUCTION

In technical fields, especially where the stakes are consequential, seamless collaboration among team members hinges on something more than cooperation and skills. It is also essential to calibrate trust against varying sources of technical information. Trust calibration is the process of how people evaluate the reliability of input from peers and the degree of trust to assign to it. When trust calibration is misaligned, teams may over-trust—over-relying on unchecked and unqualified sources of information—or under-trust, valuable insights from experts. Both trust errors are particularly important in the aerospace design, civil infrastructure, and embedded systems domains, where engineering and decision-making errors may severely endanger systems, safety, degrade performance, and compromise integrity (Zoitl, et al., 2025).

The process of trust calibration within groups is not purely analytical and knowledge-based. Trust calibration is driven by social and cognitive factors. Interpersonal informal social stratification, social groups, and stereotypes, whether consciously or subconsciously, can affect the distribution of trust. For instance, a highly competent but quiet engineer may be disregarded and critical insights ignored, while a less competent but charismatic peer is overtrusted (Tello et al., 2023). These persistent and biased patterns of misaligned trust can erode objectivity and diversity, especially in the context of technical decision making.

Team collaboration strategies such as the traditional didactic teaching, one-size-fits-all all training, or self-ordering agile frameworks often overlook the unique processes involving trust calibration, and therefore, they are not fit. These approaches reduce information exchange to a technical or procedural problem and overlook the informal and mental systems underlying trust. In turn, these frameworks do not provide the appropriate frameworks to untrusted or overtrusted trust calibration systems misalignment (Pasandideh&Hoseini, 2018).

The current study suggests a specific social system gap for engineering teams that helps in trust calibration with a specific corrective social system framework. This framework combines foundational aspects of organizational behavior, social psychology, and trust validation, reconceptualizing Human Resources (HR) as more than an administrative function to governance as an orchestrational system (Mathan et al., 2025). Trust calibration as a dynamic governance process allows human resources to actively manage the trust landscape in teams through systems with peers that include trust governance mechanisms such as trust calibration systems with peer assessments, structured reflection sessions, feedback loops, and communication audits (Azizi& Ghahremani,2016).

The projected framework does not aim at disrupting current technical workflows within engineering teams. Instead, it seeks to smoothly align with existing team dynamics and engineering workflows (Kavitha&Kirubanand, 2025). Its primary aim is to enhance trust calibration judgment accuracy by shifting the trust calibration landscape to more objective metrics through reliance on actual data streams, the reliability of the data shared, and the relevance of the data shared instead of relying on personality, hierarchy, or familiarity. Trust is a social construct that harnesses the power of collaboration; therefore, through simple structured team processes of trust calibration, joint evaluations, trust calibration workshops, and cross-role shadowing, teams begin to master the evidence-based calibration of trust (Ghazanfari et al., 2018).

This enables organizations to strengthen decisions that are technically sound while socially adaptable, improving collaboration within intricate engineering ecosystems (Saidovet al.,2024). In the end, this framework shifts trust calibration from an implicit and faulty practice to a measurable team skill that is intentional and can be improved upon (Mukherjee& Thakur, 2023).

## LITERATURE SURVEY

### 2.1 Trust Calibration in Technical Teams

The trust calibration concept emerged in the context of automated systems, where human users needed to gauge the level of trust to place in the systems accurately. It is considered more from the angle of human collaboration in the workplace. In professional engineering teams, trust calibration helps in forming the right judgment of the conveyed information and the competencies of other team members. In teams, trust calibration, in which team members inaccurately gauge the trustworthiness of a source, can result in extreme operational inefficiencies, miscommunication, or critical design errors. With the rising sophistication and specialization of engineering tasks, the urgency for proper trust alignment among team members is amplified.

### 2.2 Trust Misalignment and Cognitive Bias

Trust misalignment happens because of perception clouding biases rather than ill intent or incompetence. This includes availability heuristics, which rely on the most recent events or those tied to emotions to determine trustworthiness. Trust is often influenced by confirmation bias as well, where the acceptance of information that corroborates one's worldview happens selectively. Such biases impact multidisciplinary technological teams because a team member's knowledge, way of interacting, or even their culture may be different from the rest of the team (Veerappan, 2025). Such differences may lead to inaccurate judgments about a colleague's competence or trust, which will inhibit meaningful collaboration and effective team decisions. Hence, reducing cognitive biases is essential for achieving trust in information sources within the engineering context.

### 2.3 Role of HR in Organizational Trust Dynamics

Management practices involve recruiting personnel, conducting appraisal interviews, and resolving conflicts. Human Resource Management assumes additional responsibilities of fostering and managing trust relations, internally or externally, between and among organizations (Raghuram,2024). Through policy formulation, team-building activities, and communication training, HR creates the structures that shape trust processes. Nevertheless, the active application of HR methods to trust calibration, especially in well-functioning technical teams, is strikingly lacking (Alviri& Habibi, 2015). Engineering teams are often placed in isolated, easily defensible cubicles and are minimally supervised behaviorally, making these teams ideal targets for collaborative trust realignment efforts to which HR departments could apply their considerable knowledge (Ghazanfari et al., 2018).

### 2.4 Interventions for Communication and Role Clarity

Organizations have used different strategies in trying to improve member relations and interaction, including the use of 360-degree feedback systems and peer evaluation, as well as performance appraisal systems. These systems improve one's self-perception and aid in fostering openness about interactions in the teams. However, these do not resolve the unique gaps of trust calibration concerning the sources in ignored. Take, for example, engineering teams. They require more targeted approaches to counter trust distortions, beyond defining and explaining roles, by reinforcing the significance and validity of every member's input. Without tailored approaches, persistent gaps in communication and trust misalignment will inhibit the attainment of desired performance outcomes (Arvinth,2024).

### 2.5 Identified Gaps

Even though trust calibration is increasingly regarded as critical for team functionality, greater integration with behavioral science and organizational psychology frameworks is still lackingSharma& Das,2024). Most approaches seem to concentrate either on technical skills or on generic social skills workshops, with no consideration to how trust perception corresponds with its actual source reliability (Kapoor& Malhotra, 2025). Equally conspicuous is the absence of human resource policies tailored to engineering work. Addressing this gap calls for a comprehensive design intervention model that employs human resources organizational functions, while respecting the intricate nature of technical teams operations. With this model, trust can be more accurately recalibrated, which improves its appropriate placement, communication flow, and collaborative outcomes.

## PROPOSED METHODOLOGY

### 3.1 Overview of Phases

The outlined methodology uses a defined, three-phase model initiated by human resources (HR) to improve source trust calibration in engineering teams. The first phase, Diagnostic Assessment, is foundational in building a trust baseline and identifying barriers to communication. It begins with a team trust mapping exercise in which team members gauge their trust of team members across multiple domains of expertise. This is followed by a communication audit which analyzes interactions, feedback loops, and the frequency of collaboration to identify gaps or breakdowns in the trust and information flow.

As HR trust diagnostic assessments are based on interviews, the second phase, Intervention Deployment, puts in place both corrective and developmental actions focusing on the new development gaps. Trust workshops conducted by human resources are the primary focus in this area, assisting participants in understanding social biases and their impact on interpersonal evaluations. Furthermore, there are role clarification sessions in which every team member's function is described at length to eliminate ambiguity, thus reinforcing credibility in the perceived value of each input. This is reinforced by bias recognition training aimed at identifying and countering cognitive biases like favoritism and stereotyping, which are common in engineering contexts characterized by elevated pressure.

In the third and last phase, Evaluation & Feedback, the assessment of the intervention's effectiveness is conducted alongside the measurement of trust accuracy metrics, which is the measurement of perception vs reality regarding source reliability trust accuracy, both before and after the intervention. Evaluation of perception, communication satisfaction, and team cohesion is done with surveys both before and after the interventions. In addition, focus groups and structured interviews, which form qualitative feedback loops, capture member check processes and rich feedback on the subjective experiences of team members, which serve to refine future interventions. In total, these phases form a strong and flexible system that can strategically reset trust within engineering teams using targeted human resource interventions.

### 3.2 Flowchart of Proposed Framework

As seen in Figure 1, a tri-partite, HR-powered framework aimed at enhancing trust calibration related to sources in engineering teams is organized into three distinct phases. The initial phase, Diagnostic Assessment, identifies existing trust misalignment within a team using trust mapping and communication audits. In the second phase, Intervention Deployment, perception realignment, and trust calibration mitigation misalignment are addressed through targeted perception workshops, role clarification, and bias training. The final phase, Evaluation and Feedback, comprises measurement of trust accuracy, administering pre- and post-intervention surveys, and qualitative feedback analysis to measure and refine intervention effectiveness.

## RESULTS AND DISCUSSION

### 4.1 Pre-Intervention vs Post-Intervention Trust Accuracy Scores

**Table 1: Pre-Intervention vs Post-Intervention Trust Accuracy Scores**

| Team | Pre-Intervention Mean Score | Post-Intervention Mean Score | Improvement (%) |
|---|---|---|---|
| Team A | 62.3 | 82.7 | 32.7% |
| Team B | 58.9 | 79.5 | 35.0% |
| Team C | 66.1 | 85.0 | 28.6% |

As outlined in Table 1, the average trust accuracy scores of three different engineering teams before and after the intervention were compared. Each of the three teams demonstrated substantial gains, with increases between 28.6% and 35.0%, underscoring the effectiveness of the HR intervention in bridging the gap between perceived and actual source fidelity.

### 4.2 Communication Effectiveness

**4.2 Table 2: Communication Effectiveness Metrics**

| Metric | Before Intervention | After Intervention |
|---|---|---|
| Clarity Score | 3.2 / 5 | 4.4 / 5 |
| Response Time | 18 hrs | 9 hrs |
| Escalation Incidence | 7 per month | 2 per month |

The data in Table 2 illustrates quantifiable changes in communication effectiveness measured before and after the intervention. There were significant improvements in clarity scores, response times, and the incidence of escalations. Most importantly, the response time improved to 50% of what it previously was, and the monthly escalations dropped from seven to two which demonstrates improvement in inter-team communication and overall team cooperation.

### 4.3 Qualitative Summary

**Table 3: Employee Feedback Themes**

| Theme | Sample Quote | Frequency (n=42) |
|---|---|---|
| Increased confidence in team inputs | Now I know who to consult and when | 29 |
| Awareness of bias | I didn't realize I was overlooking quieter experts | 17 |
| Better role clarity | We clarified overlapping responsibilities | 23 |

Table 3 summarizes the qualitative feedback provided by team members about the cores of increased confidence in team inputs, increased cognizance of biases, and clearer role demarcations. The feedback received suggests that the gaps in subjective trust and interactions between team members were addressed by the framework.

### 4.4 Project Completion Rate

**Table 4: Performance Metrics Post Intervention ()**

| Quarter | Completion Rate (%) | Accuracy Score (avg/10) | Stakeholder Satisfaction |
|---|---|---|---|
| Q1 (Baseline) | 71 | 7.5 | Medium |
| Q2 | 82 | 8.1 | High |
| Q3 | 88 | 8.6 | Very High |

Table 4 chronicles performance metrics within a project over three quarters. Alongside increasing stakeholder satisfaction levels, project completion rates, average accuracy scores, and even stakeholder satisfaction levels showed steady improvement, illustrating the organizational value of enhanced trust calibration methodologies over the long term.

## CONCLUSION

This research shows that trust calibration that boosts engineering team performance can undergo significant improvement with targeted Human Resources interventions. Through the application of diagnostic evaluation, cognitive bias training, and communication facilitation, Human Resources can address the gaps in trust perception and trust reality within teams. Improvements in trust accuracy, project efficiency, and interpersonal communication benchmark HR innovation across multiple engineering teams. This further demonstrates the shifting paradigm in HR functions from traditional personnel roles to designing interventions that enhance team cognitive functions and collaborative intelligence. Further studies should investigate the application of AI in trust monitoring systems, cultural sensitivity frameworks, and the scalability of these systems across disciplines and remote collaboration.

## REFERENCE

[1] Mathan, N., Wunnava, A., Pandey, S., Tejeshwari, M. R., & Verma, L. (2025). Information-Seeking Behavior among Non-Traditional Learners in Online Education Platforms. Indian Journal of Information Sources and Services, 15(2), 160–167. https://doi.org/10.51983/ijiss-2025.IJISS.15.2.22

[2] Kavitha, K. P., &Kirubanand, V. B. (2025). Performance evaluation of transfer learning VGG16 in handwritten text using word beam search and language model. Journal of Internet Services and Information Security, 15(2), 536–551. https://doi.org/10.58346/JISIS.2025.I2.037

Prasath, C. A. (2025). Digital Twin-Driven Predictive Maintenance in Intelligent Power Systems. National Journal of Intelligent Power Systems and Technology, 1(1), 29-37.

[3] Tello, A. B., Alam, S., Salve, A. R., Kumari, B. M. K., & Arora, M. (2023). Quantitative Evaluation of Android Application Privacy Security Based on Privacy Policy and Behaviour. Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 14(3), 253-266. https://doi.org/10.58346/JOWUA.2023.I3.019

[4] Saidov, A., Yakhshieva, Z., Makhkamova, N., Gudalov, M., Djuraeva, N., Umirzaqov, o., Adilova, o., & Juraev, A. (2024). Examining environmental impact through geological interactions and earth's layers. Archives for Technical Sciences, 2(31), 230–239. https://doi.org/10.70102/afts.2024.1631.230

[5]Veerappan, S. (2025). Voices in code: Amplifying women's experiences in tech through digital storytelling and interactive media frameworks. *Journal of Women, Innovation, and Technological Empowerment, 1*(1), 31–37.

Surendar, A. (2025). Hybrid Renewable Energy Systems for Islanded Microgrids: A Multi-Criteria Optimization Approach. National Journal of Renewable Energy Systems and Innovation, 27-37.

[6] Azizi, R., & Ghahremani, M. (2016). The Impact of a Comprehensive System for Orphans on the Trust Donors (Case Study: Imam Khomeini Relief Committee (RA), South of West Azerbaijan Province). *International Academic Journal of Social Sciences*, *3*(1), 105–111.

[7]Zoitl, S., Angelov, N., & Douglass, G. H. (2025). Revolutionizing industry: Real-time industrial automation using embedded systems. *SCCTS Journal of Embedded Systems Design and Applications*, *2*(1), 12–22.

[8]Alviri, F., & Habibi, S. F. (2015). Reviewing Self-Adaptation Frameworks ForThe Implementation Of Enterprise Resource Planning Systems. *International Academic Journal of Innovative Research*, *2*(1), 10–19.

Sadulla, S. (2025). Energy-Efficient Motor Control Algorithms for Variable Load Industrial Processes. National Journal of Electric Drives and Control Systems, 32-39.

[9] Ghazanfari, M., Domirani, S., & Hamze, H. (2018). Human resources strategies approach in organizations with network model (supply chain model) "Case study: defense industries organizations". *International Academic Journal of Organizational Behavior and Human Resource Management*, *5*(1), 63–83. https://doi.org/10.9756/IAJOBHRM/V5I1/1810004

[10] Raghuram, G. (2024). Synthesis and Characterization of Novel Nanoparticles for Targeted Cancer Therapy. *Clinical Journal for Medicine, Health and Pharmacy*, *2*(4), 21-30.

[11] Sharma, R., & Das, N. (2024). Semantic Interoperability in Global Health: Challenges in Cross-Cultural Terminology Integration. *Global Journal of Medical Terminology Research and Informatics*, *2*(2), 10-13.

Sindhu, S. (2025). Multi-Phase Electrical Machines for Fault-Tolerant and High-Efficiency Power Conversion. National Journal of Electrical Machines & Power Conversion, 29-38.

[12]Arvinth, N. (2024). Effective Framework for Forecasting Employee Turnover in Organizations. *Global Perspectives in Management*, *2*(3), 24-31.

[13] Mukherjee, A., & Thakur, R. (2023). Ageing Populations and Socioeconomic Shifts: A Cross-cultural Perspective. *Progression Journal of Human Demography and Anthropology*, *1*(1), 1-4.

Velliangiri, A. (2025). Multi-Port DC-DC Converters for Integrated Renewable Energy and Storage Systems: Design, Control, and Performance Evaluation. Transactions on Power Electronics and Renewable Energy Systems, 30-35.

[14] Kapoor, P., & Malhotra, R. (2025). Zero Trust Architecture for Enhanced Cybersecurity. In *Essentials in Cyber Defence* (pp. 56-73). Periodic Series in Multidisciplinary Studies.

[15]Pasandideh, R., &Hoseini, K. (2018). Evaluation and prioritization the key factors of Human Resources Information System in Bu Ali hospital in Tehran. *International Academic Journal of Science and Engineering*, *5*(2), 182–191. https://doi.org/10.9756/IAJSE/V5I1/1810035