

Challenges and Efficiency Improvement of Digital Empowerment at the Grassroots Level of Enterprises

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Abstract: Digital technology is bringing significant changes to grassroots management within enterprises. This study employs questionnaire surveys to deeply examine the core dimensions and its interrelationships of digital empowerment at the grassroots level, aiming to uncover the potential connections among system construction, user experience, organizational support, information efficiency, and application effectiveness. The results indicate that system construction forms the foundation, user experience directly influences continued usage intention, strong organizational support is a critical driving force, and information efficiency serves as a pivotal link, ultimately maximizing application effectiveness. Furthermore, this study identifies a practical pathway, "organizational support → information efficiency → application effectiveness," demonstrating that organizational support significantly enhances information efficiency, thereby improving application effectiveness. These findings offer valuable theoretical guidance and practical insights for enterprises seeking to undergo digital transformation.

Keywords: Digital empowerment; Efficiency improvement; Organizational support; Information efficiency; Application effectiveness.

1. Introduction

At present, promoting digital transformation has become an important way and strategic choice for enterprises to achieve sustainable development [1]. Digital empowerment of enterprise grassroots refers to the introduction of digital technology in the process of enterprise grassroots governance, integrating resources from all parties, optimizing business processes, accelerating decision-making and information transmission, and achieving all-round improvement in governance efficiency. It has become a hot topic in the field of enterprise management. Digital transformation is not the same as digitization or digital upgrade. Digitalization is only a process, while transformation is the result [2]. This study focuses on this key issue and deeply analyzes how to use digital technology at the grassroots level of enterprises to build a long-term driving mechanism to help enterprises move towards a new process of high-quality development.

Although many scholars have noticed the application effectiveness and challenges faced in the transformation process, existing research has focused on the technical aspects of system construction, the institutional guarantees of organizational management, or the path to improve information efficiency, lacking a systematic and complete analysis of digital empowerment. This study uses questionnaires to collect real information feedback from employees. Starting from multiple dimensions such as system construction, user experience, organizational support, and information efficiency, it innovatively constructs a theoretical model to analyze the impact of each dimension on the effectiveness of digital empowerment applications and the interaction mechanism, providing a new perspective and theoretical support for enterprises to accurately grasp the key elements and implementation paths of grassroots empowerment when promoting digital transformation. Digital transformation is a long-term innovation process. Enterprises not only have to bear high transformation costs, but also have high uncertainty in its economic effects [3]. Therefore, this study deeply analyzes the transformation

barriers of digital empowerment at the grassroots level of enterprises, and provides practical suggestions for the efficiency and intelligence of grassroots governance of enterprises.

This study enriches the research connotation of digital empowerment at the grassroots level of enterprises at the theoretical level, expands the theoretical boundaries of related fields, and provides important reference and guidance for enterprises to achieve digital transformation and improve the effectiveness of grassroots governance at the practical level. It has important practical significance and theoretical value.

2. Literature Review

In the digital economy era, enterprise digital transformation can enhance the comprehensive strength and core competitiveness of enterprises. Digital empowerment at the grassroots level of enterprises has attracted much attention from academia and practice as a key link. Many scholars have conducted in-depth research on the digital empowerment of grassroots enterprises from different dimensions, providing rich theoretical nourishment and cutting-edge perspectives for this study.

The technical foundation of digital empowerment is system construction. Research by Feng et al. (2022) demonstrates that the primary task of enterprise digital transformation is to build a solid infrastructure and technology platform, and achieve the deep integration of digitalization and green transformation through cross-level network embedding [4]. This study clearly outlines the pioneering role of system construction in the process of digital empowerment. However, some current studies on system construction are still limited to the advanced level of the technology itself, and rarely conduct in-depth analysis of its precise matching with the actual business needs of the enterprise grassroots. This is exactly the direction that this study focuses on.

In digital transformation, organizational support plays a dual role of institutional support and strategic guidance. Zhang et al. (2022) and Al-Moaid & Almarhdi (2024) both pointed out that a sound training system, technical support

mechanism and institutional guarantee are the key to the implementation of digital effectiveness [5, 6]. However, existing research focuses on macro-level institutional design when discussing organizational guarantees, but pays insufficient attention to micro-level issues such as the specific challenges faced by grassroots organizations in the implementation process, such as the pertinence and effectiveness of training content, and the timeliness and accuracy of technical feedback. This study will delve deeper into these micro dimensions and propose more practical ideas for strengthening organizational security.

The core indicators for measuring the effectiveness of digital empowerment also include information efficiency, covering multiple different levels such as information communication, data storage and analysis and processing. Hanisch et al. (2023) and Baiyere et al. (2020) respectively started from the teaching scenario and governance mechanism, and finally confirmed the significant role of digital integration of business processes and information channels in improving communication efficiency and management effectiveness [7, 8]. Most of the existing research on the evaluation of information efficiency focuses on qualitative description and lacks a rigorous quantitative analysis framework. This has, to a certain extent, limited the research on the path to improve information efficiency. This study will attempt to construct a quantitative evaluation model to fill this research gap.

The ultimate goal of digital empowerment is application effectiveness, including indicators in multiple dimensions such as employee workload, satisfaction, organizational cohesion, and innovation capabilities. Trenerry et al. (2021) and Chatterjee et al. (2023) have argued that digital empowerment has the potential to reduce employee burden, improve satisfaction and enhance organizational cohesion. However, existing studies on the tracking of application effectiveness mostly remain at the level of short-term effects, and lack in-depth discussion on the long-term impact and sustainability of digital empowerment [9, 10]. This suggests that this study needs to expand the time dimension and comprehensively examine the application effectiveness of digital empowerment.

The economic effects of digital transformation are highly uncertain [3]. This study will focus on key dimensions such as system construction, user experience, organizational support, and information efficiency. It will integrate questionnaire surveys and empirical analysis to deeply analyze the interaction mechanism between the dimensions, thereby adding strength to the theoretical framework of digital empowerment at the grassroots level of enterprises and helping enterprises gain sustainable competitive advantages in the wave of digitalization.

3. Digital Empowerment Analysis Model

This study built a digital empowerment analysis model. The model shows that digital empowerment improves information efficiency and application effectiveness by optimizing infrastructure and strengthening organizational support. Combining questionnaire surveys with quantitative analysis, the positive impact of digital empowerment on grassroots management of enterprises was verified. By integrating theory and empirical evidence, theoretical support and practical guidance were provided for the digital

transformation of enterprises. The digital empowerment analysis model is shown in Figure 1.

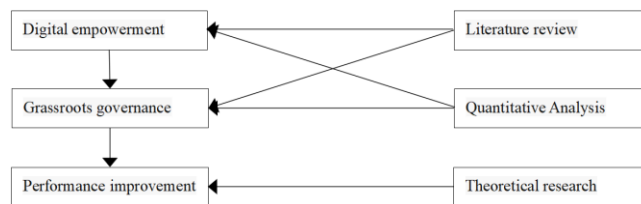


Figure 1. The digital empowerment analysis model

4. Key Dimensions and Connotations of Digital Empowerment at the Grassroots Level

The questionnaire for this study was compiled based on the actual business processes and job requirements of the target enterprise's grassroots digital transformation. During the compilation process, the information system success model proposed by Delone & McLean in 2003 and the quantitative expression in the UTAUT2 scale proposed by Venkatesh et al. in 2012 were referred to. The questionnaire was finalized after combining expert interviews and pre-test results. It includes 18 Likert-5-level items, divided into five dimensions: system construction, user experience, organizational support, information efficiency, and application effectiveness.

System construction is a key basic dimension of digital empowerment for the grassroots of an enterprise. This dimension includes the infrastructure involved in the digital construction of the grassroots of an enterprise, the functions of the software system and its operational stability, and the fit between the actual business needs of employees. Its effectiveness (Q1/Q2/Q3) is specifically manifested in that the system functions can fully match actual business needs, the operation process is stable and reliable, and the hardware facilities can effectively support the smooth operation of the system. Only when the above three aspects are effectively guaranteed can digital empowerment truly bring into play the effectiveness of the enterprise's grassroots and promote the improvement of organizational performance and work efficiency.

User experience is a key dimension to measure the effectiveness of digital empowerment at the grassroots level of an enterprise. It is the subjective evaluation given by grassroots employees of the enterprise on the ease of use, ease of operation and clarity of processes of digital systems. High-quality user experience (Q5/Q6/Q7) is reflected in the simple and intuitive features of the system interface and operation process design as well as the optimization space. The system is efficiently integrated with existing business processes, does not add extra workload to users, and can provide clear and effective operation process guidance to prevent users from being confused by operations and affecting the effectiveness of system use. User experience directly determines the acceptance of the system and the application effect of the company's grassroots employees, and is the key guarantee for the continued effectiveness of digital empowerment.

Organizational support means that enterprises can actively seek opportunities for technological improvement and innovative change by increasing R&D investment and making full use of internal and external resources [11]. It is an indispensable guarantee dimension in the process of digital empowerment at the grassroots level of enterprises. It refers to the institutional and resource support provided by

grassroots organizations of enterprises for grassroots employees to efficiently use digital systems through training system construction, technical service support and effective feedback mechanism. Organizational support (Q4/Q15/Q16) is reflected in the timeliness and effectiveness of technical support, that is, whether employees can quickly obtain technical or management feedback and solutions when they encounter problems during use; provide sufficient usage training or detailed instructions when the system is first promoted to ensure that employees are familiar with and master the system functions; when the system is updated, timely and clear information about the update content or targeted training guidance is provided to help employees quickly adapt to new functions. Adequate organizational support can effectively improve employees' acceptance and satisfaction with the system, which is an important prerequisite for digital empowerment to continue to play a role.

Information efficiency is a key indicator to measure the actual effectiveness of digital empowerment at the grassroots level of an enterprise. It refers to the specific degree to which the efficiency of grassroots employees of an enterprise has been improved in information communication, collaboration, management, analysis, and retrieval after using digital systems. information efficiency (Q8/Q9/Q10/Q11/Q12) is reflected in significantly shortening the time for internal and cross-departmental information communication and transmission, improving overall communication efficiency; helping users to easily obtain cross-departmental and cross-professional assistance through multiple channels, enhancing collaboration efficiency; achieving efficient collection and storage of work materials; facilitating the analysis and processing of information materials; and quickly and accurately retrieving the required key information from a large amount of information. The effective improvement of information efficiency directly determines the actual results of digital empowerment at the grassroots level of enterprises and is an important support for promoting the modernization of grassroots governance of enterprises.

Application effectiveness is a key dimension that reflects the actual value of digital empowerment at the grassroots level of enterprises. It refers to the actual impact of the use of digital systems by grassroots organizations on employee work efficiency, psychological burden, organizational cohesion and employee enthusiasm. The application effectiveness (Q13/Q14/Q17/Q18) are reflected in effectively reducing the actual workload and mental stress of employees and improving work efficiency; promoting employees' understanding of the overall situation of the organization, strengthening mutual interaction and collaboration, and enhancing organizational cohesion; after systematic training, employees' attitudes towards digital systems have changed, as reflected in a significant increase in acceptance and willingness to use; employees are more proactive in proposing suggestions for optimizing the system's functions, promoting continuous improvement of the system. Therefore, application effectiveness directly determines the sustainability of digital empowerment and the degree of value realization.

5. Analysis on the Performance, Practical Challenges and Mechanism of Digital Empowerment at the Grassroots Level of Enterprises

5.1. Specific Performance of Digital Empowerment at the Grassroots Level of Enterprises

This study uses a questionnaire survey conducted through the subjective perception of grassroots employees in enterprises to identify the specific effectiveness of digital empowerment in grassroots governance of enterprises. First, the digital system has significantly improved the efficiency of information communication and collaboration (Q8/Q9). After using the system, the time for information communication within and across departments has been effectively shortened, and the convenience of information sharing and collaborative interaction between departments has been improved. Secondly, digital applications have improved information management and processing efficiency (Q10/Q11/Q12), which is mainly reflected in the significant improvement in the efficiency of information collection, storage, analysis and processing, and accurate retrieval, while significantly reducing the difficulty of information management and use. Thirdly, digital empowerment can alleviate the workload and mental stress (Q13) of grassroots employees in enterprises, and improve the overall job satisfaction and mental health level of employees. Fourthly, the promotion and application of digitalization has increased employees' overall awareness of the company, strengthened interactions between colleagues, and effectively enhanced the cohesion within the organization and employees' sense of organizational identity (Q14).

5.2. Outstanding Challenges Faced by Digital Empowerment at the Grassroots Level of Enterprises

The questionnaire survey also shows that there are still many challenges that have an impact on the effective implementation and application of digital technologies. The matching degree between system functions and business is poor (Q1), that is, the design of digital system fails to fully meet the actual business needs of the enterprise, resulting in low utilization rate of some functions or even idleness. There are deficiencies in system stability and hardware support (Q2/Q3), which is manifested in frequent technical problems such as delays and crashes during system operation. The lack of basic hardware equipment directly affects the smoothness and reliability of system use. There are defects in the technical support and feedback mechanism (Q4). When employees encounter technical problems, they cannot obtain effective technical guidance and problem solutions in a timely manner, which affects the continuity and confidence of employees in using the system. There are deficiencies in system usability and business process adaptation (Q5/Q6/Q7). The complexity of the system operation interface and unclear operation instructions easily confuse employees, increase extra workload, and reduce the usability and acceptance of the system. There are shortcomings in the training and update guidance mechanism (Q15/Q16). The coverage of digital system training is limited and the updated training guidance is not timely enough, which affects the employees' proficiency in using the system and the sustained

effectiveness of the system application.

5.3. Interaction Mechanisms among Digital Empowerment Dimensions

In order to deeply understand the mechanism of improving the efficiency and challenges of digital empowerment at the grassroots level of enterprises, this study constructed an interactive analysis framework based on survey dimensions, and specifically explained the internal logical path of the interaction between various dimensions. 1) System construction (Q1-Q3) is the foundation of digital empowerment. Its quality directly determines the ease of use of the system (Q5-Q7), which in turn significantly affects the efficiency of information management and communication (Q8-Q12), and is ultimately reflected in the application effectiveness felt by employees in actual business (Q13-Q14). 2) The organizational guarantee dimension (technical support and training mechanism, Q4, Q15, Q16) plays a key

supporting role in the continued use of digital systems. Adequate organizational support can not only directly improve the system's usability and user experience, but also further enhance information management and processing efficiency by improving employees' proficiency in the system, ultimately improving employees' work enthusiasm and initiative (Q17-Q18). 3) The study also found that there are significant restriction paths between dimensions, that is, the lack of system construction and organizational guarantees will significantly limit the system's usability and information efficiency, thereby reducing the application effect of digital empowerment at the grassroots level of the enterprise, reducing employees' application efficiency and weakening their enthusiasm. This multi-dimensional interactive mechanism analysis provides more detailed theoretical understanding and practical guidance for the digital empowerment of enterprises at the grassroots level. The mechanism of digital empowerment is shown in Figure 2.

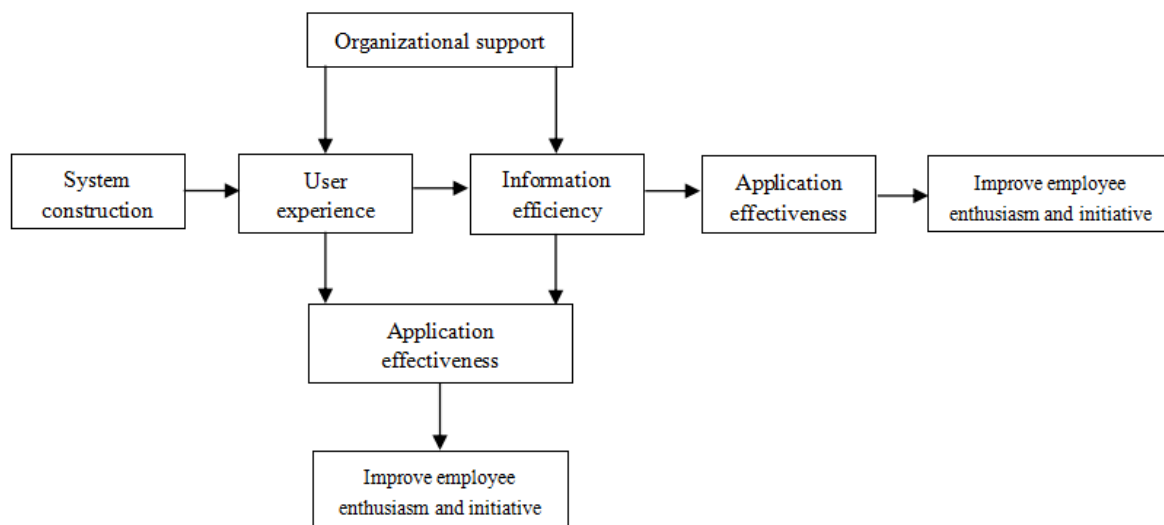


Figure 2. The framework of mechanism of action

5.4. Research Hypothesis and Analytical Model

5.4.1. Organizational Support and Information Efficiency

Organizational support can improve the efficiency of information processing by providing necessary resources, conducting effective training, and providing timely technical feedback to enhance employees' ability and enthusiasm in using digital tools. Existing studies have pointed out that the active support given by the organization can directly promote the effective dissemination and integration of information technology within the organization and improve the overall information management capabilities (Eisenberger et al., 1986; DeLone & McLean, 2003). Based on this, hypothesis H1 is proposed.

H1: Organizational support has a significant positive impact on information efficiency.

5.4.2. System Construction and Information Efficiency

System construction is the basic guarantee for digital transformation, covering the system's functional matching, system operation stability and the completeness of the hardware infrastructure, and plays a key role in improving information processing efficiency. Existing studies have pointed out that a sound system construction can effectively support the stable operation of digital tools and improve the timeliness and reliability of information acquisition and processing (DeLone & McLean, 2003). Based on this,

hypothesis H2 is proposed.

H2: System construction has a significant positive impact on information efficiency.

5.4.3. User Experience and Information Efficiency

User experience refers to the ease of use and convenience felt by grassroots employees of an enterprise when using digital systems, which is directly related to employees' enthusiasm for information use and actual operational efficiency. Existing studies have pointed out that good user experience can reduce the psychological cost of user operation, improve system usage efficiency, and thus improve information efficiency (Davis, 1989; Venkatesh et al., 2003). Based on this, hypothesis H3 is proposed.

H3: User experience has a significant positive impact on information efficiency.

5.4.4. Information Efficiency and Application Effectiveness

As the core and key link of digital empowerment, information efficiency directly affects the workload, satisfaction and organizational cohesion of employees in basic organizations. Existing studies have pointed out that efficient information flow and processing capabilities can reduce employees' extra workload and improve the collaboration and performance of the entire organization (Venkatesh et al., 2003). Based on this, hypothesis H4 is proposed.

H4: information efficiency has a significant positive impact on application effectiveness.

5.4.5. Information Efficiency Plays a Mediating Role Between Organizational Support and Application Effectiveness

From the analysis of the relationship between organizational support and application effectiveness, organizational support has a direct impact on application effectiveness, and may also have an indirect impact through the mediating variable of information efficiency. Existing studies have shown that the training and feedback mechanisms provided by organizational support can indirectly enhance the overall application effect by improving employees' information processing capabilities (Baron & Kenny, 1986; Hayes, 2018). Based on this, hypothesis H5 is proposed.

H5: information efficiency plays a mediating role between organizational support and application effectiveness.

Based on the above assumptions, this study constructed an analytical model for digital empowerment at the grassroots level of enterprises as shown in Figure 3:

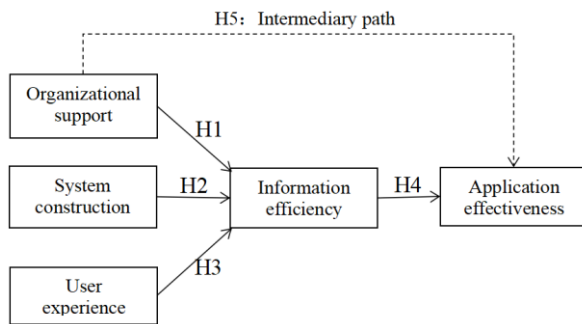


Figure 3. The conceptual hypothesis model of digital empowerment at the grassroots level of enterprises

6. Overview of Dimensional Distribution Data

6.1. Overview of Each Dimension

The scores of the system construction dimension (Q1-Q3) showed a clear differentiation trend, with an average score of 8.57 points (out of 15 points). Specifically, about 68% of the sample scores are concentrated in the range of 8-10 points, indicating that the system function coverage, hardware and performance stability of most enterprise grassroots units are at a level "slightly above the passing line". However, there are still 15% of the samples with scores of 6 or below, exposing the weak infrastructure and uneven system quality of some enterprise grassroots units. This reflects that during the system construction process, some units failed to fully consider actual business needs, resulting in a certain degree of disconnection between system functions and business processes. Insufficient investment in hardware facilities also directly affected the overall performance and stability of the digital system.

The overall average score in the user experience dimension (Q5-Q7) is 8.32 points (out of 15 points). About 55% of the respondents rated the system's ease of operation and process guidance as "relatively satisfactory", with the acceptable range being between 6 and 12 points. This result shows that although the current digital system has made some progress in user experience, there is still much room for improvement. Some users reported that the system operation interface was

complex and the process guidance was not clear enough, which brought certain confusion and extra burden to the actual operation and reduced the system's usability and user acceptance.

Organizational factors are key factors in digital transformation and are directly related to whether the digital transformation activities of enterprises can be effectively promoted [12]. The overall performance of the organizational support dimension (Q4/Q15/Q16) was relatively good, with an average of 9.57 points (out of 15 points), which was generally higher than the system construction and user experience dimensions. Among them, 72% of the respondents recognized the timeliness of training and technical feedback, with an acceptable range of 7 to 13 points. However, nearly 1/4 of the group still reported that technical support was inadequate or training coverage was insufficient. This shows that although most grassroots units of enterprises have made certain efforts in organizational support, some units still have shortcomings in the completeness of the training system and the timeliness of technical feedback, which affects employees' proficiency in the use of digital systems and the effectiveness of their continued application.

The mean value of the information efficiency dimension (Q8-Q12) is 16.98 points (out of 25 points). More than 60% of the samples scored between 17 and 20 points, reflecting that the digital system has achieved significant results in shortening communication links and improving data retrieval and analysis efficiency. However, there are still about 10% of the samples with scores below 15 points, indicating that in some units, the effectiveness of information management is still in urgent need of improvement. This is mainly due to the fact that the information systems of some units are not sufficiently integrated and data islands still exist, resulting in poor information communication and difficulty in data retrieval, which affects the overall information efficiency.

The average score of the application effectiveness dimension (Q13/Q14/Q17/Q18) was 13.32 points (out of 20 points). About 68% of the respondents said that the digital system significantly reduced the workload and improved organizational cohesion. However, in terms of work enthusiasm and proactive demand reporting, only 43% of respondents gave a "very positive" evaluation, indicating that the empowerment effect has not yet fully penetrated into the behavioral level of employees. This may be related to factors such as employees' level of awareness of digital systems, usage habits, and perceived benefits of the systems. This shows that in the process of promoting digital empowerment, it is necessary to further stimulate employees' initiative and enthusiasm so that digital systems can be more deeply integrated into employees' daily work and give full play to their empowerment value.

The data distribution in various dimensions shows many problems and shortcomings in system construction, user experience, organizational support, information efficiency and application effectiveness in the process of digital empowerment at the grassroots level of enterprises. These problems have jointly affected the overall effectiveness and progress of digital empowerment, and it is urgent for enterprises to take corresponding measures to improve and optimize in the subsequent digital transformation process.

6.2. Correlation Test between Variables

In order to verify the above hypotheses, this study conducted a correlation analysis between variables. The

results showed that there was a high positive correlation between organizational support and information efficiency ($r=0.732$, $p<0.01$), and a high positive correlation between information efficiency and application effectiveness ($r=0.855$, $p<0.01$). The correlation between system construction, user

experience and information efficiency ($r=0.390$ and $r=0.391$, $p<0.01$, respectively) was relatively weak but significant. The preliminary correlation analysis results show that the research hypothesis has preliminary rationality. The results are shown in Table 1.

Table 1. Thermal analysis diagram of correlation between variables

Variables	System construction	User experience	Organizational support	information efficiency	application effectiveness
System construction	1	0.547	0.540	0.390	0.440
User experience	0.547	1	0.516	0.391	0.409
Organizational support	0.540	0.516	1	0.732	0.737
information efficiency	0.390	0.391	0.732	1	0.855
application effectiveness	0.440	0.409	0.737	0.855	1

Note: The values in the table are Pearson correlation coefficients, and all correlations are significant at the $p < 0.01$ level.

7. Impact of Dimension Distribution on application effectiveness

7.1. Significance Test of Main Effect

This study used multiple linear regression analysis to conduct a significance test on the direct impact paths between

variables. The analysis results showed that organizational support had a significant positive impact on information efficiency ($\beta=1.225$, $p<0.001$), and the impact of information efficiency on application effectiveness was also highly significant ($\beta=0.528$, $p<0.001$). Hypotheses H1 and H4 were significantly supported, while the direct effects of system construction ($\beta=-0.030$, $p>0.005$) and user experience ($\beta=0.052$, $p>0.005$) on information efficiency did not reach a significant level, and hypotheses H2 and H3 were not verified. The analysis results are shown in Table 2.

Table 2. Multiple linear regression results analysis table (dependent variable: information efficiency)

Variables	Beta	SE	T value	P value	Significance	Lower 95% Mean	Upper 95% Mean
Constant term	5.079	2.207	2.302	0.027	*	0.619	9.539
System construction	-0.030	0.258	-0.115	0.909		-0.552	0.493
User experience	0.052	0.295	0.177	0.861		-0.543	0.647
Organizational support	1.225	0.227	5.404	<0.001	***	0.767	1.683

Note: *** means significant at the level of 0.001 ($p < 0.001$), ** means significant at the level of 0.01 ($p < 0.01$), and * means significant at the level of 0.05 ($p < 0.05$).

7.2. Test of the Mediating Effect of Information Efficiency

The mediating effect of information efficiency was tested using the three-step method. The results showed that when considering the impact of organizational support on

application effectiveness alone, organizational support showed a significant direct impact ($\beta=0.964$, $p<0.001$). After incorporating information efficiency into the regression equation, the impact of organizational support on application effectiveness was significantly weakened. information efficiency played a significant partial mediating role between organizational support and application effectiveness, and hypothesis H5 was supported. The research results are shown in Table 3.

Table 3. Analysis of mediation effect results (mediator: information efficiency)

Paths	Beta	SE	P value	Significance	Lower 95% Mean	Upper 95% Mean
Organizational support → application effectiveness (the total effect)	0.964	0.136	<0.001	***	0.697	1.231
Organizational support → information efficiency	1.231	0.177	<0.001	***	0.884	1.578
information efficiency → application effectiveness (the intermediary path)	0.528	0.088	<0.001	***	0.357	0.700
Organizational support (control intermediary) → application effectiveness	0.313	0.147	0.039	*	0.016	0.602

Note: *** means significant at the level of 0.001 ($p < 0.001$), ** means significant at the level of 0.01 ($p < 0.01$), and * means significant at the level of 0.05 ($p < 0.05$).

7.3. Endogenous Connections between Key Dimensions and Application Effectiveness

This study analyzes in detail the endogenous relationship between each key dimension and application effectiveness, and uses statistical analysis methods to rigorously process and

carefully interpret the data, so as to present the influencing mechanism of application effectiveness when each dimension interacts with each other, and provide empirical basis for the digital empowerment of enterprises at the grassroots level.

Overall, each dimension shows a significant positive correlation with application effectiveness, which fully demonstrates that system construction, user experience, organizational support, information efficiency and other aspects work together to improve the effectiveness of digital applications. System construction is the foundation of digital empowerment and lays the foundation for application effectiveness. Good system function matching and stability are the prerequisites for ensuring efficient work of employees. Optimizing user experience can increase employees' enthusiasm and satisfaction in using digital systems, allowing the systems to be better integrated into daily workflows, and indirectly driving application effectiveness. Organizational support provides strong support for the implementation of digital systems, involving training, technical feedback, update guidance and other aspects. It can significantly improve employees' understanding and application of the system, effectively solve problems and confusions during use, and promote the positive development of application results.

There is a very close connection between information efficiency and application effectiveness. Among the samples with information efficiency scores greater than 17 and application effectiveness scores greater than 14, the average application effectiveness score was 17.6, significantly higher than the overall mean of 13.32. This fully demonstrates that the improvement in the efficiency of information communication, data retrieval and analysis has become a key factor for employees to truly feel the burden-reducing and efficiency-enhancing effects of digital empowerment. In the process of digitalization, the efficient flow and precise processing of information play a key role in the optimization and upgrading of the grassroots work of enterprises. Only when employees can quickly acquire, accurately analyze and effectively utilize various information resources can they truly achieve the work performance improvement goals expected by digital empowerment.

There is also a strong correlation between organizational support and information efficiency. Among the samples with organizational support scores greater than 9 and information efficiency scores greater than 18, the average information efficiency score was 18.5, significantly higher than the overall mean of 16.98. The two interact with each other to form a strong synergy to promote improved application effectiveness. Organizational support can directly provide convenience for employees to use the system, and is more helpful in exploring and maximizing the value of information efficiency. The improvement of information efficiency in turn enhances the effectiveness of organizational support, allowing employees to be more adept at dealing with various tasks and challenges in a digital working environment.

In samples where the system construction score was less than 7 points and the organizational support score was less than 8 points, the average application effectiveness score was only 10.4, far lower than the overall average of 13.32. This situation shows that weak infrastructure and insufficient training support will have a significant impact on the system's usability and information efficiency.

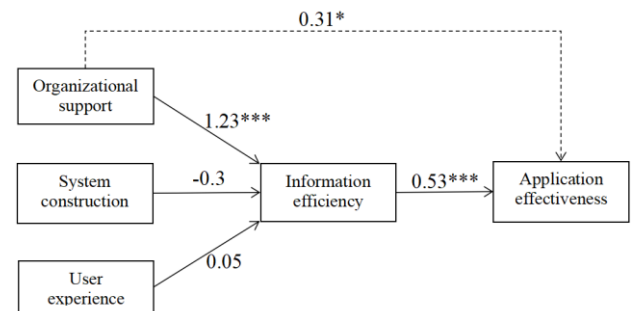
When the system functions are not perfect and the hardware equipment is not guaranteed, employees will frequently encounter technical obstacles during use, which

will greatly affect work efficiency and user experience. At the same time, if there is a lack of effective organizational support, employees will find it difficult to obtain necessary technical guidance and training in a timely manner, and will not be able to fully understand and use the various functions of the system, which will lead to the inability to effectively convert information efficiency into actual work results, and ultimately seriously affect the overall empowerment effect.

Digital transformation can deepen collaboration among key links[13]. System construction, user experience, organizational support and information efficiency are positively correlated and closely linked to each other, forming an organic whole that promotes application effectiveness, and points out the direction for the grassroots digital empowerment practice of enterprises: only by strengthening organizational support and improving information efficiency can the empowerment effectiveness be maximized.

8. Analysis of the Digital Empowerment Path of Enterprise Grassroots Based on the Intermediary Role of Information Efficiency

By analyzing and exploring the digital empowerment paths of the enterprise grassroots, we found that organizational support, information efficiency and application effectiveness are closely linked, outlining the transmission path of "organizational support → information efficiency → application effectiveness". As shown in Figure 4.



Note: *** means significant at the level of 0.001 ($p < 0.001$), ** means significant at the level of 0.01 ($p < 0.01$), and * means significant at the level of 0.05 ($p < 0.05$).

Figure 4. Organizational support - information efficiency - application effectiveness transmission path diagram

The validated model path diagram shows the impact paths and correlation coefficients of the three factors of organizational support, system construction, and user experience on information efficiency and application effectiveness. Organizational support has a significant positive impact on information efficiency ($\beta=1.23$, $p<0.001$). Hypothesis H1 is supported, which verifies the emphasis on the importance of training and feedback mechanisms to information efficiency. The path formed by system construction on information efficiency did not reach significance ($\beta=-0.03$, $p>0.005$), and hypothesis H2 was not supported, which may indicate that it is difficult to significantly improve information efficiency with only technical investment but lack of sufficient organizational supporting measures. The impact of user experience on information efficiency is also not significant ($\beta=0.05$, $p>0.005$). Hypothesis H3 is not supported, and the user's perception of the convenience of the interface has not yet been

transformed into an effective improvement in information processing efficiency. Information efficiency has a significant positive impact on application effectiveness ($\beta=0.53$, $p<0.001$), and hypothesis H4 is supported, verifying the view of Venkatesh et al. (2003) that efficient information processing capabilities directly improve employee performance and organizational cohesion [14]. Organizational support also has a significant direct positive impact on application effectiveness ($\beta=0.31$, $p<0.005$), and produces a significant indirect effect through information efficiency. Hypothesis H5 is supported, reflecting the key role played by information efficiency.

Organizational support can significantly improve information efficiency and lay a solid foundation for information communication, processing and analysis. Its improvement can greatly optimize information efficiency. For example, training can enhance employees' information literacy, and technical feedback can promptly clear bottlenecks in information flow, thereby ensuring that information flows unimpeded, accurately and efficiently from the source. This process has strongly confirmed that organizational support is the key to activating information efficiency.

Information efficiency has a strong feedback effect on application effectiveness. With the support of the organization, information efficiency injects impetus into application effectiveness, reduces employee workload and improves organizational cohesion. This highlights that information efficiency is the key to transforming digital empowerment into actual value, and provides new ideas for the digital transformation of enterprises at the grassroots level: strengthening organizational support, optimizing information efficiency in a targeted manner, and accurately accelerating the process of digital empowerment.

9. Conclusion

This study focuses on the efficiency improvement of digital empowerment at the grassroots level of enterprises and the challenges they face. The research is conducted through questionnaire surveys and empirical analysis, with the aim of revealing the operating mechanisms between key dimensions such as system construction, organizational support, and information efficiency. The research results show that organizational support has a significant positive impact on information efficiency (H1 is established), and information efficiency has a significant positive impact on application effectiveness (H4 is established). Information efficiency plays a significant partial mediating role between organizational support and application effectiveness (H5 is established), forming an effective path of "organizational support $\rightarrow$ information efficiency $\rightarrow$ application effectiveness". Although system construction and user experience did not show a direct and significant impact (H2, H3 are not established), as the underlying supporting conditions for digital empowerment, their criticality cannot be ignored. In the process of promoting digital empowerment practices, grassroots units of enterprises should focus on strengthening organizational support, using effective training and feedback mechanisms to improve employees' information processing capabilities, improve information efficiency, and maximize application results. At the same time, they need to continue to pay attention to and improve system construction and user experience, so as to comprehensively lay the foundation for digital empowerment. This study provides new theoretical

perspectives and practical guidance for the digital empowerment of enterprises at the grassroots level. Given the limitations of the sample size and source range, the universal applicability of the research results needs to be further verified. Future research will expand the sample size and combine a variety of research methods to conduct a more comprehensive and in-depth discussion on the digital empowerment of enterprises at the grassroots level.

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