HiLL PUBLISHING

Internet of Things and Smart Systems, 2025, 1(1), 18-21
https://www.hillpublisher.com/Journals/itss/
ISSN Online:

Multiple Action Mechanism of Information and Communication Technology Requirements and Power Internet of Things Support

Jianxiang Huang

State Grid Hubei Electric Power Co., LTD., Shennongjia Power Supply Company, Shennongjia 442400, Hubei, China.

How to cite this paper: Jianxiang Huang. (2025). Multiple Action Mechanism of Information and Communication Technology Requirements and Power Internet of Things Support. *Internet of Things and Smart Systems*, 1(1), 18-21.
DOI: 10.26855/itss.2025.12.005

Received: September 22, 2025
Accepted: October 16, 2025
Published: November 24, 2025

***Corresponding author:** Jianxiang Huang, State Grid Hubei Electric Power Co., LTD., Shennongjia Power Supply Company, Shennongjia 442400, Hubei, China.

Abstract

The current new economy era belongs to a network era, focusing on emerging technology, information economy and knowledge economy. Today's outstanding performance of the new economy era is the telecom industry. Information and communication technology not only has technology dependence, but also has cross-boundary nature. It will not only have an impact on people's life and work, but also have a certain impact on people's health. Through the analysis of ICT requirements, this paper deeply studies the multiple action mechanism of ICT requirements, in order to provide ideas for the future development of information and communication technology requirements.

Keywords

Information and communication; technical requirements; Multiple roles; Mechanism

Since the beginning of the new century, people have gradually entered the information age, and all industries have begun to focus on the application and popularization of information technology. Based on the need to improve organizational communication and work efficiency, companies explicitly require employees to adapt to current information and communication technologies. Information and communication technologies refer to all electronic devices or related technologies that can collect, store, and transmit information. In the current workplace, information and communication technologies play an indispensable role in internal and external communication within organizations.

1. Requirements and Characteristics of Information and Communication Technologies

1.1 Technological Dependence

Information and communication technology (ICT) requirements are often closely linked to emerging technologies. Poor ICT performance leads to a poor information experience for employees, thus creating demands for ICT solutions. Furthermore, the inherent complexity of ICT results in high requirements. In different enterprises, ICT-required technical personnel must be able to adapt and implement ICT solutions to suit the specific characteristics of each organization. Employees may also encounter compatibility issues due to a lack of effective initial deployment, leading to the development of corresponding ICT standards. While ICT provides employees with increasingly rapid access to information, the explosive growth in information volume reduces the time employees have to process information, disrupting their work rhythm and thus creating demands for ICT solutions (Ouyang et al., 2012; Liu, 2012; Zheng, Yu, & Wang, 2012).

1.2 Cross-Boundary Nature

Information and communication technology (ICT) requirements, compared to other job requirements, exhibit

significant cross-boundary characteristics. From a temporal perspective, ICT-driven work enables employees to work 24/7. However, employees shouldn't be solely immersed in ICT-related technical standards; they should also dedicate time and energy to their families. From a spatial perspective, some scholars studying work-related communication tool usage argue that ICT has led to a diversion of time and energy previously spent at home. Consequently, work pressure is shifting from the workplace to the home, creating work-family conflict. From a psychological perspective, the presence of ICT reduces employees' psychological detachment outside of work hours, impacting their recovery experience (He, 2012).

2. The Multiple Mechanisms of Information and Communication Technology Requirements

2.1 Pressure Loss Mechanism

The stress-dissipation mechanism also has the same significance for individual traits. If employees have strong self-efficacy and are confident in their work, they are less likely to perceive the use of information and communication technology (ICT) as a work requirement, thus experiencing relatively lower stress. In the stress-dissipation mechanism, utilizing work resources can mitigate the negative impact on employees. Therefore, when employees have a strong sense of control over their work and high self-efficacy, their performance is not significantly negatively affected by ICT requirements (Ren, 2011).

2.2 Restoration of the Obstacle Mechanism

The recovery mechanism, also known as the effort-recovery model, addresses how ICT-related technological standards can lead to increased resource consumption by employees during work, resulting in certain work behaviors. Once resources are depleted, employee stress increases. Furthermore, ICT requirements can slow down the recovery process when employees are recovering from negative impacts. Because employee resources are difficult to recover effectively, their personal lives, work efficiency, and quality all decline. The impact of ICT requirements on recovery varies across individuals. Generally, older employees with moderate economic status tend to have a more relaxed attitude towards ICT, experience less disruption from ICT requirements, and recover more quickly. Additionally, employees with a strong sense of control over their work usually find ICT within their control, thus facing less resistance when building up resources. This mechanism helps managers adopt more effective methods to help employees recover quickly (Fu, 2010).

2.3 Boundary Penetration Mechanism

The boundary penetration mechanism, also known as the work-family boundary model, separates work and family into two distinct domains, where individuals constantly shift roles daily. By creating and maintaining these boundaries, individuals manage their roles in each domain, fulfilling the requirements of each role and thus achieving work-life balance. Failure to achieve balance can lead to issues such as work burnout and family conflict. The unique nature of work requirements blurs the boundaries between work and family, resulting in negative factors in employees' work-life balance. The use of ICT breaks down spatial and temporal limitations, increasing employee workload. External support can help regulate ICT demands. Specifically, family support can reduce employees' guilt about using ICT, mitigating work-family conflicts. This mechanism helps to better understand the roles employees play, encouraging them to proactively adjust their mindset to reduce the negative impacts of ICT demands (Ai, 2010).

3. Information and Communication Technologies Supporting the Construction of the Ubiquitous Power Internet of Things

3.1 Data Acquisition and Intelligent Application

For the ubiquitous power Internet of Things (IoT), big data technology is utilized to deeply mine the potential value of key data, minimizing power system costs and reducing construction risks to enhance customer experience. Ensuring data visibility and enhancing the application of virtual data in construction are crucial. Augmented reality (AR) technology enables digital displays of power facilities, improving the skills of technical personnel. Virtual reality (VR) technology allows for visualized control of power operations and intelligent patrol systems, reducing the workload of grid workers and accelerating construction. Data information must be rendered realistically. This network

leverages AI and big data technologies to contextualize data, strengthening customer-centric service standards and facilitating successful network construction. It must meet the needs of its construction, ensuring customers enjoy perfect electricity services (Liu, 2010).

3.2 Secure Password Protection Technology

To ensure the realization of emerging security protection technology systems, a comprehensive security protection mechanism is needed, sometimes requiring sophisticated cryptographic techniques to ultimately meet the demands of the emerging power grid. For the comprehensive security protection system of the power Internet of Things (IoT), intelligent defense technology, mutual trust interconnection technology, and interactive security technology are sometimes used. Targeted innovation of these technologies is necessary to align with the requirements of the ubiquitous power IoT comprehensive security protection system. Regarding intelligent defense technology, proactive and comprehensive perception is implemented to detect potential risks, automatically issue alerts, and coordinate appropriate actions. Different intelligent contingency plans are formed to ensure and enhance the security of the network. For mutual trust interconnection technology, lightweight identity recognition technology can be used. For interactive security technology, it can be combined with relevant data leakage prevention technologies to strengthen protection and security auditing in unique situations, thereby enhancing interactive security (Hou, 2010).

For the ubiquitous power Internet of Things (IoT), tasks such as customer identification, data theft prevention, and data transmission are sometimes required. Emerging cryptographic technologies are utilized in all these tasks, and scientific optimization is needed to enhance their security. Effective development of corresponding standards for application technologies, as well as standards for interface protocols and scientific determination of corresponding standards for communication protocols, are essential to improve security standardization, reduce or prevent data alteration, minimize data theft, reduce unauthorized access, and prevent unauthorized interconnection (Wu, 2009).

3.3 Ubiquitous Network Technology

By selecting advanced technologies, comprehensive coverage of power facilities and their sensors can be ensured, ultimately addressing potential problems. This ensures the implementation of new space-air-ground communication network protocols. For the ubiquitous power Internet of Things (IoT), a scientific combination of different network protocols and communication modes is crucial; in essence, this means achieving synergy between multiple protocols and communication methods. Ultimately, this ensures the integration of space-air-ground communication with related information, effectively resolving issues within the power IoT. A key factor in the scientific construction of the ubiquitous power communication network is satellite communication. Scientific innovation in new space-air-ground communication network protocols is essential to ensure the smooth collection and transmission of power grid big data, while also ensuring resource sharing. The scientific application of corresponding 5G communication technologies is also necessary (Mei,2017; Zhu, 2012; Wang & Zhao, 2010; Wang, 2011; Zhang, Ling, & Ge, 2018).

4. Conclusion

This paper elucidates that the multiple mechanisms of action of information and communication technology requirements are mainly reflected in the following three aspects: first, the boundary penetration mechanism; second, the pressure loss mechanism; and third, the recovery barrier mechanism. These three mechanisms affect employees' health and their work-life balance to a certain extent. Therefore, it is necessary to strengthen the exploration of the multiple mechanisms of action of information and communication technology requirements, which will provide some reference for future information and communication work. Furthermore, it will provide key technological reference and support for the construction of the power Internet of Things.

References

Ai, J. (2010). Research on the diffusion of mobile phone user numbers based on Bass model. *Journal of Xi'an Eurasia University*, (2).

Fu, H. (2010). The Evolution of National Innovation System Theory and Future Research Directions. *Business Times*, (20).

He, X. (2012). Research on the Theory of Economic Growth Pole and the Development of Strategic Emerging Industries. *Times Finance*, (15).

Hou, R. (2010). Research on the Diffusion of Mobile Communication Products in China Based on Bass Model. *Science &*

Technology Information, (2).

Liu, H. (2010). Path Dependence Theory and Its Applications: A Literature Review. *Journal of Zhejiang University of Commerce and Industry*, (2).

Liu, W. (2012). A brief discussion on the choice of technology policy in the telecommunications industry. *Digital Technology and Applications*, (8).

Mei, Y. (2017). Stable and secure Internet of Things based on power line carrier communication. *Today's Electronics*, (6), 55-57.

Ouyang, Z., Gan, Z., Lin, H., Wu, S., Li, Y., Zhang, J., Wang, Z., Wang, Y., Wu, D., Tu, H., Chen, Y., Huang, R., Ye, T., Liu, M., Xie, C., Chen, D., Wang, W., Xia, Y., Li, C., … Ding, B., & Lin, H. (2012). Basic Research and Development of Strategic Emerging Industries. *Bulletin of the Chinese Academy of Sciences*, (6).

Ren, S. (2011). An Analysis of the Evolution and Development Trend of my country's Telecommunications Industry Regulatory Policies under the New Economy. *Journal of Harbin University of Commerce (Social Sciences Edition)*, (5).

Wang, S. (2021). A Brief Discussion on the Fundamental Role of Power Information and Communication in the Construction of Smart Grids. *Small and Medium Enterprise Management and Technology*, (8).

Wang, Y., Su, B., & Zhao, H. (2010). The concept and development trend of the power Internet of Things. *Telecommunications Science*, *26*(12A), 9-14.

Wu, H. (2009). The Inspiration from the Evolution of Telecommunication Technology. *Information and Communication Technology*, (4).

Zhang, X., Ling, K., & Ge, N. (2018). A Brief Analysis of the Fundamental Role of Power Information Communication in the Construction of Smart Grids. *Communications World*, (8).

Zheng, Z., Yu, Y., & Wang, G. (2012). Evolutionary Mechanism of Enterprise Alliance Networks in Strategic Emerging Industries—Based on the Perspective of Dissipative Structure Theory. *Finance and Economics Science*, (6).

Zhu, L. (2012). Development of Information Security Protection Technology Based on Smart Grid. *Science & Technology Information*, (12), 27.Li, X. (2010). Integration and Development of Internet of Things and Smart Grid. *Office Automation*, (6), 7-10.