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Research on User Resistance Behavior in the Post-Implementation Stage of a Hospital Information System

(Full Paper)

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ABSTRACT

The development of informatization brings great opportunities for the construction of informatization in hospitals. Hospitals are increasingly dependent on information systems. However, in the process of implementing the hospital information system, user resistance has become an important factor hindering the successful implementation of the system. The existing researches on the causes of user resistance mostly stay in the pre-implementation stage before the introduction of the system. However, the pre-implementation stage does not involve the resistance caused by users' real contact with the system, so the research conclusions are limited. Based on the existing three-factor resistance theory, choosing the resistance in the post-implementation stage of a hospital information system as case study object, starting from the three theoretical perspectives, this paper makes a comprehensive analysis of the reasons for the resistance behavior in the post-implementation stage of the information system, and puts forward that the reasons for the resistance behavior are caused by user motivation, system development technology, network infrastructure, organizational support, organizational management, and other comprehensive caused by multiple factors. Through this study, the conclusions of the existing information system resistance factors research field are further expanded and improved, making the conclusions more comprehensive and specific. This paper not only provides theoretical reference for researchers in related fields, but also provides substantive suggestions for the smooth implementation of information system in hospitals, promotes the transformation of hospital informatization, and improves the level of medical service and social health.

Keywords: User resistance factor, hospital information system, post-implementation stage, three-factor resistance theory, case analysis.

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INTRODUCTION

Health, an eternal topic of human beings, was placed at the center of sustainable development by the United Nations in 2015, and medical organizations and healthcare services play a crucial role in promoting human health (Liu & Mao, 2019). As professional service institutions to maintain human health, hospitals aim to provide active medical services to people in need and improve the health level of the whole society (Manzoor *et al.*, 2019). In recent years, with the support of many emerging information technologies, hospitals have been carrying out reform and innovation to improve medical conditions and social health level. The continuous mature development of information technology has brought new opportunities for the development of medical informatization. Medical informatization has become an important trend in the economic development of various countries and is the core force of social and economic reform. In 2008, the president of the United States proposed that strengthening the construction of medical information technology is an important frontier to achieve the reform of health care system. He suggested to invest 50 billion US dollars in the development of the electronic system of medical information technology (Liu, Guo & Zhao, 2013). In May 2012, the ministry of health in the United Kingdom released a strategy report, which set out the action for medical informatization in the next decade. China has also issued a number of relevant policies and norms, such as "the healthy China 2020 strategic research report" and "the guidance on the construction of health informatization and the preliminary development plan (2011-2015)". In the period of "13th five-year plan", the medical and health industry is taken as the key object of informatization development, and is included in the key plan of informatization construction and national network security.

Practice has proved that under the background of the continuous improvement of the level of social science information technology, medical informatization in all countries is developing rapidly, and medical information system is the indispensable infrastructure for medical organizations to carry out information reform. The implementation of information system in the hospitals can gradually improve the internal competitiveness of hospitals, improve the patient's medical experience and satisfaction, improve the quality of medical service, which lay a foundation for the improvement of doctor-patient relationship and provide important guarantee for the long-term development of the hospital, and promote public health to a new level.

However, in the process of realizing medical informatization, the implementation of hospital information system is confronted with the problem of user resistance, which has become the biggest obstacle to the successful implementation of information system (Kim, 2011). Because the implementation of information system is accompanied by changes in work content, working mode and even in organizational structure, organizational culture and organizational system, when users are worried and anxious about these changes, they will refuse to use the system, delay the implementation cycle of the system or make the new system not fully utilized, etc (Beaudry & Pinsonneault, 2005). The phenomenon that users resist the implementation of information system has become a new problem concerned by researchers in related fields (Klaus & Blanton, 2010; Adams, Berner, & Wyatt, 2004).

User resistance is the biggest obstacle to the successful implementation of information system. Some scholars have conducted researches on the causes of the resistance behavior in the implementation of information system. These researches mainly include two aspects. Part of the researches starts from the phenomenon of user resistance, focusing on the description of the phenomenon, but the lack of theoretical explanation. Researchers only carry out observation records for a certain field or specific phenomenon, and directly propose some factors that may influence the resistance behavior based on the results of individual observation (Kim & Kankanhalli, 2009). The other part of the researches reveals the causes of the resistance behavior from the perspective of the information system users themselves. Compared with the researches directly putting forward the resistance factors that lack the theoretical basis, the theoretical model provides a more solid theoretical research (Gang, 2011), and its research conclusion is more convincing as well. Based on the equity theory, Joshi (1991) studied the individual's resistance to the change of the rights and interests caused by the implementation of information system. Lapointe and Rivard (2005), based on the semantic analysis of the resistance study, came to the conclusion that "the reason for the resistance is that the introduction and implementation of the system makes the system users feel the potential threat and make them anxious, which leads to the resistance of users to the system". From the perspective of emotion theory, Marakas and Hornik (1996) explored the reasons for the formation of user resistance and proposed that when users felt that the introduction of information system would bring pressure and fear on them, they would produce some resistance behaviors. Martinko *et al.* (1996) explained the resistance behaviors based on the attribution theory, believing that users would make attributions to the impact of the implementation of the information system, which would lead to users' expectation of the results, and when the expectation was negative, the behaviors of resisting the implementation of the system would be generated. In addition, some domestic scholars have established the user resistance model based on behavior factors to analyze the factors of user resistance (Wu, Chen & Li, 2008).

However, the above researches mainly focus on the user's resistance behavior in the pre-implementation stage of information system, and seldom discuss the resistance behavior after the implementation of information system. System implementation includes pre-implementation stage and post-implementation stage. The pre-implementation stage refers to the period from the deployment of the system to the pre-use period, with specific tasks including personnel training, purchase, installation and debugging of computers and other equipment. The post-implementation stage refers to the period when the system is put into operation and users can really use the system (Marakas & Hornik, 1996). In fact, the user's resistance to the information system may occur at any stage of the system implementation (Martinko *et al.*, 1996). In the pre-implementation stage, because the users have not really contacted the system, the main reason for the resistance behavior is the users' subjective cognition of the future uncertainty (Beaudry & Pinsonneault, 2005; Klaus & Blanton, 2010; Kim & Kankanhalli, 2009). However, in the post-implementation stage, users have already had real contact with the system, the uncertainty before the implementation has disappeared, and the resulting pressure and anxiety have also changed. Therefore, the existing theories proposed in relevant researches are insufficient to explain the resistance of users to the implementation of information system in the post-implementation stage. In addition, most of the above theories about resistance behaviors focus on the individual level of users and ignore the factors of users' surrounding environment. Human behaviors are response to the stimulus of the surrounding environment, so the role of the environment must be considered when exploring human behaviors. Therefore, the external environment of the users and the interaction between the users and the environment should be considered when studying the user's resistance behaviors in the implementation of information system. In addition, the reasons for users' resistance will vary in different types of organizations and to different types of information systems (Jiang, Muhanna & Klein, 2000). Therefore, it will make the research more targeted to analyze the reasons for the resistance behaviors in a specific organizational context. Most of the previous studies focused on the implementation of information systems in for-profit enterprises, mainly the implementation of ERP systems, while few studies focused on the information system user resistance behavior in other types of organizations. Taking the medical information system as an example, the informatization development of the medical industry has become the focus of current attention, and the medical organizations are increasingly dependent on the hospital information system. There are a large number of public hospitals in China, which derive their revenues from provided services and from the large sums of money received from the government. In the process of operation, they are not purely for the purpose of profit, but need to undertake a large number of social services. Therefore, such public hospitals are different from traditional enterprises, which are not purely profit-oriented organizations. The purpose of their information system implementation is also different from that of traditional enterprises. In the implementation process, on the one hand, they should not only consider how to serve the internal management of the organization, but also consider how to serve the patients who come for medical treatment and assume social responsibility. In addition, most of the members in the hospital organizations are personnel with professional skills and each department is a relatively independent department with very professional knowledge, so the internal management of the hospitals is also a specialized discipline different from enterprise management. Therefore, the environment in which the hospital information system is implemented also has certain

particularity. To explore the issues of user resistance in the implementation of information system in hospitals will help medical organizations accurately grasp the resistance factors, take targeted measures to solve the existing resistance problems, remove obstacles in the implementation of the medical information system, promote the smooth development of the medical systems and improve the level of medical services.

Therefore, this study tries to solve the following questions: what factors can cause the resistance of medical staff to the hospital information system in the post-implementation stage? In order to solve the above problem, based on the summary of the relevant research status and the three-factor resistance theory, this paper extracted, coded and abstracted the influencing factors of the resistance behaviors in the post-implementation stage of the hospital information system from the perspective of user, system and human-system interaction. After discussion and analysis, the paper puts forward the specific reasons for the user resistance behaviors in the post-implementation stage of the hospital information system.

THEORETICAL FRAMEWORK

Through the summary of related domestic and foreign literatures, it can be found that the theories of user resistance mainly include three-factor resistance theory, equity theory, attribution theory and status quo bias (SQB) theory (Martinko *et al.*, 1996). The three-factor resistance theory is the theoretical basis of this study.

The three-factor resistance theory proposed by Marakas (1996) is the most classical theory in the field of resistance behavior research, which explains the user's resistance behaviors from the perspectives of system-oriented, human-oriented and human-system interaction theory (Xing, 2015). The system-oriented view holds that the reasons for the resistance behaviors are related to the factors related to computer technology and communication technology, specifically, the design of the system, and the quality of the system design determines whether the users will have the resistance behaviors. The human-oriented view holds that the resistance is caused by the characteristics related to the users themselves, such as values, emotions, educational background, knowledge and attitude towards information technology, etc. The human-system interaction theory emphasizes that the individual users will interact with the system in the process of implementing the information system, and such interaction will cause the change of power distribution in the process of system implementation, and the party whose power will be lost will resist the implementation of the information system. These three views are also different from each other because of the different theoretical perspectives that explain the causes of user resistance.

The main reasons for selecting the three-factor resistance theory as the theoretical basis for this study are as follows:

Firstly, the three-factor resistance theory provides a more comprehensive research framework for us to understand and analyze the user's resistance behaviors. It can be found from the above summary of the reasons for resistance that all the reasons for resistance based on the existing empirical researches contain the ideological viewpoint of the three-factor resistance theory. However, the existing research results only reflect a certain point of view of the theory, which have not fully reflected the comprehensiveness and advantages of the theory in explaining the causes of users' resistance. In the post-implementation stage, in addition to the resistance behaviors caused by the user's own factors, it also involves the resistance behaviors caused by the system characteristics, as well as the resistance behaviors caused in the process of the interaction between people and the system. In order to fully explore the causes of resistance in the post-implementation stage of the system, the three-factor resistance theory is a good choice.

Secondly, the three-factor resistance theory is the theoretical basis proposed from the organizational level. Some researchers have proposed that individual resistance is not enough to cause too much impact on the whole implementation process or lead to the failure of the system, so it is more meaningful to study group resistance behaviors (Adams, Berner, & Wyatt, 2004). This study is aimed at the resistance research of organizational level. By using the resistance theory and analyzing the causes of resistance from three perspectives, this paper will study the resistance behaviors from the organizational level.

Therefore, taking the three-factor resistance theory as the basis for theoretical construction, this study conducts an all-round analysis of the reasons for the resistance from the three perspectives proposed by the theory, and proposes more comprehensive reasons for the resistance in the post-implementation stage of the system, so as to provide practical reference for relevant researchers and users.

RESEARCH METHODS

As one of the main research methods of social science, case study is an effective tool to understand the objective world and deal with complex problems, which can effectively reveal the reasons behind complex phenomena by in-depth and comprehensive field investigation of a certain problem in reality, obtaining detailed data and analyzing the data under the guidance of theory. Yin (2017), who has studied the case study method in depth, and other senior scholars of the case study method all agree that it is appropriate to use the case study method to answer the "how" and "why" questions. The purpose of this study is to answer the questions such as why user resistance phenomenon arises and how to better avoid the resistance behavior in the process of system implementation, so the case study method is applicable. At the same time, compared with multiple case studies, single case study is more suitable for in-depth analysis and exploration of a certain problem, which can explore very deeply the case phenomenon to extract the theory or law that can reveal the complex phenomenon (Eisenhardt, 1989).

Case Selection

In order to ensure the feasibility and effectiveness of the later data collection, the selection of case study samples is a very important step. Before the case selection, this study theoretically proposed a set of reference standards, which should be followed in case selection. First, the selected cases should be representative and reflect the actual situation of the hospital in the process of implementing the information system. Second, the selected cases should have carried out the construction of informatization and have the experience of system implementation. Third, for the feasibility and convenience of data collection, managers and medical staff in the organization where the selected cases are located should actively cooperate with the research and provide researchers with a large amount of real data.

Based on the above criteria, this study finally selected a grass-roots hospital in Chengdu city of Sichuan Province in China as a case sample. First, the reason for choosing this hospital was not only that it is located in the urban area of Chengdu city, which is convenient for researchers to come to the hospital for field research and interview at any time, but also a consensus has been reached that they are willing to cooperate with the investigation process and provide the required data for the researchers after early communication with the hospital manager. Second, the hospital has been constructed information platform in order to response to the call of medical informatization, and information system used in the hospital was constantly updating and replacing information systems due to the development of technology and changing needs. During the research period, the hospital was implementing a new information system, which was in the post implementation stage, in line with the research situation. Finally, in the process of implementing the new system, the hospital was faced with many difficulties in promoting the new information system due to the replacement of the old and new systems, such as medical staff not cooperating with the implementation of the system, complaining loudly, or even not using the system, etc., which are typical user resistance behaviors and are consistent with the problems of this study. Based on the above reasons, this grass-roots hospital was taken as the research object to deeply analyze the reasons for the resistance behaviors of medical staff in the implementation stage of the hospital information system.

The new system being implemented at the hospital is the family doctor contract signing service system for health management. Family doctor service is a concept put forward in the process of deepening the reform of medical and health system and promoting health management, which is a kind of health management service mode that changes the traditional mode of doctor's sit-in, embodies the people-centered mode, provides all-round and active health management service through long-term contract signing service with patients, and pays more attention to prevention while treating, so it can effectively improve national health management level. The grass-roots hospital in this study actively responded to the family doctor contract signing service policy by continuously promoting the family doctor contract signing service. The hospital also invited Dr. J from a university in the United States to the community hospital for an exchange of experience in health management. In the process of exchange, the importance of information means in the process of contract service was emphasized. Therefore, in order to better provide family doctor contract signing services, while the hospital was vigorously carrying out contract signing services, it also attached great importance to involvement of informatization, hoping to improve the quality and efficiency of contracted services through information tools and win the recognition and satisfaction of the majority of residents. To this end, the hospital leadership finally selected a software development company to develop a family doctor contract signing system after a variety of inspection and consultation. However, after the software development company delivered the contract signing system to the hospital and completed the installation and debugging in the pre-implementation stage, it encountered many difficulties and obstacles when the system was put into operation and used in the community hospital. In the process of using the system, the medical staff reported many system problems or vulnerabilities, which leaded to their complaints and negative feelings, and even an unwillingness to continue using the system. Faced with this situation, the software development companies could not find other solutions except to try to make up for the loopholes, which made the community hospital leaders very distressed. The hospital hopes to find out the underlying reasons and promote the implementation of the system smoothly.

Data Collection

Yin (2017) proposed that in the process of case study, data materials are from six sources: literature, interviews, direct observation, archival records, participatory observation and physical evidence. In order to ensure the comprehensiveness and rigor of data collection, this study took interviews as the main source of data, supplemented by direct observation and inquiry of archival records.

In order to ensure the smooth conduct of the interview, before the formal interview, the interview outline was designed in detail according to the theoretical basis of the research, and the resistance performance of users was investigated from three dimensions of human-oriented, system-oriented and human-system interaction orientation (see Appendix). The respondents included doctors and nurses who used the system directly. In this interview, a total of twenty medical staff, including 10 doctors and 10 nurses, were interviewed, all of whom have worked for more than 5 years in the hospital. Among the ten doctors interviewed, 7 had bachelor's degree or above, and the other 3 had college degree, while ten nurses had college degrees or above. During the interview, each respondent was interviewed for more than half an hour, and eventually more than 800 minutes of interview recordings were obtained. More than 15,000 words of interview records were obtained by collating the recordings. At the same time, in addition to face-to-face communication with the respondents, we also kept in touch with the respondents throughout the research process to facilitate return visits and repeated communication and confirmation of certain issues.

Data Analysis Method

The data materials in the case study belong to qualitative data, so this study uses the qualitative data analysis technique proposed by Orlikowski (1993), which is the way of combining multi-level data coding with theoretical framework. The specific steps of analysis are as follows:

The first step is open coding to form an entry library. Through the careful arrangement and reading of the original interview materials and the materials obtained through observation and archival records, the open coding results are formed on the basis of respecting the original data, and each entry is identified with the original data vocabulary to identify the resistance behavior and performance in the process of system implementation. The statistical results are shown in Table 1.

Table 1: Statistical results of open code entries number

Data source	Data classification	Number of entries (unit: article)
First-hand materials	Data obtained from in-depth interviews	242
	Data obtained by direct observation	7
Second-hand materials	Data obtained through archival records	14
Total		263

The second step is to induce the first-level code. The surface structure analysis of the case material is conducted on the basis of open coding (Pan & Mao, 2010). That is, by carefully comparing the words repeatedly mentioned by the respondents in the open coding results, rebuilding the event process with their words, and coding in stages, the first-level concept coding can be induced.

The third step is to induce the second-level code. While doing the first-level coding, this study tries to find the relationship between these first-level codes and explore their potential correlation based on the relevant literatures in the research field of user resistance. Through the analysis of the specific performance and characteristics of the resistance behaviors, the deep-seated reasons for users' resistance are analyzed and explained. The specific coding results are shown in table Table 2.

The fourth step is to do summary coding. The work of this process is to logically group the second-level coding results with summative concept, and to summarize and explain the results from the three perspectives of human-oriented, system-oriented and human-system interaction theory in combination with the preliminary theoretical framework.

RESEARCH FINDINGS

Through the analysis and exploration of the implementation of the medical information system in a grass-roots hospital, it is found that a series of changes caused by the implementation of the system lead to the resistance of the medical staff to the system and the reasons for the behaviors.

Resistance Performance

The completion of a series of preparatory work indicates that the hospital's contract signing system will be officially put into operation. In the early stage after the configuration of parameters and operating environment and the installation of function modules, the main performances of users are not interested in the system and do nothing, such as spending little time to learn how to use the system, not being active in system training meetings, etc. The introduction of the contract signing system meant that paper records of signed patients were replaced by electronic records. This community hospital had a large number of contracted patients before the introduction of the contract signing system and medical staff need to enter their paper files into the system when using the contract signing system, which will greatly increase the workload of medical staff. In addition, some basic information of patients is recorded in the public health systems, but since the public health systems and the contract signing system do not realize data sharing, it is necessary to re-enter these patients' basic information into the contract signing system, also resulting in heavy workload of medical staff.

"In order to improve the quality and efficiency of health management, the hospital introduced the contract signing system, but due to the tedious work of data entry, my workload was increased. Moreover, I not only need to finish other work well, also need to consider the use of the new contract signing system, the work content also increased." Said one of the nurses interviewed. (Nurse: No. 5)

This example shows that the real interaction with the contract signing system makes the medical staff feel the experience of using the system. The introduction of the system makes the medical staff feel the increase of workload and work content, which leads to their reluctance to use the system and resistance to the system.

After the contract signing system has been in operation for a period of time, the respondents were gradually familiar with the operation and use of the system, and began to understand its functions. There were some changes in resistance behavior among

respondents. For doctors, after a period of getting familiar with the system, they found that the system is just to realize the informatization of family doctor service mode, the current system is just completing the archives informatization and did not achieve innovation or intelligent on the function. Although the system could basically meet the needs of the work, it did not bring more achievements to the work, which made the doctors feel that the existence of the system did not mean much, so they were still indifferent to the system.

Although adding another system has no impact on the work of doctors, it has a great impact on nurses as the system is further used. Since doctors only use the system for diagnosis and treatment and the recording of some important information, the general data entry work is done by nurses, so the workload of nurses increases a lot. At this time, the nurse's resistance to the system turned into a negative resistance, resulting in complaints against the system, delaying the use of the system and other behaviors. At this stage, nurses often complained about the unstable system, tedious data entry and heavy workload of repeated entry, and the respondents' reluctance to use the system was enhanced by the complaints and negative emotions of their peers.

"The new contract signing system increased our workload, but the working hours were only a few hours, so I couldn't finish my work in the normal working hours and had to work overtime by myself. Therefore, for this new contract signing system, I only used a few functions and operations that I had to use, and the other functions I tried not to use." Said one of the nurses interviewed. (Nurse: No. 7)

From this example, it is clear to see the respondent's negative emotions and resistance behaviors. In addition, the accumulation of everyone's negative emotions at this stage leads to a relatively negative working atmosphere, which affects people's emotions of using the system and makes them more reluctant to use the system.

Resistance Behavior Analysis

Based on the statistical results of the number of entries obtained in the previous open coding stage, the entries are analyzed. Firstly, the surface structure analysis of entries was conducted, and the first-level codes were summarized by using the vocabulary reconstruction process mentioned repeatedly by the interviewees. Then the relationship between the first-level codes was found, and the second-level codes were summarized. At the same time, a typical reference example was given under each code, and the results were analyzed and explained in detail. Finally, the results of the first-level and second-level codes and the corresponding number of entries under each code in the post-implementation stage were obtained, as shown in Table 2.

Table 2: Coding results and typical reference example in the post-implementation stage

Result of second-level codes （Number of entries）	Result of first-level codes （Number of entries）	Typical reference example
External motivation （29）	Negative expectations （14）	The use of the system increased the workload of medical staff and failed to improve their work efficiency and quality. (Nurse: No. 1-4,6,8-10 and Doctor: No:2,3,7)
	Perceived ineffectiveness（15）	The use of the system did not bring more benefits to the work of the medical staff, nor did it allow the medical staff to learn knowledge through the system that could not be obtained in other ways. (Nurse: No. 3,4,6 and Doctor: No:1-3,5-7,9,10)
Internal motivation （20）	Reform participation （9）	Medical staff did not understand the real purpose and reasons for the introduction of the new system, nor the value of the new system, making them lack the participation to use the system. (Nurse: No. 2,3,5,8 and Doctor: No:1,2,4,6-8)
	Sense of need（11）	The existing working mode could meet the working needs without introduction of new system. (Nurse: No. 1-3,5,7-9 and Doctor: No:1,2,4-7,10)
Technical level（79）	System function（5）	System function was not perfect, software quality was not high, etc. (Nurse: No. 2,6 and Doctor: No:4,5,9)
	System performance （39）	The response time was long, the processing speed was slow, the system could not be restored as soon as possible after the failure, etc. (Nurse:No. 1-5,7,9,10 and Doctor:No:1-3,5,6,8-10)
	System operation （35）	Complex system operation, etc. (Nurse: No.3,7,10 and Doctor: No:3,4,6,8,9,10)
Network infrastructure	Network speed（12）	Slow network speed caused the system page to

（12）		open slowly, etc. (Nurse: No. 3,4,8,9 and Doctor: No:2-6,8-10)
Organizational support（14）	System training（14）	The training provided by the hospital or software development company was not timely and in place, etc. (Nurse: No. 2,3,6 and Doctor: No:1,2,5,6)
Organization management（66）	Task redistribution（26）	After the introduction of the new system, the task division was not clear, resulting in tedious and trivial work content. (Nurse: No. 2-5,7,9,10 and Doctor: No:4,5,7)
	Organizational decision making（23）	Hospitals mandated the use of the contract signing system, and medical staff had to be forced to accept. (Nurse: No. 1-6,9,10 and Doctor: No:1-5,7-9)
	Business Process Reengineering（17）	The current system only copied the functions required by the family doctor service mode to the system, without business process restructuring, and the system operation was not standardized and scientific. (Nurse: No. 2,5,6,10, and Doctor: No:2-4,6,7,10)

According to the three-factor resistance theory, the reasons that cause the users to resist the system should start from three aspects: the characteristics of the users themselves, the characteristics of the system and the changes in the process of the interaction between the human and the system.

Human-oriented view

As an internal psychological factor, motivation has a very important influence on human behaviors. In the post-implementation stage, one of the important reasons for the resistance behaviors cannot be separated from the users' resistance caused by human psychological factors.

Motivation can be further subdivided into internal motivation and external motivation. Through the analysis of case materials, the internal motivation is mainly manifested in the lack of need and participation in the reform of the system by users. For users, they can complete their daily work without introducing the system, so they consider that the introduction of the system is not of great value, and of course they will not accept the new system from their hearts. External motivation is reflected in the negative expectation caused by the fact that the actual use effect of the new system is far from as good as expected after the introduction of the system, and the perceived inefficiency caused by the fact that the use of the system does not make the work of users improve qualitatively.

System-oriented view

The system-oriented view holds that resistance is caused by factors related to information technology. Since after the introduction of the system, the users have the most intuitive experience of using the new system, the reason for the resistance behaviors must be related to the characteristics of the system itself.

Through the classification and coding statistics of the interview data reported by the respondents, we find that the problems reflected about the system itself can be summarized into three aspects: system function, system performance and system operation. There is a marked difference in the number of entries in these three aspects. Among them, there are the least number of entries reflecting system function, only 5 entries, 39 entries reflecting system performance, and 35 entries reflecting system operation, which shows that, for users, the developed system can generally meet their requirements in terms of function, and they pay more attention to the operation of the system and the performance of the system. This result is similar to that of users of other types of systems, because system performance and system operation will affect the user experience, if the experience is not good, it will naturally lead to users' dissatisfaction with the system, which will affect their resistance to the system.

In addition, in the process of summarizing and sorting out the system-oriented case materials, another factor that affects the use experience of medical staff and leads to the resistance to the system is also found, that is, the Internet speed. As the infrastructure of information construction, the service quality of network speed has a direct impact on the user's mood of using the system. When these emotions are negative, they will be unwilling to continue using the system.

Human-system interaction orientation

The human-system interaction theory holds that the resistance in the implementation of information system is determined by the interaction between the system and the users. According to the view of human-system interaction orientation, user resistance will occur in the interaction between people and the system, and the interaction between people and the system takes place in such an environment as the organization, so the characteristics of the organization will affect the interaction between

people and the system, and then resistance will occur. Therefore, the influence of relevant characteristics of the organization on the resistance behaviors is worthy of attention. In the analysis of this case, we find the influence of some factors related to organizational characteristics on users' resistance behaviors.

(1) Task redistribution
Before the introduction of the new contract signing system, doctors and nurses did their jobs in their own right. After the introduction of the contract signing system, although the hospital leaders also assigned the work content and responsibilities related to the contract signing system that doctors and nurses needed to complete, the division of labor was not clear due to the lack of specific and reasonable distribution. Some users have to take on too many tasks, which, in the long run, leads to their negative emotions and reluctance to use the new system or delays in using the system.

(2) Organizational decision making
In order to respond to the informatization, the leadership decides to introduce the relevant information system, and the members of the organization can only passively accept it. As a result of passive acceptance, the medical staff naturally have resistance to the system in the process of using it, in their own words, " Don't use it if you can." Therefore, the system functions are not fully used, and the original intention of introducing the system is greatly compromised.

(3) Business process reengineering
In the interviews with healthcare professionals, we also identified a potentially important factor: business process reengineering. It is an inevitable trend to introduce information system to realize informatization, because organizations hope to improve work efficiency and work quality through information system. However, many organizations have the problem of unclear understanding of business process reengineering when implementing information system, and this case study of hospital information system is also no exception. The hospital simply thinks of information systems as transferring existing work to computer systems. However, the workflow on the computer and the traditional work process is different, in order to run a medical information system well, its business process setting must meet the requirements of informatization, so as to achieve the scientific and rational system. Simply copying existing business onto the system will only lead to defects in system processes and problems in system operation. As a result, the system is not running well, which will affect the experience of the system end users or questions about the functionality of the system, increase users' complaints or strong opinions on the system, and generate resistance to the system.

The phenomenon of user resistance to the use of the system, whether during task redistribution or when the hospital decides to force the use of the system, is caused by the improper management mode and thinking of the hospital. Therefore, organizational decision making, task redistribution and business process reengineering can be summarized as organizational management reasons.

The number of entries in Table 2 also reflects a phenomenon that the total number of entries in system-oriented view is the most among the three views of human-oriented view, system-oriented view and human-system interaction orientation.

This indicates that in the post-implementation stage of the system, as users have intuitive feelings and experiences on the use and operation of the system, the reasons that affect the users' resistance behaviors are more from factors related to the characteristics of the system. The most important factors affecting the resistance behaviors of the users are the factors of system–oriented technology level and network environment closely related to technology level. However, under the technology level as a major indicator, system function is not enough to become the factor that affects the users' resistance, and system performance and system operation can affect the users' resistance behaviors more.

CONCLUSIONS

The continuous improvement of national living standard and the enhancement of health consciousness increase the demand for medical and health services day by day, and health well-being is at the heart of many issues facing our country (Agarwal *et al.*, 2010). With the development of information technology and the push of governments around the world, the development of medical informatization has become an inevitable trend. In the process of medical informatization, the construction of hospital information system is particularly necessary. To solve the problem of user resistance behaviors in the process of system implementation to promote the smooth implementation of the hospital information system has an important impact on improving the hospital's medical service level and social health level and enhancing the hospital's core competitiveness.

By studying the resistance behaviors during the implementation of the hospital information system in the context of the medical industry, this paper comprehensively analyzes the specific reasons for the resistance in the post-implementation stage of the medical information system, and constructs a theoretical model of the system resistance behaviors (as shown in Figure 1). This study is a refinement and practical application of the current three-factor resistance theory, which better explains the reasons for the resistance behaviors of users, and also provides a reference and strategy for solving the problem of resistance behaviors and promoting the implementation of hospital information system smoothly.

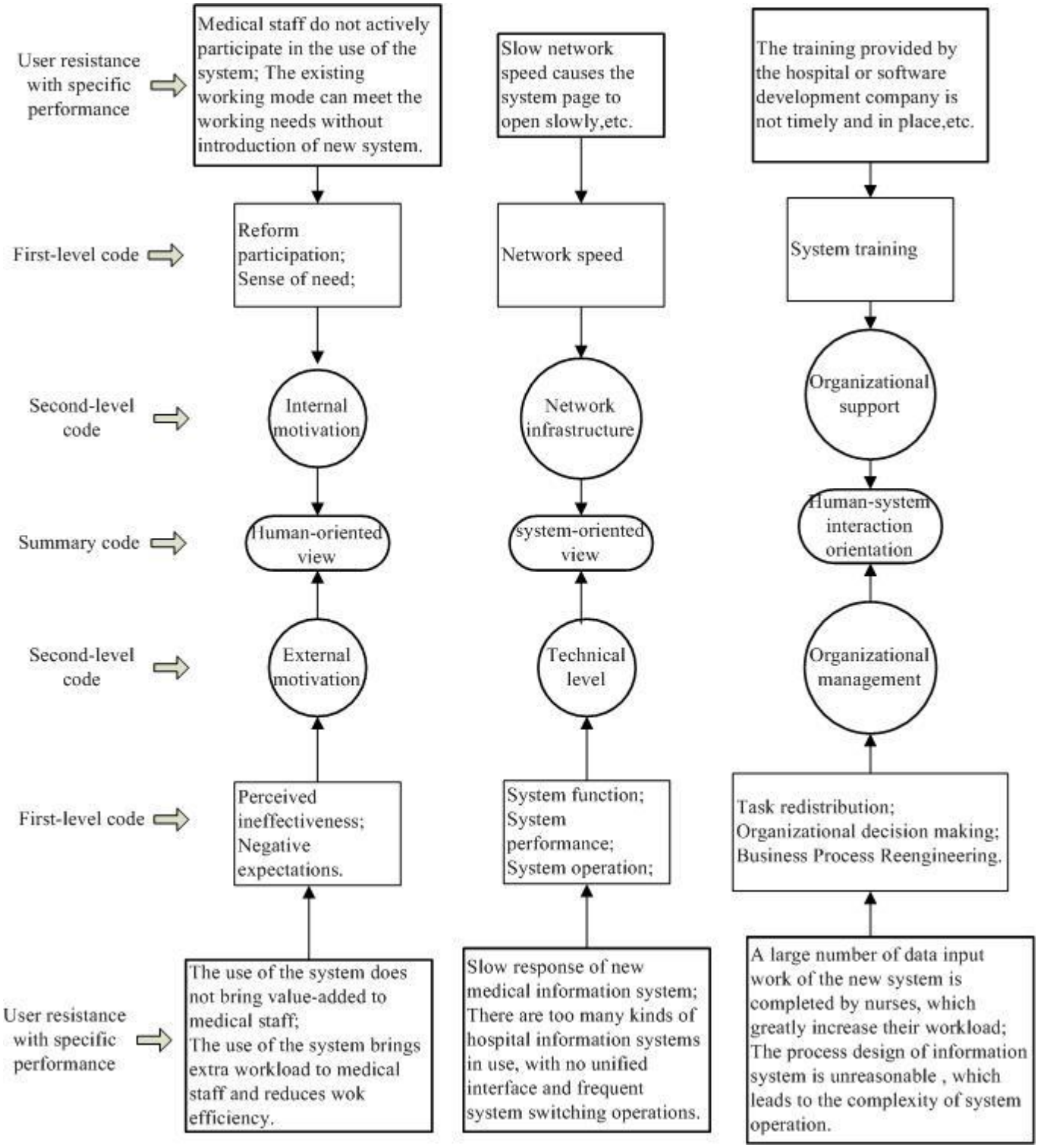

Figure 1: Theoretical model of the system resistance behaviors

It can be intuitively reflected from the theoretical model that human-oriented, system-oriented and human-system interaction orientation all have impact on the user resistance behaviors in the post-implementation stage of the system. In the case of human-oriented, the main reason for the resistance is the explanation based on the user's motivation. In the case of system-oriented, network infrastructure and system development technology will affect the resistance behaviors, among which system performance and system operation are the important reasons for the resistance behaviors. In the case of human-system interaction orientation, organizational management and organizational support become the causes that affect the occurrence of resistance behaviors.

The theoretical contribution of this study is mainly in two aspects. Firstly, based on the three perspectives of the three-factor resistance theory, the paper constructs the interpretation structure model of the users' resistance behavior during the implementation of the information system, which is a further refinement and expansion of the existing three-factor resistance

theory. The existing three-factor resistance theory provides directions for the research of resistance behaviors from three big perspectives including human-oriented, system-oriented and human-system interaction orientation, but the specific reasons for resistance behaviors from each perspective have not been analyzed in depth. This study took the resistance behaviors in the post-implementation stage of the hospital information system as the research object for in-depth analysis, classified and summarized the data obtained, extracted the relationship between each reason and the theory. This study also extended the model that originally provided only three large perspectives to the theoretical model of user resistance with specific performance, first-level code and second-level code, which can be used to explain in detail the reasons of resistance behavior in the post-implementation stage of hospital information system.

Secondly, the theoretical model of resistance behaviors obtained in this study not only includes the reasons for the resistance from the user's own perspective, but also explains the resistance behaviors from the perspective of system and organizational environment. Among the existing user resistance theories, equity theory, attribution theory and status quo bias (SQB) theory mainly focus on the individual level, and propose that the individual's own subjective and objective reasons, such as gender, age, education background, values, motivation, and response to changes in the external environment, etc. result in the resistance behaviors to information system. In this study, since the study situation is positioned at the post-implementation stage of the system in the medical industry, the individual characteristics of system users, such as age, gender, education background and other factors, have no obvious influence on the resistance behaviors, and the resistance behaviors generated by individuals mainly comes from the user's motivation. Meanwhile, because users have real experience of using the system at this stage, the influence of system characteristics on the resistance behaviors is equally important. In addition, because individuals are in the environment of organization, the influence of organizational management and support on users' resistance behaviors should not be ignored. Therefore, according to the specific problems and situations in this study, a theoretical model is constructed by integrating individual, system characteristics and organizational environment. Compared with theories that only explain the resistance behaviors from the perspective of individuals, the theoretical model proposed in this study is more comprehensive and more general, which can provide a comprehensive reference for the interpretation of the resistance behaviors.

The practical value of this paper lies in that, combined with the existing theoretical basis, the most authentic data were obtained through in-depth interviews, and the structural model was constructed completely based on the interview data. The analysis results show that the reasons for the user's resistance behaviors in the post-implementation stage of the system are a series of psychological factors, poor network infrastructure, low technology level, and inadequate organizational support and management after the implementation of the system. Based on the theoretical model obtained in this study, in the process of implementing the information system, the hospital can provide comprehensive support to system users according to the actual situation within the organization, create a good system environment for system users, and relieve users' negative emotions in the process of implementing the system. At the same time, attention should be paid to the technical support of the system to provide users with a good network environment and a system with complete functions and simple operation to improve user experience. By adopting the above strategies to avoid the phenomenon of users' resistance in the process of implementing the information system, the hospital information system can be applied more smoothly, and can be used as an important guarantee of medical informatization, providing people with more convenient, personalized and intelligent medical services, improving the quality of medical services, and helping build a healthy society.

Of course, the study of this paper still has some shortcomings. The case study method is used in this study, so the analysis of the data is mainly qualitative, although a reflective study was carried out in the process of case material analysis, and the meaning of sentences was repeatedly determined with the interviewees through return visits to avoid misunderstanding of case materials, the existence of subjectivity could not be avoided in the analysis of data. In the follow-up study, the number of respondents can be appropriately increased, and the analysis of the pre-implementation stage can be added to understand the reasons for the resistance in the whole system implementation process and its change process. In addition, in the process of data sorting and analysis, joint discussion, repeat thinking, and verification by each other in the process of case interpretation should be added. Through these ways, the existence of subjectivity can be weakened and the analysis results can be more comprehensive, scientific and reasonable.

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APPENDIX: Interview Outline

1、Basic information of respondents
（1）Age:
（2）Gender:
（3）Educational background:
（4）Position in hospital:
（5）Years of medical practice:

2、Interview questions:
(1) Do you feel bothered by the contract signing system after you really use it? If so, what are the specific manifestations of these problems? What are your specific actions in the face of these problems?

(2) Do previous habits or experiences of using an information system affect the use of the new contract signing system? Do these impacts help you better use the new system or make it difficult for you to switch to the use of the new system?

(3) Learning to use the new system requires a lot of time and effort to receive training and to adapt to the new environment or system. What is your attitude towards this situation? And what are your specific actions?

(4) After using the new system, do you think the system has improved your work efficiency and quality? If not, what do you think led to this result? And what are your actions in the face of such a result?

(5) From the original working mode (or using the original system) to using a new system, do you think the new system has helped your work or made you gain more?

(6) Do you think the new contract signing system put into use is useless? Why do you have this idea? What are your specific actions in the face of this idea?

(7) After the contract signing system is put into use, do the organizations (such as: Health and Family Planning Commission, software development company, hospitals, etc.) provide systematic and effective training? How do you rate these training?

(8) Do organizations which has mentioned in question7 provide the necessary support and help when there are difficulties in using the new system? Is this enough to help you solve the problem in time?

(9) Have you ever thought about why you want to use the contract signing system? Do you know what the purpose of the new system is? What is your opinion on this? What are your actions in the face of this situation?

(10) What is your opinion or attitude towards the hospital's practice of forcing you to use the new system?

(11) From the perspective of system function, what is your evaluation of the contract signing system?

(12) In terms of system performance, what problems do you think affect your experience in using the contract signing system?

(13) During the operation of the contract signing system, what problems do you think affect your feeling of using the system?

(14) Do these difficulties make you reluctant to continue to use the system? Are these ideas strong?