

**The Relationship between the Use of Information and Communication Technology,  
Internal Communication Satisfaction and Interaction of Remote Employees with the  
Structural Equation Modeling (Case Study: Education employees of One District of Tehran  
City)**

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**Purpose:** The interaction of remote employees can play an effective role in improving the situation of the organization, which possible factors affecting it include the use of information and communication technology and internal communication satisfaction. Therefore, the current research was conducted with the aim of determining the relationship between the use of information and communication technology, internal communication satisfaction and interaction of remote employees with structural equation modeling.

**Methodology:** In a descriptive research from type of correlation, from among the education employees of one district of Tehran city number of 220 people were selected as a sample with using the stratified random sampling method. In this study, in order to collect research data was used the Lee standard questionnaire (2023), which in the present study its validity and reliability were checked and confirmed. The data of this study were analyzed by structural equation modeling method in SPSS and Smart PLS software.

**Findings:** The findings of the present study showed that there was a positive and significant correlation between the use of information and communication technology, internal communication satisfaction and employee interaction ( $P < 0.01$ ). Also, the model of use information and communication technology on employee interaction with the mediator of internal communication satisfaction had a good fit. In this model, the use of information and communication technology had a direct and significant effect on internal communication satisfaction and employee interaction and internal communication satisfaction had a direct and significant effect on employee interaction. In addition, the use of information and communication technology with the mediator of internal communication satisfaction had an indirect and significant effect on employee interaction ( $P < 0.001$ ).

**Conclusion:** Considering the direct and indirect impact of the use of information and communication technology on employee interaction, in order to promote the status of the organization and employee interaction can be provided the conditions for improve the use of information and communication technology and internal communication satisfaction.

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## 1. Introduction

Human resources and organizational staff are the main factors in the vitality of any organization. Therefore, understanding these resources is essential and necessary for effective management. Training human resources and the interaction of employees with each other is considered an effective strategy for maintaining, improving, and developing the organization (Cao, Yan, & Teng, 2023). Understanding the perspective of employees regarding their interaction with each other in contemporary organizations is very important and vital. This is because organizations need employees for continuous improvement and creating and enhancing competitive advantage. Nowadays, organizations provide opportunities for their employees to express their ideas, opinions, and information in interaction with other employees in order to achieve competitive advantage and continuous and sustainable development (Sadeghinia, Rahimnia, Shirazi, & Kafashpoir, 2019). Employee interaction is a new way to solve organizational problems and challenges in the present era, which is considered a social responsibility for all employees of an organization and leads to a reduction in the budget and costs of the organization for solving problems and challenges (Doan, Mooney, & Kim, 2023). Interaction is a system for coordination and integration and creating a common ground for organizational activities and increasing organizational productivity. Since interaction is an inseparable part of every organization, the more effective it is in employee interaction, the more important it is (Chen & Li, 2021). In general, there are two types of formal and informal interaction among employees. Formal interaction is based on the framework of authorities, duties, organizational hierarchy, and administrative structure based on the statute, bylaws, and organizational laws, but informal interaction is unwritten and exists at all levels of the organization (Yang, Holtz, Jaffe, Suri, Sinha, Weston, et al, 2022). Interaction between organizations and organizational employees occurs in three forms based on the use of traditional communication channels (such as letters, couriers, conversations, and friendly meetings), based on the use of modern media communication channels (such as teleconferencing, video telephony, email, web pages, and electronic boards), and a combination of them (De Hauquier, Willems, Cao, & Vanderborght, 2023). Employee interaction with organizational goals adds to its efficiency and return, leading to the enhancement of efficiency, effectiveness, and organizational return (Azadi Rikandeh & Sadeghi Avansar, 2023).

Employee interactions can significantly affect the flow of information delivery through the use of information and communication technology for organizations participating in these processes (Osanolu, Pourgholami Sarvestani, Zamani, & Mohammadi, 2019). The information and knowledge-centric era, which is the result of humanity's transition from the industrial age to the information age, is increasingly expanding in societies and organizations (Gnambs, 2021). Computers, computer networks, databases, and various digital tools have each created a transformation in the transmission, storage, and retrieval of information (Amendola, Calabrese, Caputo, & Fabrizio, 2018). Information and communication technology is a set of technological tools for communication, creation, distribution, storage, and management of information, and its application in the world is rapidly increasing and affecting all aspects of human and organizational life (Lee, Kogler, & Lee, 2019). Along with globalization and the emergence of information and communication technology, increasing pressure has been exerted on organizations and societies in different regions of the world to move towards the use of information and communication technology (Xie, Ma, Zhou, & Tang, 2018). The term 'information society' reflects the development of modern information technologies and the reorganization of society around information flow. Therefore, information and communication technology has undoubtedly brought about widespread transformations in all social and economic aspects of humanity, and its impact on human societies is such that today's world is rapidly becoming an information society (Zhang, Yang, Liu, & Zhao, 2017). Nowadays, information and communication technology transforms every society, organization, and industry, and the process of digitalization leads to digital transformation in various organizations, a transformation that managers and organizational officials can hardly ignore when formulating business strategies (Nedeljko, Bogataj, Perovic, & Kaucic, 2022). The use of information and communication technology in all areas of work and life is advancing, which can have many positive effects on the production process and efficiency of organizations, leading to macroeconomic and social effects (Weerakoon &

Chandrasiri, 2023). The communication chain in the organization leads to effective exchange of knowledge and information in the organization, in which internal organizational communications, due to the strategic importance they have on the effectiveness and success of the organization, have attracted the attention of many researchers and organizational officials (Moharrami & Irajpour, 2018).

Satisfaction with communications can be one of the potential mediating variables between the use of information and communication technology and employee interaction. In recent years, the role of communicative capital as the backbone of communications in the organization and its impact on the competitive advantage of organizations has been pointed out, and based on this, internal communications have a profound impact on the organizations' achievement of competitive advantage (Akbari, Dehghanizade, & Abbiat, 2023). Internal communication means the exchange of information and ideas among employees and members of an organization to create open and trust-based relationships that enable coordination between individuals (Jacobs, Yu, & Chavez, 2016). Also, this construct means the flow of communication among individuals at the boundaries of an organization, which facilitates support among employees of an organization (Lee, 2023). Internal communication is an inseparable part of any community and organization that plays a direct and indirect significant role in the performance of the organization and in various organizational activities such as decision-making and policymaking, achieving better results, maintaining stability, facilitating and improving the management of changes, and collective performance of employees (Sebastiao, Zulato, & Trindade, 2017). Satisfaction with internal communication means satisfaction with communication systems between employers and employees and represents ideas, information, attitudes, and feelings among individuals, indicating employee satisfaction with the main aspects of communication in interpersonal, group, and organizational contexts (Akbari et al, 2023). Communication between employees is one of the fundamental determining factors for how employees perceive, interpret, and manage change, and these communications play an effective role in employees' ability to improve organizational conditions (Vercic & Spoljaric, 2020).

Few studies have been conducted on the relationships between the use of information and communication technology, satisfaction with internal communications, and the interaction of remote employees. For example, Lee (2023), in a study on the use of information and communication technology, satisfaction with internal communications, and employee engagement from home: The mediating role of dependency inclination, concluded that the use of information and communication technology had a positive and significant impact on satisfaction with internal communications and the level of internal employee interaction, with dependency inclination serving as an appropriate mediator. Mohammadi, Taghipour, and Mahboobi (2021) in their research on the impact of employing communication and information technology tools on organizational performance assessment, found that there was a significant correlation between web services, cloud information processing, artificial intelligence, mobile communication technology, intelligent business information, and information and communication technology in human resource management of organizations. Moharrami and Irajpour (2018) in their research on the impact of internal communications and employee satisfaction concluded that internal communications improved employee satisfaction through the integration of customers and suppliers. Mitic, Nikolic, Jankov, Vukonjanski, and Terek (2017) in their study on the impact of information technology on satisfaction with communications and organizational learning concluded that information technology had a direct and significant effect on employee satisfaction with communications and organizational learning. Mahdavi and Hasoumi (2016) in their research on the relationship between the use of information and communication technology and the job satisfaction of faculty members found that there was a positive and significant correlation between the use of information and communication technology and job satisfaction and attitudes towards internet services among them. Ramazanian, Safar Doust, and Abdollahian (2016) in their research on the impact of information technology on organizational behavior concluded that the level of information technology and virtuality affects conflict, trust, and collaboration or interaction.

After the COVID-19 pandemic, the discussion of employee interaction, especially in the context of information and communication technology, gained additional importance. As face-to-face interactions were limited, remote workers who worked from home after COVID-19 largely relied on computer-based communication channels or information and communication technologies. These channels and technologies helped remote workers to perform their daily and professional tasks satisfactorily and to communicate with other employees while working remotely. Studies have been conducted on the relationship between the use of information and communication technology and employee interaction, but no research was found in this area using the mediating variable of satisfaction with internal communications. Conducting such a study could expand and develop the existing knowledge base. Also, the interaction of remote workers can play an effective role in improving the condition of the organization, with potential influencing factors including the use of information and communication technology and satisfaction with internal communications. Therefore, the present study aimed to determine the relationship between the use of information and communication technology, satisfaction with internal communications, and the interaction of remote workers using structural equation modeling.

## 2. Methodology

This study was applied in terms of purpose and descriptive in terms of data collection method. Also, the research population was all employees of the Education Department in Tehran's District. Therefore, in a descriptive study of the correlational type, 220 employees of the Education Department of Tehran's District One were selected as the sample using stratified random sampling. In this study, samples were classified based on gender, and sampling was done randomly from the population according to the gender ratio in all employees of Tehran's Education Department and the sample size of 220 people. In this study, the standard questionnaire of Lee (2023) was used to collect research data, whose validity and reliability were examined and confirmed in the present study. This questionnaire included the use of information and communication technology with 4 items, satisfaction with internal communications with 5 items, and interaction of remote workers with 7 items. A five-point Likert scale ranging from strongly disagree to strongly agree was used for responding to each item. Based on the research of Lee (2023), the validity and reliability of the mentioned tool were confirmed. In the present study, the factor loading of all items was higher than 0.50, the average variance extracted for the use of information and communication technology was 0.598, satisfaction with internal communications was 0.532, and interaction of remote workers was 0.577, all of which were higher than 0.50. Also, the reliability calculated using Cronbach's alpha and composite method was respectively for the use of information and communication technology 0.789 and 0.732, satisfaction with internal communications 0.781 and 0.814, and interaction of remote workers 0.826 and 0.745, all of which were higher than 0.70. Therefore, the mentioned tool had appropriate validity and reliability (Table 1).

**Table 1.** The Results of Validity and Reliability Tests

Variables	Number of Items	Average Variance Extracted (AVE)	Cronbach's Alpha Reliability	Composite Reliability
Use of Information and Communication Technology	4	0.598	0.789	0.732
Satisfaction with Internal Communications	5	0.532	0.781	0.814
Employee Interaction	7	0.577	0.826	0.745

The process of implementing the current research was as follows: Initially, a comprehensive list of the research population was prepared by gender, and then, based on the determined sample size, sampling was conducted from the population. In the next step, the importance and necessity of the research were explained to the sample, ethical points were clarified, and the researchers committed to implementing them.

Subsequently, they were asked to respond to the 16-item questionnaire of the current research. After responding to the questionnaire, the questionnaires were collected and checked for completeness, and finally, the employees were thanked and appreciated for participating in the research and responding to the questionnaire. It is worth mentioning that before responding to the questionnaire, it was explained to the employees that there is no right or wrong answer and the best response is the one that reflects their actual situation. Finally, the data of this study were analyzed using the structural equation modeling method in SPSS and Smart.PLS software.

### 3. Findings

In this study, due to strict control and explanation of the importance and necessity of research and researchers' commitment to ethical considerations, there was no attrition in the sample, and analyses were conducted for 220 employees of the Education Department in Tehran's District. In this study, there was a significant and positive correlation between the use of information and communication technology, satisfaction with internal communications, and employee interaction ( $P < 0.01$ ) (Table 2).

**Table 2.** Correlation Coefficients of Variables

Variables	Use of ICT	Satisfaction with Internal Comm.	Employee Interaction
Use of Information and Communication Tech.	1		
Satisfaction with Internal Communications	0.756*	1	
Employee Interaction	0.721*	0.598*	1

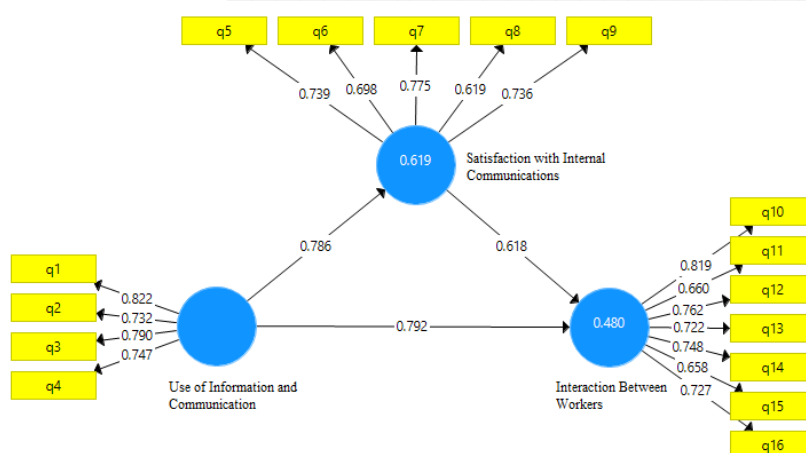
\* $p < 0.01$

In this study, the model of the use of information and communication technology on employee interaction with the mediating satisfaction from internal communications was appropriate due to the Q2 index being more than 0.25 for variables, the R2 index being more than 0.33 for endogenous variables, and the GOF index being more than 0.36 for the model (Table 3).

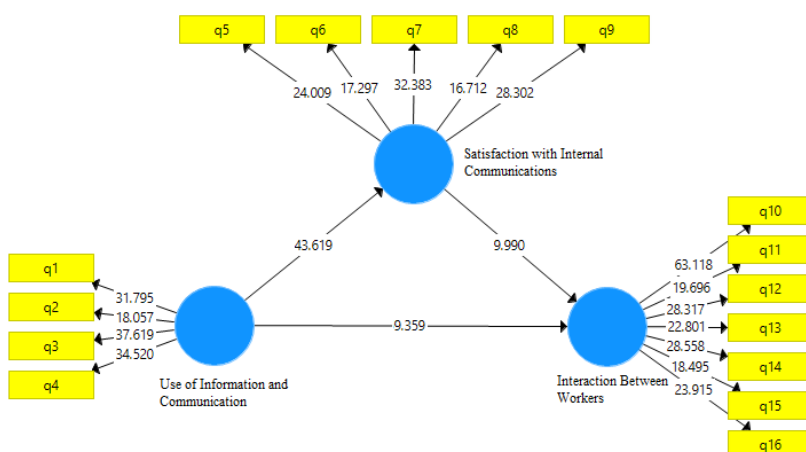
**Table 3.** Fit Indices of the Current Research Model

Variables	Q2	R2	GOF (Goodness of Fit)
Use of Information and Communication Tech.	0.298	--	0.559
Satisfaction with Internal Communications	0.254	0.619	--
Employee Interaction	0.264	0.480	--

In this study, the use of information and communication technology had a direct and significant impact on satisfaction with internal communications and employee interaction, and satisfaction with internal communications had a direct impact on employee interaction. Additionally, the use of information and communication technology, mediated by satisfaction with internal communications, had an indirect and significant impact on employee interaction ( $P < 0.001$ ) (Figures 1 and 2 and Table 4).



**Figure 1.** Final Model with Standard Coefficients (Beta)



**Figure 2.** Final Model with t-values

**Table 3.** Effects in the Model of Use of Information and Communication Technology on Employee Interaction with the Mediator of Satisfaction with Internal Communications

Effects	Standard Coefficients	Significance	Result	
Use of ICT on Satisfaction with Internal Comm.	0.786	43.619	Confirmed	
Use of ICT on Employee Interaction	0.792	9.359	Confirmed	
Satisfaction with Internal Comm. on Employee Interaction	0.618	9.990	Confirmed	
Indirect Effects		Direct	Indirect	Total
Use of ICT with Mediator of Satisfaction with Internal Comm. on Employee Interaction		0.792	0.485	1.277

#### 4. Conclusion

This study examined the relationship between the use of information and communication technology, satisfaction with internal communications, and the interaction of remote workers using the structural equation modeling method.

The findings of this research showed that the use of information and communication technology had a direct and significant impact on satisfaction with internal communications and employee interaction. This finding is consistent with the research findings of Lee (2023), Mohammadi et al. (2021), Mitic et al. (2017), and Mahdavi and Hasoumi (2016) in terms of the impact of the use of information and communication technology on satisfaction with internal communications, and with Lee (2023) and Ramazanian et al. (2016) in terms of its impact on employee interaction. In explaining these findings, it can be inferred that establishing effective

communication with employees working from home due to the COVID-19 pandemic, or in other words, teleworking, has become a key business concern for many organizations. Therefore, there are differences between these individuals and regular people who work remotely or volunteer for their needs remotely. Consequently, the use of information and communication technology, both formally and informally, leads to increased satisfaction with internal communications and employee interaction. In formal communications, information related to work processes is quickly exchanged between individuals, and employees use the said technology for informal conversations with other employees and to maintain their connection. When talking about non-work-related topics, employees have the opportunity to share their personal stories and express their feelings while working from home. Therefore, the use of information and communication technology for this purpose and for creating and improving social bonds and a sense of attachment and facilitating appropriate participation is necessary and appropriate. Consequently, it seems logical that the use of information and communication technology can have a direct and significant impact on both variables, satisfaction with internal communications, and employee interaction.

Other findings of the present study showed that satisfaction with internal communications had a direct and significant impact on employee interaction. This finding aligns with the research findings of Lee (2023) and Moharrami and Irajpour (2018) regarding the impact of satisfaction with internal communications on employee interaction. In interpreting these findings, it can be inferred that satisfaction with internal communications clarifies how technology is used by demonstrating its vital role in informing employees and creating emotional bonds between them, especially during remote work in unexpected situations like the COVID-19 pandemic. In these circumstances, employees have limited access to work and interaction with people and are heavily reliant on technology and communication technologies. These communication channels act as tools for listening to organizations and connecting with other employees, and these social and emotional resources are vital in encouraging employees to have an appropriate and desirable response to their organization and its employees. The results of this study showed that satisfaction with internal communications in an organization should not be limited to providing appropriate and job-related information to employees but should include strengthening the connection between employees and enhancing the level of their interaction. Therefore, informational nature and relational satisfaction are key organizational resources that make employees feel obligated to express their gratitude in social exchange relationships with an organization and its employees by engaging in their roles while working remotely. Consequently, it seems logical that satisfaction with internal communications can have a direct and significant impact on the variable of employee interaction.

Other findings of the present study showed that the use of information and communication technology, mediated by satisfaction with internal communications, had an indirect and significant impact on employee interaction. In explaining this finding, it can be inferred that the impact of the use of information and communication technology on employee interaction can occur through cognitive and motivational mechanisms. Since satisfaction with internal communications means satisfaction with communication systems between employers and employees, representing ideas, information, attitudes, and feelings among individuals, and indicating employee satisfaction with the main aspects of communication in interpersonal, group, and organizational areas, it can be expected that satisfaction with communications has both cognitive and motivational mechanisms. Communication between employees is one of the fundamental determinants for how employees perceive, interpret, and manage change, and these communications play an effective role in employees' ability to improve organizational conditions. Consequently, it seems logical that satisfaction with internal communications can be an appropriate mediator between the variables of the use of information and communication technology and employee interaction, and with the presence of this mediating variable, the use of information and communication technology can have an indirect and significant impact on employee interaction mediated by satisfaction with internal communications.

This study faced no particular limitation, but among the routine limitations of research, the following can be mentioned. The present study was conducted on the employees of the Education Department in Tehran's

District One. Therefore, conducting this study on the employees of the Education Department in other cities and even employees of other organizations is suggested. Another limitation of this study was the use of self-report tools, namely questionnaires, for data collection. Therefore, the use of structured or semi-structured interviews for data collection alongside or instead of questionnaires is suggested. In general, the results of this study indicated the direct and indirect (mediated by satisfaction with internal communications) impact of the use of information and communication technology on employee interaction. Therefore, considering the direct and indirect impact of the use of information and communication technology on employee interaction, conditions can be created to improve the use of information and communication technology and satisfaction with internal communications to enhance the organization's status and employee interaction. Also, since the use of information and communication technology helps employees to communicate with others while working remotely, organizational leaders and managers should use these channels to ensure that employees are aware of important decisions and changing policies in the organization, and in addition, use these channels to provide feedback for employee work and listen to their concerns and information needs.

### **Ethical Considerations**

In this study, the importance and necessity of the research were explained to the sample, ethical points were clarified, and researchers committed to implementing them.

### **Acknowledgments**

In the present study, employees were thanked and appreciated for participating in the research and responding to the questionnaire.

### **Authors' Contributions**

The authors of the present study collaborated and participated in all parts of the research.

### **Conflict of Interest**

The researchers declare no conflicts of interest.

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