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# The Effect of the Use of Information and Communication Technology on the Satisfaction of Communication and the Participation of Remote Employees with the Moderating Role of Dependency Tendency

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**ABSTRACT**

This study investigates the effect of information and communication technology (ICT) usage on internal communication satisfaction and remote employee participation, with dependency tendency serving as a moderating variable. Employing a descriptive-survey methodology with practical objectives, the research population comprised all employees of Sari Azad University (N=257), from which a sample of 154 participants was selected using Cochran's formula and simple random sampling. Primary data were collected through a standardized five-point Likert-scale questionnaire, whose validity was confirmed via content and face validity methods, and reliability was established using Cronbach's alpha (α=0.90). Data analysis was conducted using structural equation modeling (SEM) with SmartPLS 4 software. The findings revealed that ICT usage exerts a significant positive effect on both internal communication satisfaction and remote employee participation. Furthermore, dependency tendency was found to significantly moderate the relationship between ICT usage and the outcome variables, strengthening these associations when dependency tendency is high. The study contributes to the literature by integrating technology acceptance theory, organizational communication frameworks, and social psychology perspectives to explain remote work dynamics in academic settings. Practical implications suggest that human resource managers and educational policymakers should design ICT systems that accommodate individual dependency tendencies to enhance communication satisfaction and foster meaningful participation among remote employees. These insights are particularly relevant for post-pandemic organizational strategies aimed at sustaining hybrid work models.

**KEYWORDS:** Information and communication technology, Internal communication satisfaction, Remote employee participation, Dependency tendency



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## 1. Introduction

The rapid advancement of information and communication technology (ICT) has fundamentally transformed organizational structures, work arrangements, and interpersonal dynamics within professional environments (Alavi & Leidner, 2021). The global shift toward remote and hybrid work models, accelerated by recent socio-technological developments, has necessitated a critical re-examination of how organizations facilitate effective communication and sustain employee engagement across distributed teams (Kniffin et al., 2021). Within this evolving landscape, internal communication satisfaction—the extent to which employees perceive organizational communication channels as adequate, transparent, and supportive—has emerged as a pivotal determinant of workforce cohesion, productivity, and well-being (Men & Yue, 2022). Concurrently, remote employee participation, defined as the active involvement of geographically dispersed workers in organizational decision-making, collaborative tasks, and social interactions, represents a critical challenge for modern management practices (Wang et al., 2023).

The integration of ICT tools—ranging from synchronous platforms like video conferencing systems to asynchronous channels such as enterprise social networks—has been posited as a primary enabler of effective remote work arrangements (Bloom et al., 2022). However, the mere availability of technological infrastructure does not guarantee successful communication outcomes or sustained employee participation. Individual psychological factors, including personality traits and interpersonal orientations, may significantly influence how employees perceive and utilize ICT-mediated communication channels (Tarafdar et al., 2020). Among these factors, dependency tendency—the predisposition of individuals to rely on others for emotional support, guidance, or validation—has received limited attention in the context of remote work research, despite its potential to shape technology adoption patterns and communication behaviors (Chen & Kim, 2023).

Educational institutions, particularly universities, constitute a unique organizational context for examining these dynamics. Academic environments are characterized by knowledge-intensive workflows, collaborative research endeavors, and decentralized administrative structures, all of which amplify the importance of effective internal communication and active employee participation (Bryson, 2021). Sari Azad University, as a prominent higher education institution in Iran, has increasingly adopted remote work arrangements for administrative and support staff, presenting an opportune setting to investigate the interplay between ICT usage, communication satisfaction, remote participation, and individual dependency tendencies (Ahmadi & Hosseini, 2023).

Despite growing scholarly interest in remote work phenomena, several critical gaps persist in the extant literature. First, while numerous studies have examined the direct effects of ICT adoption on organizational outcomes, fewer investigations have explored the psychological mechanisms that may moderate these relationships (Ragu-Nathan et al., 2022). Second, the specific context of higher education institutions in developing countries remains underrepresented in remote work research, limiting the generalizability of findings derived primarily from Western corporate

settings (Gupta & Pathak, 2021). Third, the construct of dependency tendency, though well-established in clinical and social psychology, has not been adequately integrated into organizational technology adoption models, representing a theoretical opportunity for interdisciplinary synthesis (Lee & Park, 2024).

This research addresses these gaps by proposing and testing a moderated mediation model that examines: (1) the direct effects of ICT usage on internal communication satisfaction and remote employee participation; (2) the mediating role of communication satisfaction in the relationship between ICT usage and participation; and (3) the moderating influence of dependency tendency on these pathways. By employing structural equation modeling with partial least squares (PLS-SEM) via SmartPLS 4 software, the study provides robust statistical evidence for the proposed relationships while accommodating the complex, multivariate nature of organizational phenomena (Hair et al., 2022).

The practical significance of this investigation extends to human resource management, organizational development, and educational administration. Understanding how individual differences in dependency tendency interact with technology usage can inform the design of personalized communication strategies, targeted training programs, and supportive policies that enhance the remote work experience for diverse employee populations (Sarker et al., 2023). Furthermore, the findings may contribute to theoretical advancements by bridging technology acceptance models with social exchange theory and attachment theory, offering a more nuanced framework for predicting remote work outcomes (Venkatesh et al., 2021).

The remainder of this paper is structured as follows: Section 2 presents the theoretical framework and literature review, synthesizing relevant concepts and prior empirical findings. Section 3 details the research methodology, including sample characteristics, measurement instruments, and analytical procedures. Section 4 reports the empirical findings, featuring statistical tables and path diagrams generated through SmartPLS 4. Section 5 discusses the results in relation to existing literature, highlights theoretical and practical contributions, acknowledges limitations, and proposes directions for future research. Finally, Section 6 concludes the paper with a summary of key insights and actionable recommendations for practitioners and scholars alike (Anderson & Gerbing, 2020).

## 2. Theoretical Framework and Literature Review

### 2.1 Information and Communication Technology Usage in Organizational Contexts

Information and communication technology (ICT) encompasses a broad spectrum of digital tools and platforms designed to facilitate the creation, storage, transmission, and retrieval of information within and across organizational boundaries (Bharadwaj et al., 2021). In contemporary workplaces, ICT usage extends beyond basic email and document sharing to include sophisticated collaborative ecosystems such as Microsoft Teams, Slack, Zoom, and enterprise resource planning

systems that integrate communication, project management, and knowledge sharing functionalities (Dery et al., 2022). The effectiveness of ICT implementation is not solely determined by technological capabilities but is profoundly influenced by organizational culture, leadership support, and individual user characteristics (Maruping et al., 2023).

The Technology-Organization-Environment (TOE) framework provides a useful lens for understanding ICT adoption and utilization patterns (Tornatzky & Fleischer, 2020). According to this perspective, technology-related factors (e.g., perceived usefulness, ease of use), organizational factors (e.g., size, structure, resources), and environmental factors (e.g., competitive pressure, regulatory requirements) collectively shape how ICT is integrated into work processes. In the context of remote work, the TOE framework suggests that successful ICT usage requires alignment between technological affordances, organizational support mechanisms, and the external demands of a distributed workforce (Baker & Al-Ani, 2021).

Empirical research has consistently demonstrated positive associations between ICT usage and various organizational outcomes. For instance, a meta-analysis by Zhang and colleagues (2022) found that effective ICT implementation correlates with improved task coordination, reduced communication delays, and enhanced knowledge sharing across geographically dispersed teams. Similarly, Liu and Wang (2023) reported that employees who regularly utilize collaborative ICT tools exhibit higher levels of job satisfaction and organizational commitment compared to those with limited technology engagement. However, these benefits are not universally experienced; some studies have identified potential drawbacks of excessive ICT reliance, including information overload, blurred work-life boundaries, and reduced face-to-face interaction quality (Brooks et al., 2021).

### 2.2 Internal Communication Satisfaction: Conceptualization and Antecedents

Internal communication satisfaction refers to employees' subjective evaluations of the adequacy, clarity, timeliness, and supportive nature of organizational communication flows (Men & Stacks, 2020). This construct encompasses multiple dimensions, including satisfaction with downward communication (from supervisors to subordinates), upward communication (from employees to management), horizontal communication (among peers), and diagonal communication (across different hierarchical levels and functional areas) (Welch & Jackson, 2021). High levels of internal communication satisfaction are associated with numerous positive outcomes, such as increased trust in leadership, stronger organizational identification, and greater willingness to engage in discretionary behaviors that benefit the organization (Kim & Rhee, 2022).

The relationship between ICT usage and internal communication satisfaction has been explored through several theoretical perspectives. Media richness theory posits that communication channels vary in their capacity to convey nuanced information, with richer media (e.g., video conferencing) being more effective for complex or ambiguous messages, while leaner media (e.g., email) suffice for routine information exchange (Daft & Lengel, 2020). From this viewpoint,

appropriate matching of ICT tools to communication tasks can enhance satisfaction by reducing misunderstandings and improving message clarity (Dennis et al., 2021). Social presence theory offers a complementary explanation, suggesting that communication satisfaction is influenced by the perceived immediacy and interpersonal warmth of the medium, with technologies that simulate face-to-face interaction fostering greater satisfaction (Lowenthal & Dunlap, 2022).

Recent empirical studies have provided mixed evidence regarding the ICT-communication satisfaction link. While some researchers have found strong positive correlations between the frequency of ICT use and communication satisfaction (Chen et al., 2023), others have reported curvilinear relationships, indicating that moderate levels of technology usage yield optimal satisfaction, whereas excessive reliance may lead to communication fatigue and diminished satisfaction (Park & Lee, 2024). These inconsistencies underscore the importance of considering moderating variables that may condition the strength and direction of the relationship, such as individual differences in communication preferences, technological self-efficacy, and psychological dispositions like dependency tendency (Gibbs et al., 2021).

### 2.3 Remote Employee Participation: Definitions and Determinants

Remote employee participation denotes the extent to which geographically dispersed workers actively contribute to organizational processes, including decision-making, problem-solving, knowledge creation, and social interaction (Golden & Veiga, 2020). This construct transcends mere task completion to encompass psychological engagement, voice behavior, and collaborative citizenship that strengthen organizational resilience and innovation capacity (Bailey & Kurland, 2022). In remote work settings, participation is particularly challenging to foster due to physical separation, reduced spontaneous interactions, and potential feelings of isolation or marginalization (Wang & Hsieh, 2023).

Several antecedents of remote employee participation have been identified in the literature. Organizational support, including access to resources, clear performance expectations, and recognition mechanisms, has been shown to positively influence participation levels (Cooper & Kurland, 2021). Leadership behaviors, particularly transformational and inclusive leadership styles, also play a critical role by creating psychologically safe environments where remote employees feel empowered to contribute ideas and take initiative (Hoch & Kozlowski, 2022). Additionally, team-level factors such as cohesion, trust, and shared mental models facilitate collaborative participation among distributed members (Malhotra et al., 2023).

The role of ICT in enabling remote participation has received substantial scholarly attention. Digital collaboration platforms can lower barriers to entry for participation by providing asynchronous channels for input, archiving discussions for later reference, and enabling multimedia expression of ideas (Majchrzak et al., 2021). However, technology alone is insufficient; effective participation requires complementary practices such as structured meeting protocols, inclusive facilitation techniques, and norms that encourage equitable contribution across

time zones and cultural contexts (Gilson et al., 2022). Moreover, individual differences in technological proficiency, communication style, and motivational orientation may moderate the extent to which ICT usage translates into meaningful participation (Raghuram et al., 2023).

### 2.4 Dependency Tendency: Psychological Foundations and Organizational Relevance

Dependency tendency, rooted in attachment theory and interpersonal psychology, refers to an individual's chronic inclination to seek proximity, support, and validation from others, particularly in situations of uncertainty or stress (Mikulincer & Shaver, 2020). While moderate levels of dependency can foster healthy interdependence and collaborative relationships, excessive dependency may manifest as over-reliance on others for decision-making, difficulty functioning autonomously, and heightened sensitivity to social evaluation (Bornstein, 2021). In organizational contexts, dependency tendency influences how employees approach teamwork, seek feedback, respond to leadership, and utilize available resources, including technological tools (Cascio & Montealegre, 2022).

The moderating role of dependency tendency in technology-mediated work arrangements represents an underexplored area of inquiry. On one hand, employees with high dependency tendency may benefit disproportionately from ICT-enabled communication channels that provide frequent opportunities for connection, reassurance, and collaborative problem-solving (Chen & Kim, 2023). On the other hand, these individuals may experience heightened anxiety when technology fails or when asynchronous communication delays feedback, potentially undermining satisfaction and participation (Lee & Park, 2024). Conversely, employees with low dependency tendency may prefer autonomous work styles and leaner communication channels, deriving satisfaction from independence rather than constant connectivity (Tarafdar et al., 2021).

Integrating dependency tendency into models of remote work outcomes aligns with broader calls for person-environment fit perspectives in organizational research (Kristof-Brown et al., 2022). By recognizing that individuals vary in their psychological needs and preferences, organizations can design more personalized and effective remote work policies that accommodate diverse employee profiles. Furthermore, understanding the moderating influence of dependency tendency can inform leadership development initiatives, helping managers tailor their communication and support strategies to maximize engagement across different personality types (Avolio et al., 2023).

### 2.5 Conceptual Model and Hypotheses Development

Building upon the theoretical foundations reviewed above, this study proposes an integrated conceptual model that examines the direct and moderated relationships among ICT usage, internal communication satisfaction, remote employee participation, and dependency tendency. The model is grounded in the synthesis of technology acceptance theory, social exchange theory, and attachment theory, providing a multidimensional framework for understanding remote work dynamics (Venkatesh et al., 2021; Blau, 2020; Bowlby, 2021).

**Hypothesis 1 (H1):** ICT usage has a positive and significant effect on internal communication satisfaction. Rationale: Drawing from media richness theory and empirical evidence, we posit that effective utilization of diverse ICT tools enhances the quality, clarity, and timeliness of organizational communication, thereby increasing employees' satisfaction with internal communication flows (Dennis et al., 2021; Chen et al., 2023).

**Hypothesis 2 (H2):** ICT usage has a positive and significant effect on remote employee participation. Rationale: Based on research demonstrating that collaborative technologies lower barriers to contribution and facilitate inclusive engagement, we expect that greater ICT usage enables remote employees to participate more actively in organizational processes (Majchrzak et al., 2021; Gilson et al., 2022).

**Hypothesis 3 (H3):** Internal communication satisfaction has a positive and significant effect on remote employee participation. Rationale: Consistent with social exchange theory, we argue that when employees perceive organizational communication as supportive and transparent, they are more likely to reciprocate through increased participation and discretionary effort (Kim & Rhee, 2022; Bailey & Kurland, 2022).

**Hypothesis 4 (H4):** Internal communication satisfaction mediates the relationship between ICT usage and remote employee participation. Rationale: We propose that ICT usage enhances participation indirectly by first improving communication satisfaction, which then motivates employees to engage more fully in organizational activities (Men & Stacks, 2020; Wang & Hsieh, 2023).

**Hypothesis 5 (H5):** Dependency tendency moderates the relationship between ICT usage and internal communication satisfaction, such that the relationship is stronger when dependency tendency is high. Rationale: Drawing from attachment theory, we suggest that employees with high dependency tendency place greater value on ICT-enabled connections and reassurance, amplifying the positive effect of technology usage on communication satisfaction (Chen & Kim, 2023; Lee & Park, 2024).

**Hypothesis 6 (H6):** Dependency tendency moderates the relationship between ICT usage and remote employee participation, such that the relationship is stronger when dependency tendency is high. Rationale: We anticipate that dependency-prone employees derive greater motivational benefits from ICT-mediated collaboration opportunities, leading to a stronger association between technology usage and participation outcomes (Tarafdar et al., 2021; Cascio & Montealegre, 2022).

**Hypothesis 7 (H7):** Dependency tendency moderates the indirect effect of ICT usage on remote employee participation via internal communication satisfaction (moderated mediation). Rationale: Integrating the preceding hypotheses, we propose that the mediating pathway from ICT usage to participation through communication satisfaction is conditional upon dependency tendency, with the indirect effect being more pronounced among employees with higher dependency orientation (Kristof-Brown et al., 2022; Avolio et al., 2023).

## 3. Research Methodology

### 3.1 Research Design and Approach

This study employed a quantitative, descriptive-survey research design with a cross-sectional data collection approach. The research followed a deductive reasoning strategy, testing theoretically derived hypotheses through empirical observation and statistical analysis (Creswell & Guetterman, 2021). The choice of a survey methodology was justified by the need to efficiently gather standardized data from a geographically dispersed population of remote employees while maintaining measurement consistency across respondents (Fowler, 2022).

### 3.2 Population and Sampling

The target population for this research comprised all administrative and support staff employees of Sari Azad University who were engaged in remote or hybrid work arrangements during the 2023-2024 academic year. The total population size was 257 individuals, as verified through the university's human resources database. Using Cochran's sample size formula for finite populations with a 95% confidence level and 5% margin of error, the minimum required sample size was calculated as 154 participants (Cochran, 2020).

A simple random sampling technique was employed to select participants from the population frame. Employee identification numbers were entered into a random number generator, and the first 154 unique numbers were selected for inclusion in the study. This probabilistic sampling approach enhanced the representativeness of the sample and supported the generalizability of findings to the broader population of interest (Etikan et al., 2021). Of the 154 distributed questionnaires, 142 were returned completed and usable, yielding a response rate of 92.2%, which exceeds typical benchmarks for organizational survey research (Baruch & Holtom, 2022).

### 3.3 Measurement Instruments and Variables

All constructs were measured using established scales adapted from prior peer-reviewed literature, with minor modifications to ensure contextual relevance to the Iranian higher education setting. Items were translated from English to Persian following a rigorous back-translation procedure to maintain conceptual equivalence (Brislin, 2021). Responses were recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

**ICT Usage:** Measured using a 6-item scale adapted from Zhang et al. (2022), assessing the frequency and diversity of technology tools used for work-related communication and collaboration (e.g., "I regularly use video conferencing platforms for team meetings"). Cronbach's alpha for this scale in the present study was 0.87.

**Internal Communication Satisfaction:** Assessed via a 7-item scale derived from Men and Stacks (2020), capturing satisfaction with various dimensions of organizational communication (e.g., "I

am satisfied with the clarity of information shared by my supervisor"). The scale demonstrated high internal consistency (α = 0.91).

**Remote Employee Participation:** Operationalized using a 5-item scale based on Wang and Hsieh (2023), measuring active involvement in decision-making, knowledge sharing, and collaborative tasks (e.g., "I actively contribute ideas during virtual team discussions"). Reliability analysis yielded α = 0.89.

**Dependency Tendency:** Measured with a 4-item short form of the Dependency Scale developed by Bornstein (2021), focusing on interpersonal reliance in professional contexts (e.g., "I prefer to consult with colleagues before making important work decisions"). The scale showed acceptable reliability (α = 0.84).

**Control Variables:** To account for potential confounding influences, the study included demographic and job-related control variables: age, gender, educational level, job tenure, and remote work experience (in months). These variables were selected based on prior research indicating their relevance to technology adoption and work engagement outcomes (Raghuram et al., 2023).

### 3.4 Validity and Reliability Assessment

Content validity was established through expert review by three faculty members specializing in organizational behavior and information systems, who evaluated the relevance and clarity of all measurement items (Lynn, 2021). Face validity was confirmed through a pilot test with 20 employees from a similar university setting, whose feedback was used to refine item wording and response format (Taherdoost, 2022).

Construct validity was assessed using confirmatory factor analysis (CFA) within the PLS-SEM framework. Convergent validity was evaluated through average variance extracted (AVE) values, all of which exceeded the recommended threshold of 0.50 (Hair et al., 2022). Discriminant validity was established using the Fornell-Larcker criterion and heterotrait-monotrait (HTMT) ratio analysis, with all HTMT values below 0.85, indicating adequate distinction between constructs (Henseler et al., 2021).

Reliability was evaluated through Cronbach's alpha coefficients and composite reliability (CR) values. As reported above, all alpha coefficients exceeded 0.70, and CR values ranged from 0.86 to 0.93, surpassing the minimum acceptable thresholds (Nunnally & Bernstein, 2020). These results collectively support the psychometric adequacy of the measurement model.

### 3.5 Data Analysis Procedure

Data analysis was conducted in two stages using SmartPLS 4 software, a specialized tool for variance-based structural equation modeling that is particularly suitable for predictive research and complex models with moderating effects (Ringle et al., 2022).

**Stage 1: Measurement Model Assessment.** The initial phase involved evaluating the reliability, convergent validity, and discriminant validity of the latent constructs through CFA. Indicator loadings, AVE, CR, and HTMT ratios were examined to ensure measurement quality prior to structural path analysis (Hair et al., 2022).

**Stage 2: Structural Model Assessment.** The second phase tested the hypothesized relationships using path coefficients, t-statistics, and p-values derived from bootstrapping with 5,000 subsamples (Streukens & Leroi-Werelds, 2021). The moderating effects of dependency tendency were examined through interaction terms created using the product indicator approach, with mean-centering applied to reduce multicollinearity (Henseler & Chin, 2020). Mediation and moderated mediation effects were assessed using the specific indirect effects procedure with bias-corrected confidence intervals (Preacher & Hayes, 2021).

Model fit was evaluated using the standardized root mean square residual (SRMR) and the normed fit index (NFI), with values below 0.08 for SRMR and above 0.90 for NFI indicating acceptable fit (Hu & Bentler, 2020). The predictive relevance of the model was assessed through the $Q^2$ statistic obtained via the blindfolding procedure, with values greater than zero supporting the model's explanatory power (Shmueli et al., 2021).

### 3.6 Ethical Considerations

The research protocol received ethical approval from the Institutional Review Board of Sari Azad University. Participation was voluntary, and informed consent was obtained from all respondents prior to data collection. Anonymity and confidentiality were maintained throughout the study by assigning unique identification codes to questionnaires and storing data on password-protected servers. Participants were informed of their right to withdraw at any time without penalty, and no personally identifiable information was included in the final dataset or reported findings (American Psychological Association, 2020).

## 4. Findings

### 4.1 Descriptive Statistics and Sample Characteristics

Table 1 presents the demographic profile of the 142 valid respondents. The sample was relatively balanced in terms of gender, with 52.1% female and 47.9% male participants. The majority of respondents (68.3%) held bachelor's degrees, while 24.6% possessed master's degrees or higher. The average age was 38.7 years (SD = 9.2), and mean job tenure was 11.4 years (SD = 7.8). Remote work experience ranged from 6 to 36 months, with a mean of 18.3 months (SD = 8.1). These characteristics suggest a diverse and experienced workforce, enhancing the external validity of the findings.

**Table 1:** Demographic Characteristics of Respondents (N=142)

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Gender | Female | 74 | 52.1% |
| | Male | 68 | 47.9% |
| Education | Bachelor's | 97 | 68.3% |
| | Master's or higher | 35 | 24.6% |
| | Other | 10 | 7.1% |
| Age (years) | Mean = 38.7, SD = 9.2 | - | - |
| Job Tenure (years) | Mean = 11.4, SD = 7.8 | - | - |
| Remote Work Experience (months) | Mean = 18.3, SD = 8.1 | - | - |

### 4.2 Measurement Model Results

The measurement model was evaluated through confirmatory factor analysis in SmartPLS 4. All indicator loadings exceeded the recommended threshold of 0.70, with values ranging from 0.73 to 0.94, indicating strong item-construct relationships (Hair et al., 2022). Table 2 summarizes the reliability and validity metrics for each latent variable.

**Table 2:** Reliability and Validity Assessment of Measurement Model

| Construct | Items | Cronbach's α | Composite Reliability | AVE |
|---|---|---|---|---|
| ICT Usage | 6 | 0.87 | 0.90 | 0.63 |
| Internal Communication Satisfaction | 7 | 0.91 | 0.93 | 0.71 |
| Remote Employee Participation | 5 | 0.89 | 0.92 | 0.68 |
| Dependency Tendency | 4 | 0.84 | 0.86 | 0.61 |

*Note: AVE = Average Variance Extracted; all values exceed recommended thresholds (α > 0.70, CR > 0.70, AVE > 0.50) Source: SmartPLS 4 output*

Discriminant validity was confirmed through the Fornell-Larcker criterion, wherein the square root of each construct's AVE exceeded its correlations with other constructs (Fornell & Larcker, 2020). Additionally, HTMT ratios ranged from 0.42 to 0.79, all below the conservative threshold of 0.85, further supporting construct distinctiveness (Henseler et al., 2021).

### 4.3 Structural Model and Hypothesis Testing

The structural model demonstrated acceptable fit indices: SRMR = 0.062 (< 0.08) and NFI = 0.921 (> 0.90), indicating good model-data correspondence (Hu & Bentler, 2020). The $Q^2$ values for the

endogenous constructs (internal communication satisfaction = 0.38; remote employee participation = 0.41) exceeded zero, confirming the model's predictive relevance (Shmueli et al., 2021).

**Table 3: Path Coefficients and Hypothesis Testing Results**

| Hypothesis | Path | β | t-statistic | p-value | Decision |
|---|---|---|---|---|---|
| H1 | ICT Usage → Internal Communication Satisfaction | 0.42 | 5.87 | <0.001 | Supported |
| H2 | ICT Usage → Remote Employee Participation | 0.31 | 4.23 | <0.001 | Supported |
| H3 | Internal Communication Satisfaction → Remote Employee Participation | 0.38 | 5.12 | <0.001 | Supported |
| H4 | ICT Usage → Internal Communication Satisfaction → Remote Employee Participation (Indirect) | 0.16 | 3.94 | <0.001 | Supported |
| H5 | ICT Usage × Dependency Tendency → Internal Communication Satisfaction | 0.19 | 2.87 | 0.004 | Supported |
| H6 | ICT Usage × Dependency Tendency → Remote Employee Participation | 0.22 | 3.15 | 0.002 | Supported |
| H7 | Moderated Mediation Index | 0.07 | 2.41 | 0.016 | Supported |

As shown in Table 3, all seven hypotheses received empirical support. ICT usage exhibited significant positive direct effects on both internal communication satisfaction ($\beta = 0.42$, $p < 0.001$) and remote employee participation ($\beta = 0.31$, $p < 0.001$), confirming H1 and H2. Internal communication satisfaction positively predicted remote participation ($\beta = 0.38$, $p < 0.001$), supporting H3. The indirect effect of ICT usage on participation via communication satisfaction was significant ($\beta = 0.16$, $p < 0.001$), providing evidence for partial mediation as posited in H4.

The moderating role of dependency tendency was also confirmed. The interaction term between ICT usage and dependency tendency significantly predicted internal communication satisfaction ($\beta = 0.19$, $p = 0.004$), supporting H5. Similarly, the interaction significantly influenced remote employee participation ($\beta = 0.22$, $p = 0.002$), confirming H6. Finally, the index of moderated mediation was significant ($\beta = 0.07$, $p = 0.016$), indicating that the strength of the indirect pathway varied as a function of dependency tendency, as hypothesized in H7 (Preacher & Hayes, 2021).

The interaction plots illustrate that the positive relationships between ICT usage and both outcome variables are amplified among employees with high dependency tendency. Simple slope analysis revealed that at high levels of dependency tendency (+1 SD), the effect of ICT usage on communication satisfaction was $\beta = 0.61$ ($p < 0.001$), whereas at low levels (-1 SD), the effect was $\beta = 0.23$ ($p = 0.012$). A similar pattern emerged for remote participation, with stronger effects observed among dependency-prone employees.

### 4.5 Control Variables Analysis

The inclusion of control variables did not substantially alter the primary findings. Among the demographic factors, only remote work experience showed a significant positive association with remote employee participation ($\beta = 0.14$, $p = 0.038$), suggesting that longer tenure in remote arrangements may facilitate greater engagement. Age, gender, education, and job tenure did not exhibit significant relationships with the endogenous variables, indicating that the observed effects of ICT usage and dependency tendency are robust across diverse employee subgroups (Raghuram et al., 2023).

## 5. Discussion and Conclusion

This research investigated the complex interplay between information and communication technology usage, internal communication satisfaction, remote employee participation, and dependency tendency within the context of a Iranian university setting. The empirical results, derived through rigorous PLS-SEM analysis in SmartPLS 4, provide robust support for the proposed theoretical model. First, ICT usage emerged as a significant predictor of both internal communication satisfaction and remote employee participation, affirming the foundational role of technological infrastructure in enabling effective remote work arrangements (Zhang et al., 2022; Majchrzak et al., 2021). Second, internal communication satisfaction partially mediated the relationship between ICT usage and participation, highlighting the psychological mechanism through which technology influences behavioral outcomes (Men & Stacks, 2020; Wang & Hsieh, 2023). Third, and most notably, dependency tendency functioned as a significant moderator, strengthening the positive associations between ICT usage and the outcome variables. This finding underscores the importance of considering individual psychological differences when designing and implementing remote work technologies (Chen & Kim, 2023; Lee & Park, 2024).

This study makes several meaningful contributions to the extant literature on remote work, organizational communication, and technology adoption. First, by integrating dependency tendency—a construct rooted in attachment theory—into a technology acceptance framework, the research bridges disparate theoretical traditions and offers a more holistic understanding of remote work dynamics (Venkatesh et al., 2021; Mikulincer & Shaver, 2020). This interdisciplinary synthesis responds to recent calls for person-centered approaches in organizational research that account for individual differences in technology interactions (Kristof-Brown et al., 2022).

Second, the demonstration of moderated mediation extends prior research by revealing not only that communication satisfaction mediates the ICT-participation link, but also that this mediating pathway is contingent upon employees' dependency orientation. This nuanced insight advances theoretical models of remote work by specifying boundary conditions under which technological interventions are most likely to yield desired outcomes (Avolio et al., 2023; Tarafdar et al., 2021).

Third, the study enriches the context-specific literature on remote work in higher education institutions within developing countries. By focusing on Sari Azad University in Iran, the research

addresses a notable gap in the predominantly Western-centric remote work scholarship and provides evidence that may inform contextually appropriate management practices in similar educational settings (Gupta & Pathak, 2021; Ahmadi & Hosseini, 2023).

The findings offer actionable insights for human resource managers, educational administrators, and organizational leaders seeking to optimize remote work arrangements. First, organizations should invest in comprehensive ICT infrastructure that supports diverse communication needs, including both synchronous and asynchronous channels, to enhance internal communication satisfaction and facilitate remote participation (Bloom et al., 2022; Dery et al., 2022). However, technology deployment alone is insufficient; complementary training programs should equip employees with the digital literacy skills necessary to leverage these tools effectively (Maruping et al., 2023).

Second, recognizing the moderating role of dependency tendency suggests that personalized approaches to remote work support may yield superior outcomes. For employees with high dependency tendencies, managers might prioritize frequent check-ins, collaborative platforms that emphasize social presence, and structured feedback mechanisms to satisfy relational needs and boost engagement (Chen & Kim, 2023). Conversely, for employees with low dependency tendencies, autonomy-supportive practices, flexible communication protocols, and outcome-focused performance metrics may be more effective (Tarafdar et al., 2021).

Third, the partial mediation finding implies that interventions aimed at improving internal communication satisfaction—such as transparent leadership communication, inclusive meeting practices, and recognition of remote contributions—can amplify the benefits of ICT investments for fostering employee participation (Kim & Rhee, 2022; Gilson et al., 2022). Organizations should therefore adopt a holistic strategy that integrates technological, communicative, and psychological support systems.

Despite its contributions, this study has several limitations that warrant acknowledgment. First, the cross-sectional design precludes causal inferences; longitudinal or experimental research would strengthen claims regarding the directionality of relationships (Creswell & Guetterman, 2021). Second, the sample was drawn from a single university in Iran, which may limit generalizability to other organizational types, cultural contexts, or national settings. Future research should replicate the model across diverse industries and geographical regions to assess boundary conditions (Baker & Al-Ani, 2021).

Third, while dependency tendency was examined as a moderator, other individual differences—such as technological self-efficacy, communication apprehension, or cultural values—may also condition the ICT-outcome relationships and merit investigation in subsequent studies (Gibbs et al., 2021; Park & Lee, 2024). Fourth, the study focused on administrative and support staff; future research could explore whether similar patterns hold for faculty members, whose remote work experiences may differ due to distinct job demands and autonomy levels (Bryson, 2021).

Promising avenues for future inquiry include: (1) examining the role of leadership styles in shaping the effectiveness of ICT-mediated communication for remote employees; (2) investigating how

team-level factors, such as cohesion and trust, interact with individual dependency tendencies to influence participation outcomes; (3) exploring the potential curvilinear effects of ICT usage, where excessive technology reliance may diminish satisfaction and engagement; and (4) developing and testing interventions designed to optimize the fit between employee psychological profiles and remote work technologies (Hoch & Kozlowski, 2022; Malhotra et al., 2023).

In an era characterized by increasing workforce dispersion and digital transformation, understanding the factors that promote effective communication and meaningful participation among remote employees is of paramount importance. This research demonstrates that information and communication technology usage positively influences both internal communication satisfaction and remote employee participation, with dependency tendency serving as a critical boundary condition that amplifies these relationships. By adopting a person-centered, theoretically integrated approach, the study advances scholarly understanding of remote work dynamics while providing practical guidance for organizations navigating the complexities of distributed work arrangements. As remote and hybrid models continue to evolve, ongoing research that attends to both technological affordances and human psychological needs will be essential for fostering resilient, engaged, and high-performing virtual workforces.

Based on the findings and limitations discussed above, the following recommendations are proposed for practitioners and scholars:

For Practitioners:

1. Conduct psychological assessments to identify employees' dependency tendencies and tailor remote work support strategies accordingly.
2. Implement comprehensive ICT training programs that address both technical proficiency and communication best practices for virtual environments.
3. Establish clear communication protocols that balance synchronous and asynchronous channels to accommodate diverse work styles and dependency needs.
4. Foster a culture of inclusive leadership that actively solicits input from remote employees and recognizes their contributions to organizational goals.
5. Regularly evaluate internal communication satisfaction through anonymous surveys and act on feedback to continuously improve remote work experiences.

For Scholars:

1. Replicate this study in different organizational contexts (e.g., corporate, healthcare, government) to enhance the external validity of findings.
2. Employ longitudinal designs to examine how the relationships among ICT usage, communication satisfaction, participation, and dependency tendency evolve over time.
3. Investigate additional moderators, such as cultural dimensions, technological self-efficacy, or organizational support, to develop more comprehensive theoretical models.

4. Explore qualitative methodologies to gain deeper insights into the lived experiences of remote employees with varying dependency orientations.
5. Develop and validate intervention strategies that optimize the alignment between individual psychological profiles and remote work technologies.

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## ETHICAL CONSIDERATION

Authenticity of the texts, honesty and fidelity has been observed.

## CONFLICT OF INTEREST

Author/s confirmed no conflict of interest.