INSTITUTO
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Influence of Health Professionals' Workload on their Resistance to Information System Implementation: An Empirical Study of Tertiary Hospitals in Guizhou Province

CHEN Jianping

Doctor of Management

Supervisors:
PhD Henrique Duarte, Associate Professor,
ISCTE University Institute of Lisbon
PhD Wu Wei, Professor,
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March, 2024

BUSINESS
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Marketing, Operations and General Management Department

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Abstract

In today's digital generation, medical informatization not only optimizes the medical service process and improves work efficiency, but also plays a vital role in multiple levels such as medical record management, resource allocation, and emergency response mechanism. However, in the process of widely promoting hospital information systems, there is resistance from medical staff to new systems. The study was conducted in tertiary hospitals in Guizhou, China, and the results of 1118 valid questionnaires were analyzed by questionnaire survey and statistical analysis, and the influencing factors of user resistance among medical staff were discussed. The results showed that workload, psychological contract rupture and emotional exhaustion had a positive impact on the user resistance of information system among medical staff, and verified that emotional exhaustion and psychological contract rupture played a mediating role in the relationship between workload and user resistance, and the relationship between organizational support and information system resistance played a moderating role. In the medical context, this study analyzes the influencing factors that lead to the resistance of medical staff in the implementation stage of the information system from the dual path of cognition and emotion, and puts forward targeted countermeasures according to the analysis results, so as to provide strategic suggestions for hospital information management and promote the effective implementation of the information system.

Keywords: Hospital Informatization, Medical Staff, User Resistance, Workload
JEL: M12; J28

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Resumo

Na era digital atual, a informatização médica não serve apenas para otimizar o fluxo de serviços médicos e melhorar a eficiência do trabalho, mas também para desempenhar um papel crucial em vários aspetos, como na gestão de registos médicos, distribuição de recursos e mecanismos de resposta a emergências. No entanto, no processo de promoção alargada dos sistemas de informação hospitalar, existe uma resistência dos profissionais de saúde ao sistema.Este estudo foi conduzido em hospitais terciários na província de Guizhou, China, e utilizando inquéritos por questionário e análise estatística, este estudo analisou 1118 questionários válidos para explorar os fatores que influenciam a resistência dos profissionais de saúde ao uso de sistemas de informação.Os resultados mostram que o volume de trabalho, a quebra do contrato psicológico e o esgotamento emocional têm um impacto positivo na resistência aos sistemas de informação por este tipo de profissionais. Além disso, verificou-se que o esgotamento emocional e a quebra do contrato psicológico desempenham um papel mediador na relação entre o volume de trabalho e a resistência dos utilizadores, enquanto a perceção de apoio organizacional tem um efeito moderador na relação entre esses fatores e os comportamentos de resistência face à utilização de sistemas de informação. No contexto médico, este estudo explora os fatores que levam à resistência dos profissionais de saúde durante a fase de implementação dos sistemas de informação, através de uma análise de caminhos cognitivos e emocionais, e propõe medidas com base nos resultados da análise, fornecendo sugestões estratégicas para a gestão da informatização hospitalar no sentido de promover a implementação eficaz dos sistemas de informação.

Palavras-chave: Informatização hospitalar, Profissionais de saúde, Resistência do utilizador, Volume de trabalho

JEL: M12; J28

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摘 要

在当今数字化时代，医疗信息化不仅优化了医疗服务流程，提高了工作效率，而且在病历管理、资源配置以及紧急响应机制等多个层面发挥了至关重要的作用。然而，在广泛推进医院信息系统的过程中，医护人员存在对系统的抵制现象。本研究以贵州三级医院为实证研究对象，采用问卷调查、统计分析等方法，分析了1118份调查问卷的结果，探讨了医护人员产生用户抵制的影响因素。研究结果显示，工作负荷、心理契约破裂、情绪耗竭因素对医护人员对信息系统的用户抵制有正向影响，同时验证了情绪耗竭和心理契约破裂在工作负荷与用户抵制的关系中起中介作用，组织支持感对这些因素与信息系统抵制行为之间的关系起到了调节作用。本研究在医疗背景下，从认知和情感的双路径探析信息系统正在实施阶段中导致医护人员抵制行为发生的影响因素，并根据分析结果有针对性的提出应对措施，为医院信息化管理提供策略建议，促进信息系统的有效实施。

关键词：医院信息化，医护人员，用户抵制，工作负荷

JEL: M12; J28

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Today, I suddenly realized that only the acknowledgments section is left to be completed!

Writing a thesis is a bittersweet experience. When I struggled for the management principles I have longed for, my heart was filled with sheer joy. When insights and perspectives flowed from my tired fingers to the screen, my heart brimmed with pure happiness.

How many tranquil nights have passed, and how many mornings have followed? How many times have my pen traveled over the grid, and how many times have I navigated through the literature? In writing, there's always a force inspiring me to advance towards the ideal shore.

What kind of force is this?

I know, it's a great power bestowed upon me by love! This love comes from my supervisor and my family!

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有多少个万籁俱静的夜晚，又有多少个随之而来的清晨，有多少次笔走于方格之上，又有多少次游弋在文献之间！

写作中，总有力量在鼓舞着我向理想的彼岸进发!

这是什么样的力量？

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陈建平

2024年2月19日

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Chapter 1: Introduction

1.1 Research background

1.1.1 History of hospital informatization

In the late 1960s, hospital informatization originated from the United States where information technology was most developed and it was first deployed by medical facilities and drug supply companies in the terminals of medical institutions. In the early 1960s, the United States began to integrate information technology into the business management system of medical institutions (Ling & Chen, 2014). In the 1970s, application of the information technology in medical information management entered a period of rapid growth. Medical institutions in the United States, Japan and Europe, especially those affiliated to universities, commenced to develop or apply hospital management information system which gradually became the supporting foundation for the formation and development of medical informatics. By the 1980s, hospital informatization industry had witnessed great development. In recent years, the developed countries have widely applied hospital information management system. For example, in 1998, Brigham and Women's Hospital in Boston with the HIS system worked together with six medical institutions including Massachusetts General Hospital to build the largest integrated healthcare network group in the Northeast of the United States. It connected over 27,000 online medical business workstations, including terminal computers used by more than 25,000 health professionals providing service to over 4.5 million patients. It possesses a series of clinical functions, including medical orders, electronic medical records, automatic monitoring, LIS, RIS, and PACS (Wen, 2010).

Development of medical information system started comparatively late in China. In the late 1970s, General Hospital of Nanjing Military Area Command, Beijing Jishuitan Hospital and Beijing Hospital all developed and applied hospital information system. Later in the 1990s, with the development of information and communication technology and the centralized bidding and procurement of medicine, the process of hospital informatization was increasingly accelerated. In May 2004, "Solutions to Informatization of Medicine Circulation and Medicine Supply Chain Management System" developed by Shanghai Changhai Hospital passed the expert technical appraisal, realizing the integration, networking and sharing of Chinese hospital

information system services. The promotion of hospital informatization has been highly valued by the National Health Department and a series of guiding policies and norms have been formulated. The newly revised *Basic Function Specification of Hospital Information System* in 2002 is the normative document for hospital informatization. In 2003, the Ministry of Health printed and distributed *the Outline of China's National Plan for Health Informatization Development (2003-2010)*, proposing general requirements for the construction and development of medical informatization. It is proposed to increase investment in medical informatization because of its important role in reducing the overall medical cost, improving the medical service level and rationalizing the use of health resources. In recent years, the informatization of China's medical institutions has developed rapidly and most large hospitals have established an integrated information system, in which medical orders, charges, patient flow, medicines and medical supplies can all be covered. Some hospitals with rapid development of informatization have realized clinical informatization applications in nurse workstations and inspection workstations (Xiao et al., 2021).

The development of hospital informatization has roughly undergone three stages: the stage of Hospital Information System (HIS), the stage of Clinical Information System (CIS), and the stage of Globe Medical Information Service (GMIS). The first stage is the HIS stage, which mainly aims to improve the work efficiency of medical management and facilitate financial accounting. In this stage, information cannot be exchanged or shared between systems. In other words, it is a "stand-alone version" of hospital information system (Dai, 2020). The representative application systems mainly include outpatient medical order system, outpatient pricing and charging system, and pharmacy management system. In the second stage of CIS, the information technology is progressively applied in more clinical medical activities to realize "patient-centered" clinical information system management. This stage takes "digital healthcare" as the development goal. The third stage is the GMIS stage. With the advancement of medical information technology and rapid development of Internet applications, as well as development of the remote medical information interaction and community healthcare, medical information interaction has gone beyond geographical restrictions, rather than being restricted to individuals within a certain medical institution. In this stage, medical information resources at the social level can be fully interacted and shared. Countries with comparatively developed medical information technology in the world are gradually entering the third stage. However, informatization of many hospitals in China is still in the first stage (Liu et al., 2016).

In summary, we can see that from the 1960s till now, hospital informatization has gone through the process from the start-up stage, rapid development stage, and gradual maturity stage.

In the early stage of hospital informatization, the information system is a "stand-alone version", then the hospital information system began to be transformed to a "patient-centered" clinical management system, and in the 21st century, hospital informatization has entered the stage of regional healthcare service system, in which the healthcare services are no longer limited to a single medical institution, instead; a medical service network covering a wider area has been formed. This not only improves the utilization efficiency of medical resources, but also provides patients with more convenient and efficient medical services. Developed countries such as the United States, Japan and Europe have always been at the leading position in this field, despite the relative maturity of healthcare information technology in many countries, the development of hospital informatization is still facing a number of challenges and problems, such as data security and privacy protection, cross-system information interoperability and sharing, and the cultivation of healthcare informatization talents. In addition, with the continuous emergence of new technologies such as artificial intelligence, big data and cloud computing, the development of hospital informatization will also usher in new opportunities and challenges. Although hospital informatization started late in China, it has developed rapidly in recent years and made remarkable achievements, gradually narrowing the gap with the international advanced level.

In the future, China needs to further increase investment, strengthen top-level design, promote the innovation and application of medical informatization technology, and train professional talents, so as to realize modernization and intelligentization of medical services, improve the overall level of medical services, and better meet the public demands for health. It is also necessary to promote the interoperability and sharing of medical information on the premise of ensuring data security and privacy protection, realize the optimal allocation and efficient use of medical resources, and provide strong support for the construction of a society featuring universal health.

1.1.2 Significance of medical informatization

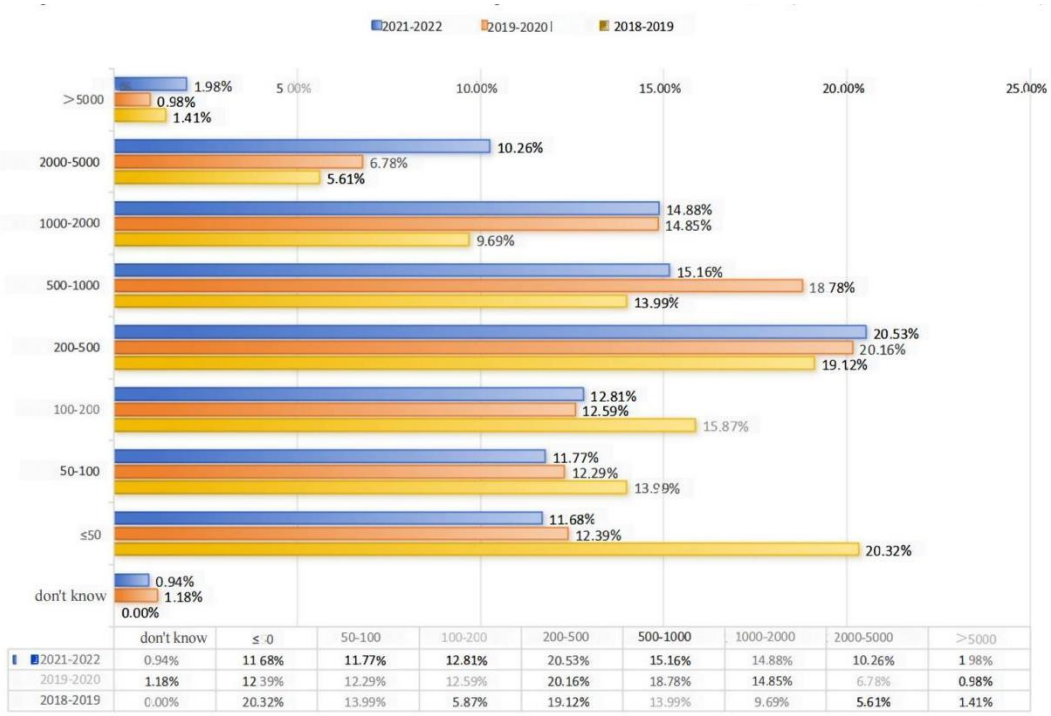
Since 2002, the Chinese government has issued multiple policies, and in the *Guiding Opinions on Strengthening the Construction of Medical Informatization*, it is clearly stipulated that informatization should be incorporated into the overall plan for the development of health services. It is proposed to use informatization as a means to play its role of technical support in deepening reform, optimizing process, improving service, establishing mechanism, improving quality, and promoting communication. The introduction of a series of policies reflects the Chinese government's full recognition of the importance of healthcare informatization and its firm

support to implement healthcare informatization. These policies not only highlight the centrality of informatization in the healthcare sector, but also make it part of the overall planning for healthcare development. The policy documents also set clear goals for the construction of informatization, including the establishment of comprehensive basic databases such as electronic health records and electronic medical records, as well as the enhancement of data integration and business collaboration among application systems for medical services and healthcare security. Hospital informatization plays a crucial role in enhancing the efficiency of medical services, improving the public's experience in seeking medical treatment, and strengthening the supervision of medical services. In recent years, with the rapid development of information technology, the pace of hospital informatization construction has accelerated significantly, and its importance has increasingly received extensive attention from the academic community.

Relevant policy documents have been retrieved and organized through official channels such as the Chinese government website and they are arranged in chronological order as per Annex B, which clearly presents the evolution and development of the Chinese government's policies in terms of healthcare informatization. The formulation and implementation of these policies not only provide guidance and support for the improvement and upgrading of hospital information systems, but also promote the overall level of medical informatization, which is of great significance in promoting the improvement of healthcare service quality and the rational use of medical resources. Therefore, research on and practice of medical informatization construction is not only an innovation and development at the technical level, but also an important initiative to respond to the national policy, serve the people's health and promote the continuous progress of the medical industry.

Meanwhile, in the past five years from 2014 to 2019, the investment of hospital informatization in China has been growing rapidly. According to the data released by the Information Professional Committee of the China Hospital Association, the cumulative investment in informatization of national tertiary hospitals in the past three years had increased from 6,325,900 yuan in 2014 to 10,192,000 yuan in 2019, with an increase of 61.12%. The survey results show that in 2021, most hospitals had realized the importance of informatization and invested heavily in their own informatization, among which the vast majority of hospitals invest 2 million to 5 million yuan, but few are willing to invest 5 to 10 million yuan. In addition, compared to the period of 2019-2020, the average amount of investment in informationization in 2021-2022 increased by 1,614,400 yuan from 7,748,000 yuan to 9,362,400 yuan. After data comparison, it is found that major hospitals nationwide have significantly increased their investment in in-

formatization from 2021 to 2022. Proportion of the hospitals investing 20 to 50 million witnesses the highest growth, with a growth rate of 3.48%. However, proportion of the hospitals investing 5 to 10 million yuan witnesses the highest decrease, with a decrease ratio of 3.62%. The detailed data are shown as Figure 1.1 Survey on the informatization of hospital in China from 2021 to 2022.



	don't know	≤50	50-100	100-200	200-500	500-1000	1000-2000	2000-5000	>5000
2021-2022	0.94%	11.68%	11.77%	12.81%	20.53%	15.16%	14.88%	10.26%	1.98%
2019-2020	1.18%	12.39%	12.29%	12.59%	20.16%	18.78%	14.85%	6.78%	0.98%
2018-2019	0.00%	20.32%	13.99%	5.87%	19.12%	13.99%	9.69%	5.61%	1.41%

Figure 1.1 Survey on the informatization of hospital in China from 2021 to 2022

Source: Fu (2022)

By analyzing the data of investment of China's tertiary hospitals in informatization from 2014 to 2019, it can be clearly seen that the investment scale of hospital informatization has grown rapidly during these five years, and the cumulative investment has increased by 61.12%. The data of 2021 shows that the vast majority of hospitals invest 2 to 5 million yuan in informatization, and the average investment amount has increased significantly from 7,748,000 yuan in 2019 -2020 to 9,362,400 yuan in 2021-2022. In addition, the percentage of hospitals with high investment has increased, while the percentage of hospitals with medium investment has decreased, reflecting a general trend toward increased investment, especially heavy investment, in hospital informatization. These data collectively indicate one trend: China's hospitals are gradually increasing investment, especially high-end investment, in informatization, showing that hospital informatization is becoming a key area of concern for the medical industry.

The construction of Hospital Information System (HIS) has become a key part of the innovation of hospital management (An et al., 2020) By establishing a modernized hospital man-

agement system, hospital informatization can not only effectively improve management efficiency and service quality, but also has great significance in deepening the reform of the medical and health system, and improving the statistics and prediction and evaluation of residents' health status. In addition, numerous existing studies have confirmed the positive role of hospital informatization in improving hospital management.

(1) Strengthen departmental data exchange. In this context, the hospital attaches great importance to the development of informatization, and uses network technology to establish a hospital information management system, which can achieve standardized management within the hospital to a certain extent. It focuses on the internal network security of the hospital, and can strengthen outpatient or inpatient management, as well as inter-departmental exchange of data and information (Li, 2022; Ma, 2020).

(2) Standardize internal hospital management. The application of high-tech means such as informatization and artificial intelligence in hospital economic management is in line with not only the new direction of modernized hospital management, but also the new law of the development of the times (Li, 2022). Reasonable strengthening of informatization development can provide good support for the stable development of hospitals in the new era. Therefore, hospitals must maintain a high degree of emphasis on informatization development, and explore demand management measures in the process, so as to make full use of the important role of demand management to effectively promote the stable development of hospitals in the new era (G. P. Zhang et al., 2017).

(3) Optimize patient treatment environment. In order to provide high-end and personalized services for patients, hospitals should pay attention to the development of hospital informatization. In the digitalized and networked environment, data sharing in scientific research, training, and teaching has been realized. To implement knowledge education and promote the initiative and enthusiasm of hospital medical staff to learn is more conducive for hospital staff to mastering relevant knowledge of various information systems (Liu, 2022).

(4) Facilitate healthy circular development. Although development of hospital informatization cannot bring corresponding economic returns for the moment, medical staff must correctly recognize its importance. Reforms and innovations are significant not because they can bring economic benefits. Although informatization cannot bring economic benefits in the short term, it can help the healthy and sustainable development of hospitals, improve patient recognition of the hospital, and enhance the hospital's reputation and image, so that the hospital can gain innovative power in its development and enter the stage of healthy circular development (Zheng, 2021).

1.2 Research problem

As an important product of the information society, the successful implementation of information systems is the ultimate goal of system development. However, in the implementation of information systems in many organizations, there are numerous cases of system implementation failure due to user resistance, which has been considered as the principal factor causing failure in information system implementation (Shirish & Batuekueno, 2021). User resistance is a complex phenomenon that has long been considered as a major constraint to successful implementation of information systems (Kim et al., 2022; Popovič, 2017). In addition, user resistance may vary between passive resistance and active resistance, and can be a source of guidance to reduce problems associated with organizational change. User resistance has been increasingly important in system implementation (Rezazade Mehrizi et al., 2022). According to Wang et al. (2013), the successful implementation of information systems is the ultimate goal of system development in today's society. Ali et al. (2016) emphasize that user resistance plays a crucial role in the implementation of new technologies and methods within an organization. Kwahk and Lee (2008) focused on the negative behaviors of employees in their response to changes in corporate work methods, such as user resistance. Beaudry and Pinsonneault (2005) argue that if users resist, the new system will not be implemented effectively or not be completed within the required time limits. Han (2020) found that residents in China's rural areas are unable to fully utilize e-public services, with 70% to 80% of rural residents hardly using e-public services.

The relevant policy documents show that hospital information system is currently very important for the overall development of the country and hospitals, but user resistance still exists in the implementation of information systems. For example, Gao et al. (2022) pointed out that in the transition from traditional medical care to Internet-based diagnostic and treatment services, users resist the use of online medical services and have a low utilization of Internet-based diagnostic and treatment services. Hu et al. (2016) suggested that the implementation of an electronic medical record system in hospitals may bring distress and uneasiness among the health professionals, and their resistance may inhibit their willingness to use the electronic medical record system. Bhattacherjee and Hikmet (2007) carried out a survey of 129 users of the healthcare information system, and found that healthcare information system can cause changes in various aspects of workflow, and users perceive that the healthcare information system will bring threats to them, which will lead to user resistance. Paré et al. (2011) argue that for physicians, their intention to adopt EHRs often depends on the hospital's implementation of EHRs.

The analysis of the above literature reveals that user resistance is widespread in the implementation of hospital information systems.

The issue of user resistance is a major focus of information technology (IT)-related projects. Nowadays, technology plays a key role in improving organizational effectiveness, so understanding of user resistance has attracted considerable attention in the literature (Dickson & Simmons, 1970; Keen, 1981). Thompson (1995) argue that failure to understand user resistance may lead to reduced productivity, which in turn can cause serious problems for firms. The reason why user resistance occurs is that when facing a new system, users often need to take on some new work based on the new system, and this change will lead to the user's perception that their workload has increased and the work content becomes more complex, and the impact on the users will greatly determine their attitude towards the new system (Min et al., 2004). Nowadays, technology plays a key role in improving organizational effectiveness, so understanding of user resistance has attracted considerable attention in the literature (Rivard & Lapointe, 2012; Hu et al., 2016). Klaus et al. (2010) asserted that it is necessary to understand user resistance because it has been found to be "the root cause of the failure of software projects in many companies". Su et al. (2016) argue that failure to understand user resistance may prevent users from effectively engaging with the system and rejecting the changes brought about by the system, which ultimately affects the successful application of the information system. Han (2020) believes that understanding and managing user resistance is critical to the success of electronic public service system, and not understanding the formation of user resistance is an important reason for triggering system failure. Lee and Joshi (2017) suggest exploring and analyzing the reasons for the formation of user resistance, which will help in the acceptance and application of information systems by users. Therefore, it is necessary to explore user resistance encountered during the implementation of information systems to better understand and find the factors that influence user resistance.

Scholars have conducted extensive research on the factors influencing user resistance. According to Kim and Kankanhalli (2009), in the pre-implementation stage of an information system, namely, the period between the deployment of the system and the practical application, uncertainty cost, transitional cost, sunk cost, transfer benefit, and perceived value are the factors influencing user resistance. Aslam (2011) found that at the individual level, user expectations, user training, and technology usability influence user resistance in the post-implementation stage of an information system, namely, the period after the system is put into use. Oreg (2006) further demonstrated that user resistance is closely related to motivation and cognition, and in the pre-implementation and post-implementation stages of an information system, factors such

as interests and status and intrinsic reward have a more pronounced effect on whether users will engage in resistance behavior. Joshi (2005) found that the implementation of an information system tends to cause changes in four areas, namely, increase or decrease in inputs and increase or decrease in outputs, and users' resistance is mainly caused by bad changes, or increase in inputs or decrease in outputs. Kemp and Low (2008) suggest that user expectations in the pre-implementation stage of an EPR information system influence user resistance. Selander and Henfridsson (2012) interpreted resistance as being highly emotional and they believe that in both the pre-implementation and post-implementation stages of an information system, users will present resistance to system if they experience the system in a way that generates negative emotions, such as anger and disgust.

User resistance occurs at all stages of information system implementation, including pre-implementation, during-implementation, and post-implementation stages (Klaus & Blanton, 2010). The factors influencing user resistance are not the same in different stages of implementation. Only by precisely identifying the factors influencing user resistance at each stage of information system implementation, can we accurately determine the degree of influence of each factor on user resistance, formulate corresponding policies, and take effective actions to enhance users' usage intention and reduce user resistance. Most of the existing studies analyze the influencing factors of user resistance in the pre-implementation stage or post-implementation stage, with little research on the during-implementation stage (Alzahrani et al., 2021; Lee & Lee, 2017). In this context, this study will analyze the factors influencing the resistance of the healthcare professionals in the during-implementation stage from both cognitive and affective paths in healthcare institutions, and propose targeted countermeasures based on the analysis results.

1.3 Research questions

This research is carried out based on the following four research questions.

Q1: Why do the health professionals resist information system?

Q2: What are the factors influencing resistance of the health professionals to information system at the during-implementation stage?

Q3: What are the mediating and moderating factors of resistance of the health professionals to information system at the during-implementation stage?

Q4: How can we reduce or address resistance of the health professionals to information system?

1.4 Research purpose

The purpose of this research is to explore in depth the various factors that influence resistance of the health professionals to the information system during the implementation of healthcare informatization. The importance of healthcare informatization for the implementation of information systems among health professionals is further demonstrated by analyzing and understanding their resistance to the hospital information system during the implementation stage. In the digital era, healthcare informatization not only optimizes the healthcare service process and improves work efficiency, but also plays a crucial role in multiple dimensions such as medical record management, resource allocation, and emergency response mechanisms. However, in the extensive promotion of hospital information systems, the workload of the health professionals has significantly increased, leading to psychological contract breach and emotional exhaustion, so they tend to present resistance to the new system. With tertiary hospitals in Guizhou Province as the empirical basis, this study is dedicated to analyze the relationship between workload, psychological contract breach, emotional exhaustion, and information system resistance of the health professionals, and tries to identify the moderating effect of the perceived organizational support on resistance of the health professionals on the information system, as well as the similarities and differences of the moderating effect of the perceived organizational support at the individual level and the organizational level. The research is designed to provide strategic recommendations for hospital administrators, so as to regulate and improve organizational behavior, optimize information system implementation plans, reduce resistance behavior, and promote hospital informatization development to a higher level.

1.5 Research method

Saunders et al. (2019) in Research Methods for Business Students defines research methods as "systematic processes used to collect and analyse data in order to answer research questions and to conduct scientific enquiry tools and techniques". This paper mainly adopts a quantitative research method to explore the influencing factors of healthcare workers' workload on the resistance behaviour of information system implementation in the empirical environment of a tertiary hospital in Guizhou Province. In the quantitative study, a questionnaire was mainly used to collect a large amount of relevant data from healthcare workers by designing a questionnaire, which was then analysed using data analysis software.

1.5.1 Literature review

By utilizing literature from relevant books, theses, websites, and other literature databases, such as Journal China, China National Knowledge Infrastructure (CNKI), China National Digital Library, Wanfang Database, PubMed, and Web of Science, we extensively and systematically examine the relevant literature on the concepts of workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support to establish the research framework for this thesis. Thus, this research clarifies the limitations of existing research in this area, summarizes the relevant theoretical foundations and methodologies at home and abroad, and proposes the necessity for this research. The analysis of existing literature provides a solid theoretical foundation for research hypotheses, model construction and logical deduction.

First, in order to have a deeper understanding of the related concepts, we define the connotation of the concepts of hospitals, health professionals, information systems, and user resistance, provide an overview of the stages of information system implementation, and systematically review the existing domestic and foreign literature on user resistance by identifying its types, stages, influencing factors, influencing results, and coping strategies. Through meticulous review, it is found that previous studies have mainly focused on corporate employees and users, and there is no research on health professionals and healthcare contexts. This study takes the perspective of hospital information system users (healthcare professionals) to identify the factors influencing user resistance to hospital information system. It is found that the existing research focuses on exploring the triggers of user resistance with a view to finding appropriate management practices and avoiding user resistance at the source, thereby facilitating the smooth implementation of information system (Oreg & Berson, 2019)。

In addition, after reviewing the literature on the antecedent variables of user resistance in different implementation stages of information system, it is found that scholars mainly focus on the influence of individual factors (Helpap, 2016) and organizational factors (Du & Cui, 2019) on user resistance. There are few studies on the factors influencing user resistance in the during-implementation stage of information system. In this stage, users need to understand and learn the knowledge and technical operations related to the information system, which undoubtedly adds workload to their original work. Therefore, as for this stage, we mainly explore the positive effect of workload on user resistance.

Moreover, existing research does not involve the pathways and mechanisms of how workload affects user resistance. This study explores the mechanism of action between workload

and user resistance from the perspective of cognitive and affective pathways based on the cognitive-affective processing system framework. Users may experience psychological contract breach and emotional exhaustion due to their intense workload, which reduces their work efficiency and enthusiasm and causes physical and psychological damage. In the state of psychological contract breach and emotional exhaustion, users may vent their dissatisfaction and stress through resistance behavior. Therefore, this study aims to explore the mediating role of psychological contract breach and emotional exhaustion in the relationship between workload and user resistance.

Finally, if users perceive organizational support and obtain favorable feedback from the organization (Zhu et al., 2017), it will, to some extent, slow down the generation of psychological contract breach and emotional exhaustion, and reduce user resistance. Therefore, perceived organizational support is introduced as a moderating variable and we endeavor to explore its moderating role in the influence of workload on user resistance through psychological contract breach and emotional exhaustion.

1.5.2 Questionnaire survey method

Questionnaire survey method is a way to obtain first-hand data, which can ensure the authenticity and reliability of the empirical research. Based on the review of relevant literature at home and abroad, the study refers to Chinese and foreign scales with good reliability and validity, and designs the first draft based on the basic principles of questionnaire survey method. Through the pre-survey, the questionnaire is optimized, modified and finalized to improve its validity, reliability and ease of use. Subsequently, the questionnaires are distributed to hospitals at different levels in Guizhou to investigate perceptions of the health professionals on workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support, so as to obtain the research data needed for empirical analyses and validate the proposed hypotheses and models. This data collection process facilitates the empirical analysis, validates the proposed hypotheses and models, and plays a crucial role in the research method.

1.5.3 Statistical analysis method

Based on the questionnaire data, reliability and validity tests, descriptive statistics, one-way analysis of variance and correlation analysis are conducted using SPSS 27. This analytical process aims to explore the correlations between the variables and verify the hypotheses proposed in this study.

1.5.4 Other data analysis software

In this thesis, we explore the interrelationships among the workload, user resistance, and emotional exhaustion of the health professionals using literature review and multiple analytical tools, including AMOS 26, Smart-PLS 4.0, and Stata. Through data analysis and structural equation modeling (SEM), we aim to clearly reveal the dynamic links between these variables and test the relevant hypotheses. By visualizing the complex data, this study provides hospital managers with evidence-based strategic recommendations to optimize management practices and enhance the overall operational efficiency of hospitals.

In general, we will integrate literature review, questionnaire survey, and data analysis methods to explore the influencing factors of health professionals' workload on their resistance to information system implementation in a comprehensive and in-depth manner. Through the use of multiple research methods, we expect to obtain research results with scientific reliability, which will provide useful references for enhancing the effectiveness of information system implementation and improving the healthcare work environment.

1.6 Thesis framework

This thesis is divided into six chapters.

Chapter 1: Introduction. It describes the background of the study, the purpose of the study, the research methodology and the framework of the thesis.

Chapter 2: Literature Review. Firstly, the theoretical basis of this study, Cognitive Affective Personality System (CAPS), is proposed and the research progress of scholars at home and abroad is discussed; second, the definitions related to tertiary hospitals, health professionals and information systems are outlined; finally, the connotation, classification, measurement, influencing factors, influencing outcomes and coping strategies of user resistance, workload, psychological contract breach, emotional exhaustion, and perceived organizational support are studied to grasp an in-depth understanding of the five concepts. The research hypotheses between them are proposed in this chapter, which lays the foundation for the successful subsequent research on the relationship between workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support.

Chapter 3: Research Design and Data Collection. Through literature review and other methods, the content of the questionnaire is determined and the questionnaire is designed accordingly. In this thesis, health professionals of tertiary hospitals in Guizhou Province are selected

as the research subjects and questionnaires are distributed to investigate their use of hospital information systems, their basic personal information, and their perceptions of workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support, so as to obtain the research data.

Chapter 4: Data analysis 2- An Exploration of the Cross-Level Influence of Perceived Organizational Support. Data analysis 2 uses multilevel modeling to examine the influence of workload and perceived organizational support on psychological contract breach and emotional exhaustion. In this study, perceived organizational support may be both an individual-level and an organizational-level variable, because there may be large differences among hospitals in terms of organizational culture and climate, organizational system, and leadership styles. Perceived organizational support may be embedded at a higher level because of homogeneity of the aforementioned factors within hospitals. Therefore, we use the multilevel modeling to test the hypotheses, as this analytical technique provides a more comprehensive and precise test of cross-level data structures. Multilevel regression analysis is conducted using Stata 18.0 software through a random intercept model.

Chapter 5: Data analysis 1- An Exploration of the Impact on the Work Behavior of Health Professionals. In this study, data on workload, user resistance, emotional exhaustion, psychological contract breach and perceived organizational support are statistically analyzed using SPSS, Stata, and MPlus. The purpose of the analysis is to assess the differences in the impact of workload on resistance to information system implementation among health professionals in different tertiary hospitals in Guizhou Province. In addition, nine hypotheses related to workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support are proposed based on structural equation modeling (SEM). (1) Workload has a significant positive impact on user resistance; (2) Workload has a significant positive impact on psychological contract breach; (3) Psychological contract breach has a significant positive impact on user resistance; (4) Workload has a significant positive impact on emotional exhaustion; (5) Emotional exhaustion has a significant positive impact on user resistance; (6) Psychological contract breach mediates the relationship between workload and user resistance; (7) Emotional exhaustion mediates the relationship between workload and user resistance; (8) Perceived organizational support negatively moderates the relationship between workload and psychological contract breach, namely, when the higher the perceived organizational support, the weaker the positive correlation between workload and psychological contract breach; (9) Perceived organizational support negatively moderates the relationship between workload and emotional exhaustion, namely, the higher the perceived organizational support, the weaker the

positive correlation between workload and emotional exhaustion. Meanwhile, based on the theoretical hypotheses, we propose a corresponding theoretical model with workload as the independent variable, psychological contract breach and emotional exhaustion as the mediating variables, perceived organizational support as the moderating variable, and user resistance as the dependent variable.

Chapter 6: Discussion. This chapter discusses the results of the analysis of the research hypotheses tested for workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support.

Chapter 7: Conclusions and Suggestions for Future Study. This chapter summarizes the findings of this research and identifies the theoretical contributions. In addition, countermeasures and suggestions for hospital administrators are proposed so as to give full play to the positive role of the health professionals and improve the core competitiveness of the hospitals. This chapter also points out the limitations of this research and suggestions for future research.

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Chapter 2: Literature Review

Literature review plays a crucial role in this research. First, it lays a solid theoretical foundation for the research by comprehensively analyzing the literature on health professionals' resistance to information systems, which not only helps gain an in-depth understanding of the known motivators and influencing factors of health professionals' resistance to information systems, but also provides a clear theoretical framework and guiding direction for the research. Second, literature review helps precisely identify the research problem and background, ensuring the uniqueness and innovativeness of the research. By reviewing previous research results, we are able to identify the unexplored areas in the field and ensure the novelty and creativity of this research.

Third, literature review provides valuable guidance in selecting the research method. By evaluating the methods used in previous studies, we can select the most suitable method to address the current research questions and gain insight into its strengths and weaknesses, so as to ensure the scientific and rational nature of the research method. In addition, the literature enables us to gain a deep understanding of the complexity and diversity of health professionals' resistance toward information systems. By synthesizing the findings of different studies, we are able to get a comprehensive picture of the current status, trends and challenges faced in the field, providing a comprehensive background knowledge for the research.

Finally, the importance of literature review is also reflected in the identification of factors that may play a mediating and moderating role. This is critical for an in-depth exploration of the process of health professionals' resistance to information systems and the proposition of targeted solutions. Through the literature review, we are able to identify factors that may play a key role in practical operation and build a model accordingly in line with scientific principles. In conclusion, literature review provides a solid foundation and a clear direction for this study, and ensures the scientific validity and credibility of the research as well.

2.1 Theoretical foundation

The cognitive-affective system theory was proposed to address a long-standing paradox in personality and social psychology, namely, the apparent contradiction between the core assumption

of personality stability and invariability across situations and the empirical findings of behavioral variability (Yang & Guo, 2004). The cognitive and affective units of individuals are interacting systems, and individuals' cognitive processing of important social information often has an affective arousal function. In this context, the situations in which individuals are located will stimulate their cognitive and affective units (Mischel & Shoda, 1995), which in turn determine their specific behaviors (Chen et al., 2022) and construct a multilevel cognitive-affective-behavioral parallel framework (Zayas et al., 2002). In the CAPS theory, Mischel and Shoda (1995) refer to the prototype classification method of Rousseau (1989) and argue that the most useful cognitive social structure may be essentially a mixture of people-in-situations, or goals-in-situations, or behavioral-script-in-situations, and cognitive prototype is a relatively stable cognitive construct that allows people to present relatively stable characteristics in terms of behavioral styles and personality traits.

The behavior of a person in a certain situation is affected by two aspects. First, the specific situation of the person will exert an impact on human behavior; and second, different cognitive-affective units (CAUs) will also affect human behavior, and the interaction of the two together determines what kind of behavior a person will do in a certain situation. The CAPS model further decomposes the CAU, and identifies that it is made up of coding, expectations and beliefs, and affectations (Mendoza Denton et al., 1997), and the system allows different people to form different representations in immediate combinations outside of conscious awareness when faced with different situations. The CAPS theory suggests that individuals differ across cognitive-emotional units, and the organizational relationship in the cognitive-emotional unit is relatively stable. Because of the stability of the organizational relationship, different people will show a relatively stable personality, and the uniqueness of people can be reflected.

The research on CAPS theory at home and abroad is at its initial stage. Foreign research on the CAPS theory is mainly focused on the field of psychology and healthcare. In the field of psychology, the CAPS theory is mainly applied to the study of the relationship between behavior patterns and personality (Mendoza Denton et al., 1997), while in the healthcare field, the CAPS theory is mainly applied to the study of personality traits and related treatment (Eaton et al., 2009).

Chinese research on the CAPS theory mainly focuses on the field of psychology (Yang & Guo, 2006) and learning behavior (Hu, 2008). In recent years, a small portion of research in the business management field also involves this theory (Li, 2022). The theory proposed by Mischel and Shoda (1995) aims to explain the paradox between the invariance of personality and the variability of behavior across contexts. The theory takes into account the predictable

pattern of behavioral variability of individuals across contexts, as well as the overall average level of behavior. Godin et al. (2008) systematically investigated the evaluation of healthcare professionals' intentions and behaviors based on socio-emotional cognitive theories with the aim of exploring the factors influencing the behaviors of health professionals, and they found that certain cognitive mechanisms underpin healthcare professionals' behaviors, so they emphasize the importance of understanding these mechanisms so as to improve intervention measures for behavioral change. Bandura (2009) provides a framework for analyzing how symbolic communication influences human thoughts, feelings, and actions through social cognitive theory, and this framework can be applied to healthcare settings to understand how the media and communication tactics influence the behaviors and attitudes of health professionals.

2.2 Overview of grade A tertiary hospitals and health professionals

2.2.1 Grade A tertiary hospital

The classification of hospitals in China is an accreditation system implemented by the health administration department of the People's Republic of China for medical institutions within its administrative jurisdiction. Currently, China adopts a three-level medical service system, and hospitals in each level can be divided into grade A and grade B hospitals, with grade A tertiary hospital being the top accreditation for hospitals in the Chinese mainland. As a high-quality medical resource, tertiary hospitals are mostly found in large cities such as municipalities directly under the central government, provincial capitals and large prefecture-level cities, while very few county-level hospitals can reach the level of tertiary hospitals.

Hospital accreditation in China started from 1989. In November 1989, the Ministry of Health issued the Measures for Administration of Hospital Classification (Trial) and Standards for Administration of General Hospital Classification (Trial) which classify hospitals into different levels and grades. The hospitals are divided into primary, secondary, and tertiary hospitals according to different functions and tasks. To be specific, primary hospitals are grassroots hospitals and health centers providing prevention, medical treatment, health care and rehabilitation services directly to communities; secondary hospitals are regional hospitals providing comprehensive medical and health services to a number of communities and undertaking certain teaching, and scientific research tasks; tertiary hospitals are cross-regional hospitals providing high-level of specialized medical and health services to several regions and undertaking higher edu-

cation and scientific research tasks. The issuance of the two documents marks the official initiation of China's hospital classification and hierarchical management.

In February 1994, the State Council of China issued the *Regulations on the Administration of Medical Institution*, which came into force on September 1 of the same year. Article 41 of the *Regulations* stipulates that "China implements an accreditation system for medical institutions". Based on this *Regulation*, the Ministry of Health issued the *Measures for Accreditation of Medical Institutions* in 1995, which further stipulates that the basic conclusions of medical institution accreditation are "qualified" and "unqualified", and that medical institutions in each level are divided into "grade A", "grade B", and "grade C", and those "qualified" medical institutions can be accredited as "grade C" or above.

In 2005 and 2008, the Ministry of Health of China released two editions of the *Guidelines for the Evaluation of Hospital Management.* In 2005, a series of nationwide hospital management year activities were launched with the theme of "taking patients as the center and improving the quality of medical services" in order to promote the scientific, normative and standardized development of hospital management and improve medical quality.

In 2010, the Ministry of Health restarted the accreditation of hospitals. In 2011, the Ministry of Health released the *Interim Measures for Hospital Accreditation*, *Accreditation Standards for Tertiary General Hospitals (2011 Version)* and the *Implementing Regulations of the Accreditation Standards for Tertiary General Hospitals (2011 Version)*. The *Interim Measures for Hospital Accreditation* made updates to the 1995 version of *Measures for Accreditation of Medical Institutions*, which stipulates that the conclusions of hospital accreditation are classified as grade A, grade B, or unqualified. It is clearly identified that each provincial health administrative department is responsible for the hospital accreditation in its jurisdiction.

According to the *Accreditation Standards for Tertiary General Hospitals (2011 Version)*, a grade A tertiary hospital is a medical institution classified according to the *Measures for Administration of Hospital Classification*, and it is the highest level in the hospital classification pattern of "three levels and six grades" in the Chinese mainland. With a bed capacity exceeding 500, tertiary hospitals are trans-regional hospitals that provide high-quality specialist health services to several regions, and undertake tasks such as higher education and scientific research. The level of hospitals run by enterprises and public institutions, the collective, and individuals can be identified with reference to the classification of public hospitals. After accreditation, hospitals at all levels are classified into three grades of A, B, and C in accordance with the *Measures for Administration of Hospital Classification*. The classification of grade is based on the technical strength, management level, equipment conditions, and research capabilities of

the hospitals. To sum up, grade A tertiary hospitals are those having achieved remarkable results in hospital development, with their departmental setting, staffing, management level, technical level, work quality and technical facilities exceeding 900 points in the comprehensive assessment and inspection.

With the increasing investment in grassroots health industry and the expansion of the telemedicine system, the "Internet & medicine" has benefited more people. Three documents in the field of Internet medicine, including the *Measures for the Administration of Internet Medical Treatment (Trial)*, were released and implemented in September 2018, which further regulates the conduct of Internet medical treatment. All tertiary hospitals across China have launched telemedicine services to cover all county hospitals in impoverished counties. The extension of telemedicine services to the grassroots medical institutions has improved the medical level of grassroots hospitals, making hospital treatment smarter and patient access more convenient. It is evident that the abundant human resources and advanced hardware facilities in tertiary hospitals can attract more high-end medical talents, which is beneficial to improving medical technology and increasing popularity of the hospitals.

In this research, we select grade A tertiary hospitals in Guizhou Province as the cases for the following reasons.

(1) Grade A tertiary hospitals have greater advantages than other hospitals in terms of medical technology, overall quality of medical personnel, nursing level, hospital management, medical equipment, and medical platform, so research on them is more representative and has greater research value.

(2) Grade A tertiary hospitals represent the highest level of medical care in China. In recent years, China has been attaching great importance to the medical reform, and patients often choose to seek medical treatment in grade A tertiary hospitals to get better treatment results, so it is imperative to select grade A tertiary hospitals for the research.

(3) The study of grade A tertiary hospitals can provide more scientific, effective, and practical coping methods to other levels of hospitals, and promote the effective allocation and utilization of medical resources, so as to promote the comprehensive development of China's health care industry and the continuous deepening of the comprehensive reform of public hospitals.

(4) Geographical characteristics and medical challenges

The mountainous terrain and multi-ethnic character of Guizhou bring unique healthcare challenges such as service accessibility in remote areas and multilingual communication. The implementation of and resistance to information systems in tertiary hospitals in such environments provide valuable perspectives on understanding and overcoming region-specific

healthcare challenges.

(5) Economic development and resource allocation

The relatively slow economic development and limited healthcare resources in Guizhou Province are in drastic contrast with the high standard of facilities and services in tertiary hospitals. Studying how these hospitals implement healthcare information systems in the context of resource constraints can provide important practical experience for optimizing resource allocation and improving service quality.

(6) A testing ground for healthcare reform

As pioneers of healthcare reform and informatization, tertiary hospitals in Guizhou Province play an exemplary and guiding role in the improvement of healthcare standard and deepening of healthcare reform in China. The study of these hospitals can provide insights into effective strategies and possible resistances to the implementation of healthcare information systems, and provide lessons and strategies that can be learned by hospitals in other regions and other levels.

In summary, the combination of the specific regional characteristics of Guizhou Province and the high-level standards of tertiary hospitals provides a unique and rich research environment for studying healthcare information system implementation and resistance behaviors, which not only helps to deepen the understanding of the challenges of healthcare informatization, but also provides valuable empirical support and strategic guidance for healthcare service optimization and public health system reform.

2.2.2 Health professional

Health professionals (healthcare professional, medical personnel) refers to professionals engaged in medical and healthcare work and providers of healthcare services. As defined in the *Rules for the Implementation of the Regulations on the Administration of Medical Institutions*, healthcare professionals are those who have obtained the qualification or professional title of health technicians in accordance with the relevant national laws, regulations and rules.

The Ministry of Health issued the Interim Regulations on Job Titles and Promotion of Health Technicians in 1963, and re-issued the Interim Regulations on Professional Titles and Promotion of Health Technicians (for trial implementation) in 1979, which stipulates that health technicians in China are divided into four categories according to the nature of their work, namely, medical epidemic prevention personnel, pharmacy personnel, nursing personnel, and other technical personnel. The medical epidemic prevention personnel include those engaged

in Chinese medicine, Western medicine, health and epidemic prevention, parasite control, endemic disease control, industrial hygiene, and maternal and child health care. The pharmacy personnel include those engaged in traditional Chinese medicine and Western medicine pharmacy. The professional titles of the nursing personnel include chief nurse, deputy chief nurse, nurse-in-charge, nurse practitioner, nurse, and nurse practitioner. Other technical personnel include those engaged in laboratory science, physical therapy, pathology, dentistry, isotope, radiation, nutrition, and biological products production.

In 1986, the central leading group for professional title reform forwarded the *Regulations for the Trial Implementation of the Job Positions of Health Technicians* and the corresponding *Opinions on the Implementation*, which pointed out that the main duties of health technical positions are the application of medicine and healthcare technology. The professional technical job positions are set according to the actual needs of healthcare service, and health technical positions are divided into four categories: medical, pharmaceutical, nursing and technical positions. The duties of the health technical job positions and the basic conditions required to fulfill the corresponding duties are also clarified.

The Ministry of Human Resources and Social Security, the National Health Commission, and the National Administration of Traditional Chinese Medicine issued the *Guiding Opinions on Deepening the Reform of the Professional Title System for Health Professionals* in 2021, which further clarified the names of professional titles for different positions of healthcare professionals at all levels. There are junior, intermediate and senior professional titles for healthcare professionals who are categorized into medical, pharmaceutical, nursing and technical personnel. The professional titles of medical personnel at all levels include assistant physician, physician, attending physician, deputy chief physician, and chief physician; the professional titles of pharmaceutical personnel at all levels include assistant pharmacist, pharmacist, pharmacist in charge, deputy chief pharmacist, and chief pharmacist; the professional titles of nursing personnel at all levels include nurse, nurse practitioner, nurse in charge, deputy chief nurse, and chief nurse; and the professional titles of technical personnel at all levels include assistant technician, technician, technician in charge, deputy chief technician, and chief technician. The *Guiding Opinions on Deepening the Reform of the Professional Title System for Health Professionals and Technicians* specifies the professional title structure of health professionals, and this reform may have far-reaching effects on their work attitudes, career development, and acceptance of hospital information systems. Therefore, studying the behavior of health professionals in this context is extremely important to understand and optimize the implementation of hospital information systems.

(1) The main users of the information system. As the direct users, health professionals' acceptance of the hospital information system and the efficiency of its use determine the success or failure of the system implementation, and their feedback and experience have a direct impact on system optimization.

(2) The impact of professional title system reform. Professional title system reform may reshape the career development and evaluation system of the health professionals, which in turn will affect their attitude towards work and their acceptance and use of new technology systems, and exploration of this impact is significant for the optimization of the information system.

(3) The correlation between workload and psychological state. High workload and psychological pressure may trigger health professionals' resistance to new technologies, and studying this relationship will help understand and solve the problem of personnel resistance in the implementation of information systems.

(4) Differences in technology acceptance among those with different professional titles. The level of professional title of health professionals reflects differences in their educational backgrounds, work experiences, and career stages, which may lead to differences in information system acceptance and usage habits, and an understanding of these differences can help in the development of effective training and promotion strategies.

(5) Core roles in hospital operation. Health professionals play key roles in patient care, medical record management, and medical decision-making, and their usage habits and efficiency directly affect the overall quality and efficiency of hospital operation.

2.3 Overview of information system

2.3.1 Connotation of Hospital information system

2.3.1.1 Definition of information system

Information system is an application system based on information technology (IT) and carries a specific business model to support the operation and development of an organization. The information technology has experienced rapidly changing advances and innovations, as manifested in the development from mainframe computers to personal computers, and from the Internet to social network, and then to mobile network, Internet of Things, cloud computing, and even big data and artificial intelligence. IT has helped the people build a digital life and intermingled with human socio-economic activities to form information systems that continuously

change the behavior of individuals and organizations during the life cycle of the systems (Chen et al., 2022).

2.3.1.2 Definition of hospital information system

As a large-scale organization, a hospital has a complex management system. From an internal perspective, the functional departments and business units are horizontally connected with various departments and logistics departments, and from an external perspective, a hospital is a subsystem of the healthcare system, undertaking responsibilities such as the diagnosis and treatment of various diseases and nursing care of patients (Guo et al., 2022). Therefore, the development of hospital information system is indispensable for a hospital to ensure its smooth and timely information transmission as well as its efficient and orderly operation under this complex system.

Davis et al. (1968), an expert in the field of information research in the United States, defined hospital information system as a system in which electronic computers and communication equipment are used to provide hospital departments with the ability to collect, store, process, extract and exchange data for patient treatment information and administrative information and meet the functional needs of all authorized users. The *Basic Function Specifications of Hospital Information System* issued and published by the Ministry of Health in 1997 defines hospital information system as a computer application software system that utilizes electronic computers and network communication equipment to provide hospitals and their departments with the ability to collect, store, process, extract and communicate data of patient medical information, financial accounting and analysis information, administrative management information and statistical information for decision analysis, and satisfies all authorized users' needs for various functions of information.

With the rapid development of computer network technology, the implementation of the major medical reform policies and the transformation of the medical model, according to the international trend of hospital informatization and the current situation and needs of hospital informatization in China, the Ministry of Health went through repeated demonstration and discussion in 2002 and formed a new version of the *Basic Function Specifications of Hospital Information System*. The hospital formation system is defined as a system in which computer hardware and software technology, network communication technology and other modern means are used to implement comprehensive management of human, material and financial flows in the hospital and the respective departments, and collect, store, handle, extract, transmit,

aggregate and process data generated in all stages of medical activities to generate various information so as to provide comprehensive and automated management and services for the overall operation of the hospital.

In recent years, with the rapid development of mobile Internet, cloud computing, Internet of Things and other emerging information technologies, especially the widespread use of mobile and intelligent medical aids, the healthcare industry has been experiencing unprecedentedly huge changes. Cloud computing, big data, Internet of Things, artificial intelligence, 5G, block chain and other new generation information technologies have been widely used in hospital information systems, driving continuous change and collaborative innovation across boundaries in the healthcare industry. The government has put forward a series of policy requirements, construction standard specifications and functional guidelines for hospital information systems, and the related documents mainly include the *National Hospital Informatization Construction Standards and Specifications*, the *Hierarchical Evaluation Criteria for the Functional Application Level of Electronic Medical Record Systems*, the *Hierarchical Evaluation Criteria System for Hospital Smart Services, the Standardized Maturity Measurement Criteria for the Interconnectivity of National Healthcare and Hospital Information*, the *Implementation Plan for the Construction of Quality and Efficient Medical and Health Service System in the 14th Five-Year Plan*, and the *Guidelines for Informatization of Public Hospital Operation and Management*.

In this study, we follow the definition of hospital information system in the Basic Function Specifications of Hospital Information System and integrates the application framework and functional design requirements for operation and management informatization in the *Functional Guidelines for Informatization of Public Hospital Operation and Management*. Therefore, we define hospital information system as a system in which the modern means such as computer hardware and software technology and network communication technologies are used to carry out comprehensive management of human, logistic and financial flows in hospitals and their departments, and collect, store, handle, extract, transmit, aggregate, and process data generated in the various stages of medical activities to generate a variety of information, so as to provide 9 business functions to the overall operation of the hospital concerning business activities of healthcare, teaching, research, and prevention, comprehensive management, financial management, assets, human resources, matters, operational management decisions, data base, and basic management and integration.

2.3.2 Stages of information system implementation

2.3.2.1 Definition of information implementation stages

Klaus and Blanton (2010) suggest that the implementation of an information system is usually categorized into three stages: pre-implementation, implementation and post-implementation. These three stages together constitute a full cycle of information system development and deployment. Each stage has its own specific goals, tasks and activities, but they are interrelated, and the successful implementation of each stage lays the foundation for the next stage. The pre-implementation stage focuses on planning and design to ensure that project goals and needs are fully understood and prepared; the implementation stage focuses on the actual system deployment and startup; and the post-implementation stage ensures the effective operation of the system and optimization and improvement based on actual operation.

2.3.2.2 Pre-implementation stage of information system

Before the implementation of the information system, it is necessary to do the formal project initiation and program planning, which requires preliminary investigation of the organizational environment, objectives, and the status of the current system. The development strategy of the information system should be identified according to the organization's objectives and development strategy. We should analyze and forecast the demand for building the new system, consider the various constraints on building the new system, study the necessity and possibility of building the new system, and conduct feasibility analysis of the alternatives. At this stage, it is necessary to focus on the five tasks of team building, risk identification, solution formulation, user resistance and new technology introduction.

Prior to the implementation of the information system, Lewin (1947) emphasized the importance of guiding the team to promote successful change. They argue that it is necessary to establish a team with a shared commitment and sufficient authority to lead the change. The pre-implementation of information system is further divided into three phases: readiness assessment, needs identification, and solution selection. Razmi and Sangari (2013) argue that a readiness assessment of the system should be conducted before implementation, and leaders should have a comprehensive understanding of the weaknesses of the system and help to strengthen the weaknesses in order to effectively control project costs and risks. In addition, before selecting and implementing the system, it is important to consider whether the system is compatible with the company's requirements. Finally, the system should have a variety of solutions. Based on case discussion, You (2013) points out that the information system implementation should be

preceded by a clear information system integration model and planning based on the reality. The system must be able to support a clear definition of the desired mission and a vision for strategic implementation. Expectations include not only the ultimate goal (in terms of data quality, time to improvement, paperless operation), but there are milestone expectations at all stages of the implementation to ensure that the process is on track. One of the most critical factors in the success of an information system implementation is the selection of right leaders who have a good communication experience with the employees. While most MIS approaches naturally tend to maximize user satisfaction and reduce potential resistance, Meissonier and Houzé(2010) argue for enhancing resistance so as to anticipate and resolve potential conflicts directly or indirectly related to the project. They therefore suggest to consider user resistance to IT as a key process embedded in IT selection and design. Hwang et al. (2016) argue that the biggest challenge for the management to ensure the successful implementation of a new system is to gain user recognition and support by creating and maintaining positive attitudes towards the newly implemented system. Moreover, the introduction of a new technology into the workplace is a change effort that is subject to contextual factors that influence individuals' reactions to the technology and its use. In this study, we mainly refer to the views of Meissonier and Houzé (2010) and focus on the impact of user resistance to information system on information system selection and implementation.

2.3.2.3 Implementation stage of information system

In this stage, it is necessary to discern which factors directly or indirectly affect the successful implementation of the information system. Murthy et al. (2014) believe that factors of successful implementation include proper planning of the project, involvement of state holders, effective training, user friendliness, ownership, site preparation and higher-level management support. It also includes application challenges such as interoperability, integration with third party software, unauthorized data access, and security. Ahram and Falcão (2018) also argue that the successful implementation of information management system needs to consider both human factors and technological solutions. In this study, we mainly explore the impact of employee resistance on information system implementation.

From the employee perspective, Munassar et al. (2013), Shukor et al. (2009), Carpenter et al. (2012), and Shao et al. (2022) believe that people are a very important factor in the implementation of information systems. According to Tani et al. (2019), during the implementation of hospital information system, system introduction is often advanced after the management makes selection. However, in reality, the management and the staff have different requirements

for the system. As a result, the system often fails to meet the requirements of the employees, leading to increased dissatisfaction of the employees with the system. During system implementation, it is important and necessary to develop employee motivation for the successful system implementation and post-implementation utilization. From an organizational perspective, resistance to change is one of the common problems in the implementation of new systems and needs to be dealt with wisely. The success or failure of the implementation is closely related to their level of adoption of the changes, and Ziemba and Obłąk (2015) have demonstrated that change management can be helpful for the successful implementation of information systems projects. As the culture varies from organization to organization, employees in different organizations have different reactions to changes (Almajed & Mayhew, 2014). The commitment of users and team members (Levasseur, 2010) is the key to the successful implementation of IS. Wang et al. (2020) suggest integrating change management into clinical healthcare IT projects to increase user adoption.

2.3.2.4 Post-implementation stage of information system

Post-implementation is about ensuring the continuity of IS in the organization. Kotter emphasizes the importance of having a succession plan in place to avoid dependency on certain users. In the implementation of hospital IS, dependence on certain users is dangerous due to the frequent turnover of staff within the organization. In Kotter's approach to change management, he notes the need for continuous evaluation to sustain change. An evaluation process needs to be developed to determine what is working and what needs to be improved. The evaluation needs to be done regularly to ensure that change becomes a culture within the organization. In addition, regular audits can be thought of as a form of implementation and monitoring to ensure that IS can be consistently implemented. In addition, Kotter argues that it is important to ensure the continuity of the information system in the organization in the post-implementation stage, therefore he emphasizes the importance of developing a succession plan to avoid dependency on certain users. Continuous and regular evaluation is required to sustain the change and identify room for improvement so as to ensure that the change becomes a culture within the organization.

Moawad and Elsheshengy (2014) gave a general overview of the information system implementation stages after an investigation that readiness to change had a significant positive impact on overall satisfaction during and after implementation. By summarizing previous related studies, it is found that in the post-implementation stage of healthcare system, the user satisfaction is mainly promoted by enhancing the efficiency and quality of communication. Larrabee et al. (2001) studied nurses' use of information system and found that it can improve

the efficiency of their decision-making regarding patient care. Walji et al. (2009) conducted a survey on the implementation of a dental electronic medical record system, and found that many users felt that electronic medical records improved patient care and they would recommend the system to dentists starting a new practice. Mills et al. (2017) believe that patient safety and communication of discharge information are improved after the implementation of the information system. In addition, post-implementation stage has consistently improved the organization's written handovers and is associated with improved patient safety and hospital efficiency. Thanks to the information system, the medical workers can clearly present their complete prescriptions, communication between secondary and primary medical institutions is enhanced, and the behaviors adopted by the medical workers are also changed to ensure that general practitioners can receive high quality information. It is believed in this research that resistance to change had a significant impact on overall end-user satisfaction during implementation, but it had no significant impact after implementation. By surveying nurses' satisfaction with the information system before and after implementation, Laramee et al. (2012) found that the attitudes of the nurses were positive before implementation and became less positive after implementation, possibly due to changes in some work processes and discrepancy between reality and initial expectations. In addition, the information system quality plays an important role in improving the overall satisfaction of end users with the new information system during and after implementation. Organizations should focus more on system quality during information system implementation and attach the greatest importance on service quality after implementation.

2.3.3 Summary

In this study, we focus on the implementation stage of the hospital information system, aiming to gain insight into the impact of health professionals' workload on their resistance to the implementation of the information system. Through this focus, we are able to capture the most significant moments of resistance behavior during the implementation process, namely, the critical period when health professionals begin to interact directly with the new system. During this stage, health professionals' resistance behaviors are more obvious due to the increased workload brought by major changes in workflow, providing us with an excellent window of observation and analysis.

By exploring the implementation stage, we can not only more accurately understand the training needs and adaptation issues of health professionals, but obtain real-time feedback from

them on the system. The interaction and feedback in this process are invaluable in making immediate adjustments to implementation strategies, reducing resistance, and ensuring the successful implementation of the overall system.

In addition, by accurately analyzing the perceptions and behaviors of health professionals during the implementation stage, we can identify key factors affecting resistance, such as workload, ease of use, and training support. This provides us with an important basis for developing effective strategies and measures to counteract resistance behavior, which in turn helps to improve the overall success rate of information system implementation.

In summary, by focusing on the implementation stage of an information system, this study not only provides us with insights to understand resistance of health professionals, but also offers valuable information for adjusting and optimizing strategies during the implementation process. With these insights, we expect to facilitate the smooth implementation of hospital information systems, ensure efficient continuity of hospital operations, and improve the quality of healthcare services and patient satisfaction.

2.4 Overview of workload

2.4.1 Connotation of workload

Workload is an important concept in organizational behavior, which involves several factors such as time pressure, work difficulty, task requirements, employee capability, and work skills (Hao et al., 2015). Caplan and Jones (1975) consider workload as quantifiable, which refers to the specific amount of work tasks completed by employees within a given period of working time. Veltman and Gaillard (1996) define workload as the physical and psychological resources that employees expend to complete their work tasks, and it is the cost that employees pay to perform their job duties. Maslach et al. (2001) classify work requirements in terms of both qualitative and quantitative criteria, in which quantitative work requirements are all classified as workload. Lean and Shan (2012) argue that workload is an individual's sense of efficacy in completing single or multiple work tasks, and it is a comprehensive subjective perception. Wang and Li (2017) define workload as an excessive amount of work tasks beyond a certain standard undertaken by employees in an organization.

2.4.2 Measure of workload

A widely used measure of workload is the five-item questionnaire developed by (Peterson et al., 1995), with examples of key items such as "I believe it is necessary to reduce my workload today", and it has a Cronbach's alpha of 0.90. Karasek et al. (1998) developed a five-item self-assessment scale with items such as "I often have a lot of work to do" and "I need to make extra efforts to complete some tasks", and it has a Cronbach's alpha of 0.90. NASA has developed the National Aeronautics and Space Administration Task Load Index (NASA-TLX), which is a modified version of the original version, and it consists of four items including mental demand, physical demand, temporal demand, and effort. They are rated on an interval scale ranging from low (1) to high (20). The higher the score, the higher the workload, and the lower the score, the lower the workload.

2.4.3 Review of research on workload

Regarding studies related to the antecedent variables of workload, Van Leeuwen et al. (2019) found that employees' goal orientation affects the utility of their workload and learning goal orientation can bring positive effects of workload on employees. DiStaso and Shoss (2020) believe that employees' expectations of changes in workload significantly affect their emotional perceptions, and the employees are more inclined to accept and tolerate the current stressful work environment if they expect their workload to decrease.

Lipman et al. (2012) argues that implementation of electronic health record (EHR) affects workflow of service providers at the nursing stations. Information access and data entry tasks have been added to the workload of service providers, which negatively influences clinical workflow as well as perceived resources and job satisfaction of the service providers. The volume and complexity of information needed for patient care as well as documentation needed for administrative and medicolegal purposes are rapidly increasing, resulting in a growing impact on cognitive functions of the providers. According to relevant data, excessive workload has been added to the users during the information system implementation. Typically, the information systems implementation stage lasts from two to three months, namely, 60 to 90 days. During the implementation of information system, health professionals are faced with a number of additional work tasks and challenges, and the additional work during this period includes: discussion of new processes; discussion of new forms; development of new departmental specialty templates; participation in training sessions on the new system in order to learn how to operate it; participation in the migration and entry of data from the old system to the new system;

and participation in system testing and provision of feedback to ensure that the system meets job requirements. In addition, they need to adapt to workflow changes introduced by the new system, resolve technical problems that may be encountered in the early stages of implementation, and update relevant work documents and operating instructions. Health professionals also need to maintain effective communication with patients during the use of the new system, and at the same time, learning and adaptation to the new system may bring them additional psychological and adaptive stress and a significant increase in workload.

Work overload means that an individual takes on too many work tasks (Wang & Li, 2017) and it is a workplace stressor. Studies have pointed out that workload has a negative impact on employee performance and job involvement and at the same time, can lead to negative employee performance and behaviors such as increased frequency of work errors (Delisle, 2020) and turnover (Morter, 2010). If the information system is implemented in a high-workload situation, employees will need to spend extra time and effort in addition to their regular work, so they will face greater work stress, physical threats, and psychological distress, and will be more likely to generate fatigue and burnout, with a consequent decrease in job involvement (Wang & Li, 2017). Under such circumstances, in order to reduce the stress caused by the implementation of the new system, employees will try to maintain the status quo and take actions to protect their original rights and interests, which will lead to resistance psychology and behavior. Workload has an extensive and far-reaching impact on organizations and employees, but mainly in the negative aspects. Workload reduces employees' work engagement (TAŞTAN, 2014), reduces employees' job satisfaction and significantly increases their turnover intention (Morter, 2010), and reduces employees' job performance (Tahir et al., 2012). In addition, workload is also a valid predictor of whether or not an employee develops emotional exhaustion and job burnout (Weigl et al., 2016). With coal miners as the research subjects, Ren (2021) found that their workload can significantly induce employees' unsafe behaviors. Yao et al. (2019) studied construction workers and found that workload positively predicts employees' unsafe behaviors. However, researchers have also found positive effects of workload. Xun (2019) found that employees' workload can significantly and positively predict employees' innovative behaviors. On this basis, the following hypothesis H1 is proposed.

H1: Workload have a positive relationship with user resistance.

2.5 Overview of psychological contract breach

2.5.1 Connotation of psychological contract breach

The definition of psychological contract breach is based on the concept of psychological contract. Psychological contract is the psychological link between an organization and its employees, which embodies the implicit exchange relationship between them. Argyris (1960) first introduced the concept of psychological work contract and defined it as the informal and implicit relationship between workers and organizations. In line with this view, early research on psychological contract all emphasized the implicit nature of the psychological contract and the two-way expectations of the organizations and the employees in the exchange process (Levinson et al., 1962). The American psychologist Rousseau redefined psychological contract in 1995, arguing that psychological contract refers to the individual's unilateral understanding and beliefs about the respective responsibilities and obligations that he or she and the organization need to assume in the employment relationship (Rousseau, 1995). This belief is based on the exchange relationship between the individual and the organization and includes both the individual's perception of his or her own contribution and the individual's understanding of the compensation that the organization needs to provide. However, such beliefs originate from the subjective perceptions of the employee rather than from a consistent view of the employee and the organization, and the psychological contract is thus transformed into a concept that refers to the unilateral perceptions of the employee (Morrison & Robinson, 1997).

With the drastic changes in the external environment of the organization, organizational restructuring, downsizing and layoffs as well as the lack of communication, conflict and ambiguity between the organization and its employees, employees have a subjective perception that their psychological contract has been broken, thus giving rise to the concept of psychological contract breach. American psychologists Robinson and Morrison (1995) defined psychological contract breach as the employee's perception that the organization has failed to fulfill the responsibilities and obligations expected in the psychological contract. In 1997, they distinguished between psychological contract breach and psychological contract violation, arguing that psychological contract breach is a subjective perception that can occur in objective situations where the organization does not break the contract. Once an individual perceives psychological contract breach, his or her psychology, attitude, and behavior will change, and the emotional experience resulting from psychological contract breach is called psychological contract

violation (Morrison & Robinson, 1997).

In summary, psychological contract breach arises from the psychological contract and is an employee's subjective perception of the organization's failure to fulfill the responsibilities and obligations expected by the psychological contract, and inadequate communication, conflict and ambiguity between the organization and the employees.

2.5.2 Measure of psychological contract breach

There are three main approaches to measure psychological contract breach, namely, direct measure, indirect measure, and multivariate measure. Direct measure is a way to directly ask individuals whether they believe the organization fails to fulfill its psychological contract. This method is mainly implemented through questionnaires, including multiple-item scale, single-item scale, and semi-structured interview. Indirect measure assesses the degree of psychological contract breach through indirect indicators that measure individual's reactions to psychological contract breach. This approach consists of two main measurement instruments: cognitive response measure and physiological response measure. Multivariate measure refers to assessment of the degree of psychological contract breach through a combination of multiple measures. This approach involves measuring individual's subjective responses through scales, and integrating cognitive and physiological response measures to find out individual's psychological states and physiological responses.

In practice, the most common measure of psychological contract breach is the direct measure by scales. Since the concept of psychological contract breach is developed on the basis of the concept of psychological contract, the measure dimensions of psychological contract breach follow those of psychological contract and are mainly divided into unidimensional structure, two-dimensional structure, and three-dimensional structure. The unidimensional structure scale is the scale developed by Robinson and Morrison (2000), which is widely used by scholars. The two-dimensional structure scale mainly includes Macneil (1985) two-dimensional theory of psychological contract, which suggests that there are two types of psychological contracts, namely, transactional and relational contracts. With a survey on 224 graduating MBA students, Rousseau (1989) verified Macneil's classification and categorized psychological contract breach into two dimensions of relational contract and transactional contract. The relational contract is based on emotions and attitudes, with an emphasis on long-term social and emotional interactions; the transactional contract is based on economic exchange, with an emphasis on benefits such as high salaries, performance incentives, training opportunities, and long-term career development. In addition, Kickul et al. (2002) classified the psychological contract from

the employer's perspective into extrinsic contract and intrinsic contract. The extrinsic contract is related to job outcomes and benefits, and the intrinsic contract is related to job nature and development. With the deepening of research, researchers proposed a three-dimensional theory of the psychological contract based on the two-dimensional theory. Rousseau and Tijoriwala (1999) emphasized that in organizations characterized by employee cooperation and team orientation, the dimension of team member should be added in addition to the transactional and relational dimensions. Coyle Shapiro and Kessler (2000) proposed that the psychological contract should include three dimensions of transactional responsibility, relational responsibility, and training responsibility, and training responsibility includes necessary job training, new knowledge and new skills training, and other organizational responsibilities related to increase of employee knowledge and improvement of employee capabilities. Li and Sun (2006) conducted a study on the psychological contract in the Chinese cultural context and classified the psychological contract of Chinese employees into normative responsibility, interpersonal responsibility, and developmental responsibility.

2.5.3 Review of research on psychological contract breach

According to the model of psychological contract breach formation proposed by Morrison and Robinson (1997), there are three main causes of psychological contract breach: intentional violation, inability to fulfill the promise, and understanding ambiguity. Intentional violation means that in the employment relationship, based on the power asymmetry between the employees and the organization and the difference in the type of exchange relationship, the organization intentionally violates the psychological contract after weighing the advantages and disadvantages. Inability means that the organization is unable to fulfill its promises due to some uncontrollable external factors or insufficient organizational capacity. Understanding ambiguity means that due to the poor communication between the employee and the organization, cognitive bias or cultural differences, the organization cannot meet the promise and therefore results in psychological contract breach. When employees perceive that the organization has not fully fulfilled the contract due to the above factors, they will initiate a comparison process. If the compensation (both tangible and intangible) from the organization is lower than the cost invested in fulfilling the psychological contract, the employees will experience psychological contract breach.

In addition, there have been plenty of studies focusing on the antecedent variables that cause psychological contract breach from different perspectives. At the individual level, personality traits are strongly associated with psychological contract breach. Neuroticism has a

positive influence on psychological contract breach, while perceptiveness is negatively related to psychological contract breach, and individuals with neuroticism tend to perceive psychological contract breach more easily due to lack of trust (Raja et al., 2004). An individual's attributional style also influences the degree of perceived psychological contract breach, with external attributional style positively correlated with psychological contract breach. This positive correlation will be weakened if employees tend to seek information from their supervisors, while obtaining information through peers will enhance this correlation (Hermida & Luchman, 2013). The employees will be more likely to perceive psychological contract breach if they experience role conflict, perceived lack of career development opportunities, or lack of control over their work (Xavier & Jepsen, 2015). At the relational level: when superiors and subordinates share the same cognitive style, their shared reference framework will minimize potential misunderstandings and therefore the intention of psychological contract breach will be reduced (Suazo et al., 2005). At the organizational level, factors such as organizational change, perceived organizational support, organizational politics, and job resources all have a significant impact on the generation of psychological contract breach (Rosen et al., 2009; Vantilborgh et al., 2016).

Generally speaking, the impacts of psychological contract breach are mainly manifested in affective, attitudinal, and behavioral aspects.

The affective reactions to psychological contract breach are mainly in the psychological contract violation and organizational distrust. Psychological contract breach is a significant predictor of psychological contract violation, but psychological contract violation is not an inevitable outcome of psychological contract breach (Morrison & Robinson, 1997; Raja et al., 2004; Turnley & Feldman, 1999). McAllister (1995) argues that there is an affective component in trust and trust relationships can increase the affective engagement of individuals. Once psychological contract breach occurs, employees will become skeptical about the organization, which in turn leads to hostility toward organizational motives and retaliation against the organization through a decrease of work engagement.

The impact on work attitude is manifested by a decrease in job satisfaction and organizational commitment. When employees perceive psychological contract breach, they tend to reduce their organizational commitment and organizational identification (Conway & Briner, 2002; Coyle Shapiro & Kessler, 2000). In addition, there is a significant negative correlation between psychological contract breach and job satisfaction. The employees' job satisfaction will decrease when there is a perceived inconsistency between what is promised and what they actually get.

Psychological contract breach has an overall negative effect on employee behavior, and

employees tend to reduce their commitment to the organization or leave the organization (Robinson et al., 1994). Employees who perceive psychological contract breach will experience a decline in their in-role performance (Suazo et al., 2005). In addition, psychological contract breach significantly reduces employees' willingness to engage in organizational citizenship behaviors within the organization, and the higher the level of psychological contract breach, the less the organizational citizenship behaviors (Robinson & Morrison, 1995). Moreover, psychological contract breach can stimulate negative behaviors of employees within the organization, such as workplace deviance (Chiu & Peng, 2008) and absenteeism (Johnson & O'Leary Kelly, 2003). The employees consider these behaviors as a form of retaliation to reestablish equality in the employment relationship. Corresponding to the retaliation intention, some employees may have turnover intention, and it has been empirically verified that psychological contract breach has a significant correlation with employees' turnover intention and rational behavior (Conway & Briner, 2002).

The psychological contract breach reflects the psychological measure of the employee's perception that his or her relationship with the organization is in a state of disequilibrium (Van Stormbroek & Blomme, 2017), and when the employees perceive psychological contract breach, they would believe that they are treated unfairly by the organization and may maintain internal balance by reducing positive behaviors or adopting negative behaviors (Cao & Li, 2016). The psychological contract breach perceived by the healthcare professionals will lead to a decrease in their trust in the organization and thus they will no longer be willing to fulfill their obligations to the organization. Therefore, the implementation of information system in organizations will increase the workload of the healthcare professionals, which will lead to their perception of psychological contract breach. This perception will gradually be transformed to behaviors as reflected in the resistance of the healthcare professionals to information systems (user resistance). On this basis, the following hypothesis H2 is proposed.

H2: Psychological contract breach has a positive relationship with user resistance.

The psychological contract refers to an individual's unilateral understanding and beliefs about the responsibilities and obligations that he or she and the organization need to assume respectively in the employment relationship (Rousseau, 1995). If employees can feel the goodwill of the organization, such as obtaining a variety of resources from the organization, they will be less prone to psychological contract breach. On the contrary, if the employees are treated unfairly or if their promises are not fulfilled, the likelihood of psychological contract breach will be further increased. Xie et al. (2021) argue that when employees perceive that the organization fails to fulfill its promises or responsibilities, they will have a cognitive response of

psychological contract breach, which will adversely affect their work attitudes and organizational behaviors (Zhong et al., 2020). As the implementation of an information system requires health professionals to spend a lot of time and energy to learn, adapt and apply, the workload of the health professionals is increased. The increase of workload, which is an important stressor, may threaten or lead to the loss of employees' individual resources (Ma et al., 2017). High workload may cause the health professionals to feel that their physical and mental resources are threatened, and they tend to believe that the organization has violated the agreement of reciprocity between the two parties, thus giving rise to the perception of psychological contract breach. Based on this, the following hypothesis H3 is proposed.

H3: Workload is positive related with psychological contract breach.

Lin et al. (2018) proposed an exploratory model to examine user resistance in information system implementation from the perspective of psychological contract breach. It is found that user-perceived psychological contract breach leads to user resistance and feelings of breach, and the relationship between user-perceived psychological contract breach and feelings of breach is moderated by unfulfilled promises, hypervigilance, user explanations of the breach (causal attribution of the breach), and perceived fairness after the breach. Ma et al. (2019) explored the relationship between job insecurity, psychological contract breach, and counterproductive work behavior and tested the mediating role of psychological contract breach as well as the moderating role of employment status. The results show that psychological contract breach partially mediates the influence of job insecurity on counterproductive work behaviors, including counterproductive behaviors toward the organization and counterproductive behaviors toward the interpersonal relationship. In addition, there are significant differences between permanent and contract workers in the relationship between job insecurity, psychological contract breach, and counterproductive work behavior. On this basis, the following hypothesis H4 is proposed.

H4: Psychological contract breach mediates the relationship between workload and user resistance.

2.6 Overview of emotional exhaustion

2.6.1 Connotation of emotional exhaustion

The focus on emotional exhaustion originates from the study on job burnout. Based on his observation of medical workers and his personal experience, Freudenberger (1974) first proposed

the concept of burnout and defined it as a set of physical, behavioral, and psychological negative symptoms, including feelings of exhaustion and fatigue, headaches, insomnia, and abnormal behaviors. Leiter and Maslach (1988) noted the phenomenon of burnout at work and considered emotional exhaustion as a manifestation of burnout and a response to excessive workload. Since the concept of job burnout was introduced, the phenomenon of emotional exhaustion has also attracted the attention of scholars. Many scholars have defined emotional exhaustion, but there are no fundamental differences between these definitions. Many scholars adopt Maslach and Jackson (1981) definition of emotional exhaustion in their research, and in this research, we also adopt Maslach and Jackson (1981) definition that emotional exhaustion refers to feelings of being emotionally overextended and depleted of emotional resources by work.

2.6.2 Measure of emotional exhaustion

Emotional exhaustion measurement scale was developed along with the job burnout inventory. As the core dimension of job burnout, emotional exhaustion has been studied by many scholars. In 2003, Li and Shi (2003) translated the Maslach Burnout Inventory - General Survey (MBI-GS) developed by Li and Shi (2003), in which emotional exhaustion consists of five items. The quality of MBI has been extensively tested in studies around the world and across the various industries. Demerouti et al. (2001) developed the Oldenberg Burnout Inventory (OLBI), which includes two dimensions of disengagement and exhaustion. The quality of OLBI has also been verified in different industries. The OLBI has gradually attracted more attention from more researchers. Li and Shi translated MBI-GS and tested its reliability and validity. When selecting measure of emotional exhaustion, we fully consider the questionnaire reliability and validity, as well as applicability in the Chinese context. As we only measure the variable of emotional exhaustion in this research, the 3-item scale used in the study of Watkins et al. (2015) is selected, with sample items such as "Work makes me feel emotionally drained".

2.6.3 Review of research on emotional exhaustion

Research has shown that there are many factors influencing emotional exhaustion, and they can be broadly classified into several categories including individual differences, work factors, organizational factors, and social factors.

Demographically speaking, women are more likely to feel exhaustion than men (Bakker et al., 2002), and the level of emotional exhaustion decreases with the increase of age (Maslach et al., 2001). In addition, individuals with low levels of tolerance and self-esteem, external control,

and type A personality are more likely to develop emotional exhaustion (Bakker et al., 2002; Maslach et al., 2001). In contrast, individuals with high self-efficacy are less likely to feel emotionally drained (Evers et al., 2002). In terms of work-related factors, role conflict and role ambiguity (Burke & Greenglass, 1995; Coffey & Coleman, 2001; Moore, 2000), role overload (Jackson et al., 1986), interpersonal conflict (Leiter & Maslach, 1988), lack of job autonomy and inadequate pay can all significantly predict the occurrence of emotional exhaustion (Jackson et al., 1986; Moore, 2000).

Usually organization-related factors such as organizational change and organizational equity can also predict emotional exhaustion. When organizations are about to undergo mergers and layoffs, the internal turmoil and instability makes employees more likely to feel anxious and fidgeted and in turn generate emotional exhaustion. In addition, Li and Shi (2003) found that an equitable distribution has a significant negative predictive effect on emotional exhaustion. Social factors can also affect emotional exhaustion, and typical social factors include social support. Family support is the most important factor in alleviation of emotional exhaustion (Baruch-Feldman et al., 2002). Support from superiors is more likely to reduce emotional exhaustion than support among colleagues (Maslach et al., 2001).

Research on the outcome variables of emotional exhaustion has focused on both the individual dimension and the organization-wide dimension. It has been generally demonstrated that the impacts of emotional exhaustion on both individuals and organizations are negative. The impacts of emotional exhaustion on individuals mainly include employee work-family conflict, work withdrawal behavior, and undesirable job performance. Li (2003) found that emotional exhaustion has a significantly positive predictive effect on employees' turnover intention. Liu et al. (2016) analyzed the current situation of burnout among college teachers and the influencing factors, and found that emotional exhaustion has a significantly negative impact on job performance. The impact of emotional exhaustion on the organization is mainly negative influence on organizational performance. Emotional exhaustion brings more stress to the employees and causes them to develop some negative behaviors, which in turn affects individual performance and organizational performance (Cropanzano et al., 2003).

Emotional exhaustion is a state in which emotional resources are depleted after overuse of mental and emotional resources (Yan et al., 2020). Stressors at work are often considered to be important antecedents of emotional exhaustion of the employees (Qi et al., 2020). According to the conservation of resources theory, individuals tend to conserve, protect, and acquire resources. Threats to resources can trigger feelings of tension and stress, and excessive resource

depletion without replenishment can lead to emotional exhaustion (Hobfoll, 2004). When employees feel overloaded at work, they will perceive tension, worry, anxiety and disappointment, and are susceptible to sleep disorders, which will cause both psychological and physiological damage to the user. Emotional exhaustion occurs when an individual's emotional resources are consumed beyond the upper limit of their burden. On this basis, the following hypothesis H5 is proposed.

H5: Workload has a positive relationship with emotional exhaustion.

Lim and Choi (2017) explored the effects of stress caused by social media apps on users' psychological and behavioral responses, including emotional exhaustion, intention to switch apps, and resistance. Users need to spend a great deal of time and energy and invest a lot of psychological resources to relieve psychological stress and anxiety, resulting in excessive loss of resources and thus accelerating the emotional exhaustion of employees. Previous studies have shown that emotional exhaustion can lead to a series of negative outcomes (Dong et al., 2020). For example, emotional exhaustion can trigger workplace deviant behaviors and reduce job satisfaction and well-being at work. Chen et al. (2020) think that in a state of emotional exhaustion, the users may reduce their efforts, reduce their workload, or avoid adverse changes to protect and compensate for their resources, cope with stress, and vent their emotions, and, in turn, are likely to resist the implementation of information system. On this basis, the following hypothesis H6 is proposed.

H6: Emotional exhaustion has a positive relationship with user resistance.

Karatepe (2013) proposed and tested a research model to explore how emotional exhaustion acts as a mediator of the effects of work overload, work-family conflict and family-work conflict on perceived job embeddedness and job performance. Based on data from 110 full-time frontline hotel employees and their managers in Romania, the research used Structural Equation Modeling (SEM) for evaluation and the result indicates that emotional exhaustion fully mediates the relationship between work overload, work-family conflict, and family-work conflict, and perceived job embeddedness and job performance. To be specific, employees who have workload or are unable to strike a balance between work and family roles will feel emotionally exhausted, and in turn, they will present poor job performance and a reduced sense of embeddedness in their jobs during service delivery. In summary, workload may trigger user resistance by influencing the emotional change of users, namely, occurrence of emotional exhaustion. On this basis, the following hypothesis H7 is proposed.

H7: Emotional exhaustion mediates the relationship between workload and user resistance.

2.7 Overview of perceived organizational support

2.7.1 Connotation of perceived organizational support

Based on the social exchange theory in social psychology, Eisenberger first introduced the concept of perceived organizational support in 1986, which is used to reflect the employees' perception of the commitment made by their organizations to them. Eisenberger defines perceived organizational support as employees' beliefs concerning the extent to which their organization cares about their well-being and values their contributions. This definition includes two main points: first, employees' perceptions of whether the organization values their contributions; and second, employees' perceptions of whether the organization cares about their well-being. In 1997, McMillin supplemented to the concept of perceived organizational support proposed by Eisenberger et al., arguing that instrumental support (information, training, tools and equipment needed to finish the job) is necessary to get the job done and should be an important part of perceived organizational support.

2.7.2 Measure of perceived organizational support

In 1986, Eisenberger et al. (2001) developed a survey scale to measure perceived organizational support. It is a 5-point Likert scale with 36 items in total, including 18 positively described items and 18 negatively described items. Sample items include "The company values my contribution to it". The questionnaire has been tested to have high reliability and validity, and confirmed the unidimensional nature of perceived organizational support.

The scale developed by Rhoades and Eisenberger in 2001 is currently the most widely used one and has made great contribution to the measure of perceived organizational support. It is a 5-point Likert scale with 8 items such as "My company really cares about my health". In 2006, Ling et al. developed a questionnaire to explore the dimensions of employees' perceived organizational support through an empirical study. They found that the structure of employees' perceived organizational support in China was not unidimensional as proposed by Eisenberger, but three-dimensional including work support, value identity, and concern for interests. The questionnaire is scored on a 6-point scale and includes 24 items, with sample items such as "Values employees' opinions at work". It has relatively high reliability and validity.

In addition, Bao and Liu (2011) developed the Chinese Employee Perceived Organizational Support Scale based on the findings of previous studies and small-scale interviews, suggesting

that employees' perceived organizational support comes from the organizational system, supervisors and colleagues. The perceived supervisor support is further divided into task-oriented support and relationship-oriented support, and perceived colleague support is further divided into work support and life support, thus proposing a multidimensional model. This is also a 5-point Likert scale with 37 items, with sample items such as "The organizational system ensures that I receive the funds necessary to do my job".

2.7.3 Review of research on perceived organizational support

With the gradual development and improvement of the perceived organizational support theory, Rhoades and Eisenberger (2002) inherited Eisenberger's view and argue that the antecedent variables of perceived organizational support mainly include organizational fairness, superior support, and work environment. In order to maintain healthy and benign development of an organization, it is necessary to treat employees fairly, which will make them feel a sense of belonging. In addition, employees should get strong support from their superiors, and the organization should provide employees with a good working environment. Organizational human resource policies can also affect employees' perceived organizational support. Employees' perceptions of procedural fairness are generated through their awareness of organizational policies such as wage increases and job promotions, and employees' feelings of organizational support are naturally generated through their continued perceptions of procedural fairness. Through an empirical study, Huang (2010) found that procedural fairness, perceived supervisor support, organizational compensation, and working conditions are also important antecedent variables of perceived organizational support. In addition, demographic variables such as age, gender, and marital status, length of service, education level, and personality traits are also among the factors that affect employees' perceived organizational support.

In the existing Chinese and foreign studies, the impacts of the perceived organizational support mainly focus on the influence on employees' attitudes and behaviors and most of the impacts are positive. Eisenberger et al. (1986) found that perceived organizational support has a positive effect on employee satisfaction, emotional attachment and organizational commitment. Loi et al. (2006) found that perceived organizational support has a positive influence on organizational commitment and a negative influence on turnover intention. Chen et al. (2009) pointed out that perceived organizational support can trigger extra-role behaviors of employees. Ling et al. (2006) believe that perceived organizational support will induce organizational citizenship behaviors among employees. Tian and Xie (2010) contend that perceived organiza-

tional support will reduce employees' active absenteeism. In addition, as a psychological perception of employees towards the organization, the perceived organizational support affects individuals' attitudes toward work (Chiaburu et al., 2015; Rhoades et al., 2001; Huang et al., 2020). A high level of perceived organizational support not only makes it easier for employees to form emotional bonds with the organization and increase their sense of identification and belonging to the organization, but also motivates employees to generate more positive emotions at work so that they can work in a more positive manner.

Organizational support refers to the degree to which employees perceive that the organization values their contribution and well-being at work (Eisenberger et al., 1986). Emotional support, welfare support, and instrumental support from the organization provide the employees with a positive work experience and enable them to feel respected, cared, and valued by the organization (Rhoades & Eisenberger, 2002). As a psychological perception of the organization by the employees, organizational support affects individual attitudes toward work and their behaviors (Chiaburu et al., 2015; Rhoades et al., 2001). A high level of organizational support not only makes it easier for employees to form an emotional bond with the organization and increase their sense of identification and belonging to the organization, but also promotes the employees to generate more positive emotions at work so that they will treat their work in a more positive manner. It is believed that organizational support can diminish the positive impact of workload on employee psychological contract breach. According to the cognitive-affective system theory, the characteristics of the external environment of individuals can activate the cognitive and affective units of the personality system, which will in turn exert a significant impact on the individual's behavioral performance (Mischel & Shoda, 1995). Employees with high organizational support tend to believe that the organization is safe and trustworthy, and employees will feel confident and hopeful if the organization respects and acknowledges their contributions to the organization (Eisenberger et al., 2001). High perceived organizational support can effectively alleviate the psychological stress caused by workload, and the degree of employee psychological contract breach will be reduced accordingly. On the contrary, employees with low perceived organizational support receive less encouragement, respect and rewards from the organization and believe that the organization has low recognition of their abilities and values (Y. J. Zhang et al., 2016). The workload will widen the psychological distance between employees and the organization. The employees will feel stronger psychological pressure and their psychological contract breach will be further intensified. In summary, in the face of workload, employees with high organizational support will have reduced psychological contract breach. In this context, the following hypothesis H8 is proposed.

H8: Organizational support negatively moderates the relationship between workload and psychological contract breach, more specifically, the higher the organizational support, the weaker the positive correlation between workload and psychological contract breach.

Kowalski et al. (2010) examined the relationship between hospital social capital, individual decision-making freedom, workload, and emotional exhaustion, with age, gender, years of professional experience, and length of service as the control variables. The results show that workload (positive correlation), decision-making freedom (negative correlation) and hospital social capital (negative correlation) are significantly correlated with emotional exhaustion. Organizational support at the collective level of the hospital encompasses a broader and deeper system of social support, which reflects the hospital's organizational culture and values, and promotes the sharing of knowledge and resources as well as collaboration among inter-disciplinary teams. Such support not only shapes a positive work environment and enhances employees' job satisfaction and sense of belonging, but also builds a sense of psychological security and mutual trust, encouraging employees to seek help and express concerns in the face of work stress. Through these mechanisms, collective-level organizational support effectively reduces emotional exhaustion caused by workload. It is emphasized that the hospital administrators need to build supportive organizational environments from a holistic and collective perspective to improve employee well-being at work. On this basis, the following hypothesis H9 is proposed.

H9: Organizational support at the hospital collective level has a stronger relationship with workload (H9a) and psychological contract breach (H9b) than organizational support at the individual employee level.

According to the cognitive-affective system theory, the individual's cognitive units and affective units are interacting systems, and individual's cognitive processing of important social information often has an affective arousal function (Mischel & Shoda, 1995). In this case, the situation in which individuals are located will stimulate their cognitive and affective units, which will in turn determine their specific behaviors. To be specific, employees with high perceived organizational support can feel the affective support and care from the organization compared to those with low perceived organizational support, which alleviates their emotional resources depleted due to high workload and prevents them from developing a negative state of emotional exhaustion(Rhoades & Eisenberger, 2002) In contrast, employees with low perceived organizational support cannot feel the affective and material support from the organization, which tends to increase their emotional exhaustion caused by high workload. To sum up, when employees with high perceived organizational support are faced with workload, their negative state of emotional exhaustion will be alleviated. Therefore, the following hypothesis H10

is proposed.

H10: Organizational support negatively moderates the relationship between workload and emotional exhaustion, more specifically, the higher the organizational support, the weaker the positive correlation between workload and emotional exhaustion.

Organizational support at the collective level of the hospitals provides a more comprehensive system of resources and support, including social capital, teamwork, and sharing of organizational culture and values, which work together to reduce work stress and emotional exhaustion. Aiken and Sloane (1997) found that nurses working in specialized AIDS-related institutions, or in "magnet" hospitals that are perceived to have organizational characteristics that attract nurses, show relatively low levels of emotional exhaustion than nurses working in generalized, decentralized bed-based healthcare institutions. These differences persist after controlling nurse characteristics, partly due to control of perceived organizational support of the nurses in the workplace. This study highlights that the improvement of organizational support and resource sharing can effectively reduce emotional exhaustion of nurses in hospitals, thereby improving the quality of healthcare services and job satisfaction of the nursing staff. Therefore, the following hypothesis H11 is proposed.

H11: Organizational support at the hospital collective level has a stronger relationship with workload (H11a) and emotional exhaustion (H11b) than organizational support at the individual employee level.

2.8 Overview of user resistance

2.8.1 Connotation of user resistance

No consensus has been reached on the definition of user resistance, and the most cited definitions of user resistance fall into two categories. The first category is the definition given by the American scholar (Markus, 1983), and user resistance is defined as a variety of implicit or explicit actions by individuals to prevent the implementation or use of an information system. This category of definitions emphasizes the behavioral manifestations of user resistance. The other category is the definition given by Kim and Kankanhalli who define user resistance as an individual's adverse reaction and opposition to potential changes resulting from information system implementation. This category of definition emphasizes the behavioral causes of user resistance (Kim & Kankanhalli, 2009). Therefore, in this study, we list the elaborations given

by different scholars on the different definitions of information system resistance as shown in Annex C.

2.8.2 Types of user resistance

In the research on information systems, scholars have classified user resistance into different categories based on different perspectives. Dickson and Simmons (1970) described three types of resistance, namely, aggression (the physically or non-physically aggressive behavior toward the target individual who causes the problem, and often with the behavioral intent to harm or damage), projection (the behavior occurred when the user blames the system for difficulty in work), and avoidance (the behavior of the user to avoid or distance himself from the system). (McGrath et al., 1998) classified user resistance into cultural resistance, social resistance, organizational resistance, and psychological resistance. To be specific, cultural resistance and psychological resistance are caused by individual traditional values and conservative mentality, while social and organizational resistance are closely related to power redistribution. Other scholars have classified user resistance into apathy, passive resistance, active resistance, and aggressive resistance based on the intensity of the resistance (Joseph, 2010; Lapointe & Rivard, 2005; Lauer & Rajagopalan, 2002; Malm-Nicolaisen et al., 2022). Specifically, apathy refers to lack of interest in the information system implementation and is manifested as inaction and alienation; passive resistance is implicit and includes delay tactics, excuses, persistence of previous behavior, and withdrawal of system use; active resistance is characterized by explicit but less destructive behaviors, including voicing opposite points of view or instigating others to jointly resist the new system; aggressive resistance is the most destructive resistance, including strike, joint boycott or even sabotage. Based on previous studies, Seol et al. (2017) classified resistance into two categories from the perspective of behavioral expressions: active resistance and passive resistance. Shang (2012) classified resistance into non-destructive resistance, passively destructive resistance, and aggressively destructive resistance, which is consistent with the previous four categories in their connotations. Shirish and Batuekueno (2021) have also mentioned this point in their study. Non-destructive resistance aims to eliminate the user's relationship with the system. In this form of resistance, users request to transfer from their current position or resign, increase absenteeism or work procrastination, and convey negative feelings to co-workers, but they cause no substantial damage to the system. Destructive resistance, on the other hand, is a behavior that directly prevents or destructs the implementation or application of the system and is further subdivided into positively destructive resistance and negatively

destructive resistance. User resistance is classified into affective resistance, behavioral resistance, and cognitive resistance. The specific classification of user resistance is shown as per Annex D, and new classifications will emerge as user resistance research progresses.

(1) Aggression, projection and avoidance

Dickson and Simmons (1970) described three types of resistance, namely, aggression (the physically or non-physically aggressive behavior toward the target individual who causes the problem, and often with the behavioral intent to harm or damage), projection (the behavior occurred when the user blames the system for difficulty in work), and avoidance (the behavior of the user to avoid or distance himself from the system).

(2) Withholding data, providing inaccurate data, distrusting computer output and showing lowered morale

In the context of computer-based system usage, Sanders (1974) argues that user resistance is mainly reflected in the forms of withholding data, providing inaccurate data, distrusting computer output, and showing lowered morale.

(3) Apathy, passive resistance, active resistance and aggressive resistance

According to the classification of user resistance by Joseph (2010) and Malm-Nicolaisen et al. (2022), user resistance is divided into four levels: apathy, passive resistance, active resistance, and aggressive resistance. Specifically, apathy includes inaction, distance, and lack of interest; passive resistance includes delay tactics, excuses, persistence of previous behavior, and withdrawal of system use; active resistance is characterized by strong but less destructive behaviors, including voicing opposite points of view and asking someone else to intervene or forming a coalition to resist the objects; aggressive resistance is the most destructive resistance, including infighting, threats, boycotts or even sabotage.

(4) Active resistance and passive resistance

From the perspective of behavioral manifestation, Seol et al. (2017) divided resistance into active resistance and passive resistance. For active resistance, people express personal concerns and objections to the system or leave the organization because of unwillingness to adapt to the new system. For passive resistance, people reluctantly accept the system and respond to the system in a contingent way. However, they secretly cooperate with each other to deliberately disrupt the system.

(5) Non-destructive resistance and destructive resistance

A more comprehensive classification was proposed by Shang, who, based on the classification of Lauer and Rajagopalan, added the criterion of "whether the outcome of the behavior

is destructive" and classified resistance into non-destructive resistance and destructive resistance (Shang, 2012). In addition, Shirish and Batuekueno (2021) also mentioned this point in their research. Non-destructive resistance is aimed at eliminating the user's relationship with the system, and is manifested as applying for transfer from the current position to another one or resigning, increasing absenteeism or procrastination, and exchanging negative feelings with colleagues, which will not cause substantial damage to the system. Destructive resistance, on the other hand, directly prevents or disrupts the implementation or application of the system, and is further subdivided into positively destructive resistance and negatively destructive resistance. The former refers to the direct destruction of the processing procedures of the new system, such as deliberate disruption of the workflow, and intentional errors caused by carelessness; the latter prevents the implementation of the organization's new system through passive disruption, which commonly takes the form of refusing to cooperate with other employees, neglecting work tasks, wasting time and not making effective efforts to improve job-related knowledge and skills, accepting poor quality performance and refusing to cooperate with consultants.

The classification of information system resistance in the existing literature has all been made from the perspective of individual behavior. However, information system projects are carried out in an organizational setting. A group is the grassroots component of the organization and group behavior exerts a significant impact on organizational behavior. Therefore, research on information system resistance should include both individual and group behavior. Although Lapointe and Rivard (2005) mentioned group resistance in their study, they mainly used the multi-level analysis method to explain the nature of individual behavior leading to group behavior in a bottom-up manner in resistance, and focused on explaining the formation process of group resistance, with no elaboration on the manifestation forms of group resistance to the information system. In this research, we adopt the definition of user resistance by Y. J. Zhang et al. (2016) according to different stages of information system implementation. In the pre-implementation stage and during-implementation stage, user resistance refers to the behavior of individuals trying to prevent the successful implementation of the information system. In the post-implementation stage, user resistance refers to the behavior of individuals not making full use of the information system.

2.8.3 Measure of user resistance

The questionnaire developed by Kim and Kankanhalli (2009) is the most commonly used measure of user resistance. It consists of four items such as "I do not comply with the changes in

work style brought about by the implementation of the information system" and "I am against the changes in work paradigm brought about by the implementation of the information systems", with an internal consistency coefficient of 0.894. The degrees of user resistance vary from covert passive behavior to overt active behavior, and the items in the scale also distinguish between explicit (opposition) and implicit (indifference) user resistance.

2.8.4 Review of research on user resistance

2.8.4.1 Influencing factors of user resistance

In the field of information system, there are many studies focusing on user resistance. Scholars have been exploring the causes of resistance and endeavoring to identify the factors that contribute to user resistance behavior. In this research, the factors influencing user resistance are divided into three levels: individual level, team level, and organizational level (Annex E).

(1) Individual level

If a system is likely to bring threats to users, the users will adopt some resistant behaviors to respond to these threats (Lapointe & Rivard, 2005; Lin et al., 2018). The factors of resistance at the individual level can be summarized in terms of personal psychology and position power. From the perspective of personal psychology, Selander and Henfridsson (2012) argue that users' negative emotions in the face of information systems can increase their resistance. Perceived value (Hsieh & Lin, 2018; Kim & Kankanhalli, 2009) is also an important influencing factor. The implementation of a new information system will bring some value to the users, and if employees perceive that using the new system can create more value, their resistance to the information system will be reduced accordingly. From the perspective of position power, the implementation of a new system may cause employees to feel that their position power is threatened, and when such perceived threats exist, employees may resist the new information system. Iyanna et al. (2022), Kim and Kankanhalli (2009), Krogh (2018), Rivard and Lapointe (2012) believed that the post-implementation resistance commonly seen in organizational change is due to the discrepancy between the expected position and associated rights and responsibilities before implementation and the actual consequences experienced after implementation.

(2) Team level

As people in the workplace are social beings, other people in the team are also important factors that influence employee behavior; Kim and Kankanhalli (2009) found that opinions of colleagues can affect employee behavior, and objections of colleagues to the information system can also increase user resistance. In addition, the efficiency of communication between the

leaders and members of the team also affects employee resistance. If the new information system is implemented after sufficient leader-member communication and exchange, the employees will be more willing to use the new information system (Popovič, 2017). Finally, the mutual collaboration and support of team members can also help them quickly adapt to the use of the new information system. If there is no cooperation among the team members, it will be difficult for them to adapt to the new work system on their own, and the lack of collaboration can also increase resistance (Ilie & Turel, 2020).

(3) Organizational level

The factors influencing user resistance at the organizational level can be described in terms of organizational behavior and technology. From the perspective of organizational behavior, organizational support, organizational infrastructure, and user training are all factors influencing user resistance. From the perspective of technology, influencing factors include system design and technical process fit. Organizational support and user training are two complementary factors. The employees can gain mastery of the new system through individual efforts, and external organizational support for change can achieve the same results. Organizational support for change is defined as the perceived convenience provided by the organization to make it easier for users to adapt to changes related to the new information system (Kim & Kankanhalli, 2009). The transition to new working styles and new information systems requires guidance and related resources for learning. Facilitating changes through mechanisms such as training and provision of resources may influence users' responses to new information systems-related changes (Aslam, 2011). As the level of organizational support for change increases, users may react less negatively to the implementation of the new information system with less resistance. The ease of use as well as the usefulness and efficient design of the system can increase the likelihood for the use of the new systems (Ilie & Turel, 2020; Iyanna et al., 2022; Krogh, 2018), and the organization should also ensure the fit between system processes and the organization's operational processes so that the new information system can adapt to the organization's operations (Popovič, 2017).

2.8.4.2 Impacts of user resistance

User resistance is identified as a key challenge to the implementation of information technology systems and achievement of information technology advantages (Ali et al., 2016; Lapointe & Rivard, 2005; Laumer et al., 2016; McGrath et al., 1998). It is a behavior of confrontation, and a perception of "threat" generated by the actors in their evaluation of the inevitable interaction

between IT and the social and political structures (Meissonier & Houzé, 2010; Van Offenbeek et al., 2013). The details are shown as per Annex F.

(1) Individual level

The impact of user resistance on employees is mainly reflected on three dimensions of affection, cognition and behavior (Oreg, 2006). The affective components refer to the negative emotions such as frustration and dissatisfaction in the game of resistance as employees feel lost and anxious about not being able to adapt quickly to the new work model when faced with a new work information system, especially when the organization requires mandatory usage of the system (Vaghasiya et al., 2021). The cognitive components mainly involve individual views on the work environment and changes in work patterns. For instance, employees may question the application of the information system and mandatory organizational requirements. The behavioral components refer to the behavioral responses of individuals generated after the cognitive assessment, such as the indifference and non-cooperation towards the implementation of the information system (Nilsen et al., 2019). It has been found that behavioral intentions of individuals, their emotional perceptions, and their cognitive evaluations are a continuous process (Oreg, 2006). Therefore, user resistance can trigger negative emotions of the employees, and the increased work stress caused by the accumulation of negative emotions indirectly triggers more undesirable behaviors (Westbrook et al., 2022), such as inaction (Lapointe & Rivard, 2005), rumors about colleagues, and deliberate breaking of IT implementation rules (Bhattacherjee et al., 2018).

(2) Organizational level

User resistance can have further impact on organizational development based on its adverse impact on individuals. It has been proved that user resistance is a significant obstacle that prevents organizations from dealing with practical problems (Oreg, 2006). User resistance by employees leads to difficulties for organizational management after the system is put into use (Lapointe & Rivard, 2005). Resistance also brings about a huge waste of resources such as time and money for the organization (Chi et al., 2020)and may even lead to overall failure of IT system innovation (Bhattacherjee et al., 2013), ultimately leading to stagnation of IT-driven change and innovation in companies. To be specific, when a company implements a new system for the first time, user resistance can spread rapidly among employees due to the complexity of the IT system and organizational environment, and the spread of resistance is much faster than the speed of system implementation (Wang et al., 2013), which can result in delays in the system implementation cycle. If a company needs to customize the system for certain departments

or lines of work, such as the finance department, it will spend substantial resources in developing, implementing, and maintaining the system. Furthermore, previous studies have found that some of the relatively extreme negative user resistance behaviors, such as threats and joint boycotts (Lapointe & Rivard, 2005), can not only lead to great difficulties for organizational management, but also expose the company to the risk of an overall failure of information system reform. However, although resistance and acceptance are originally two behaviors with different attributes, it has been suggested that user resistance and user acceptance are not necessarily opposites, but may be located at opposite ends of a "continuum" (from resistance to acceptance) (Bhattacherjee et al., 2018; Rizzuto et al., 2014).

2.9 Summary of literature review

With changes of management environment and management objectives in modern companies, there has been an increasing need for scientific and predictive management decisions, and the emergence and application of information systems can facilitate business management decisions in modern management environment. However, organizations encounter many obstacles in the implementation of information systems, and one of the key reasons for failure of information system implementation is the existence of user resistance. The information system implementation includes three stages, namely, pre-implementation stage, during-implementation stage, and post-implementation stage (Klaus & Blanton, 2010) and user resistance occurs frequently in all the three stages. Review of existing literature shows that previous studies mainly analyze the influencing factors of user resistance from the pre-implementation or post-implementation stages (Kemp & Low, 2008; Y. J. Zhang et al., 2014), with insufficient research on the during-implementation stage. However, the influencing factors of user resistance are differentiated in different implementation stages, and it is equally crucial to analyze the influencing factors of user resistance in the during-implementation stage of information systems. In addition, literature review reveals that previous studies have mainly focused on corporate employees and users, and no studies have yet been conducted on healthcare professionals in healthcare contexts. Therefore, this study intends to identify the factors that influence the resistance of hospital information system users in the during-implementation stage from the perspective of the users, namely, the healthcare professionals.

The healthcare professionals are already busy with their daily work. In the during-implementation stage of the information system, they have to learn and use the information system in addition to their own medical affairs. When forced to change their way of working, the users

need to spend more time and efforts to understand and learn the knowledge and technical operations related to the information system (Lapointe & Rivard, 2005). In the during-implementation stage, the substantial changes in work tasks exert the greatest impact on the healthcare professionals. In contrast, in the pre-implementation stage, the subjective perception of future uncertainty influences more on the users' psychological state, and users perceive that information system implementation may lead to favorable changes (transfer benefits) as well as adverse changes (transfer costs) (Kim & Kankanhalli, 2009). In addition, in the post-implementation stage, information system implementation is often seen as a "chief-leader" project. If authoritarian leaders require the users to strictly follow instructions from their superiors, the users will have no opportunities to participate in decision-making and will be unable to question the procedures in place (Cheng et al., 2004). Compared with the pre-implementation and post-implementation stages, the added work tasks in the during-implementation stage always bring a huge workload for the users and exert a more profound and direct impact on user resistance. Therefore, we endeavor to explore the impact of workload on user resistance in the during-implementation stage of the information system.

Through the information system in different implementation phase of the relevant variables of research literature, found that scholars mostly focus on individual factors (Cheng et al., 2004)and organizational factors (Du & Cui, 2019), the influence of user resistance, such as subjective perception of uncertainty in the future (Kim & Kankanhalli, 2009), power loss (Peng, 2010), perceived transfer costs and transfer benefits (Y. J. Zhang et al., 2015). But in general, the relevant research results are still relatively limited. In the stage of the implementation of the information system, the users are forced to change the original working mode, and it needs to spend time and energy to re-understand and learn the knowledge and technical operation related to the information system. The increase of the workload virtually causes a huge workload to the users. Therefore, this study attempts to explore the impact of the ongoing implementation stage workload on user resistance.

A considerable number of scholars have devoted themselves to exploring user resistance in the during-implementation stage of information systems, and previous studies have proved the mediating role of negative emotions between perceived transfer costs and perceived transfer benefits and employee user resistance (Y. J. Zhang et al., 2015), as well as the mediating role of perceived value between perceived transfer costs and perceived transfer benefits and employee user resistance (Han, 2020). The theories mainly involve human-system interaction theory (Markus, 1983), equity-implementation model (Joshi, 1991), and status quo bias theory (Li & Hou, 2013). However, the path mechanisms by which workload affects user resistance is still

unclear in the existing research. Based on the cognitive-affective processing system framework, we find that the dual pathways through which workload affects user resistance will lead to physical (Kuroda & Yamamoto, 2019; Liu et al., 2021) and mental damage to the employees and generate psychological breach and emotional exhaustion (DiStaso & Shoss, 2020; Elsaied, 2022), in which case they may vent their dissatisfaction and stress through resistance behaviors (Klaus et al., 2015; Wright & Hobfoll, 2004). According to the cognitive-affective processing system framework, an individual's behavior is influenced by his or her cognitive processing and affective processing of external information, and the two processes often interact with each other. The implementation of information systems increases the workload of healthcare professionals. On the one hand, high workload makes healthcare professionals feel threatened in their physical and mental resources (Ma et al., 2017), and therefore they generate perceptions of psychological contract breach, so they are more likely to maintain internal balance by adopting negative behaviors (Cao & Li, 2016), such as resistance. On the other hand, excessive workload can trigger negative emotions such as anxiety and disappointment, which will accelerate employees' emotional exhaustion (Walji et al., 2009). Previous studies have proved that emotional exhaustion can trigger a range of negative outcomes (Chen et al., 2020). Therefore, this study aims to explore the mediating role of psychological contract breach (cognitive) and emotional exhaustion (affective) in the relationship between workload and user resistance.

Finally, most previous studies have explored the moderating role of employees' individual traits in user resistance. For instance, avoidance of uncertainty significantly moderates the relationship between job insecurity, positive emotions and user resistance (Y. J. Zhang et al., 2015); individual inertia moderates the relationship between perceived transfer benefits, perceived transfer costs and user resistance (Y. J. Zhang et al., 2015). Perceived organizational support is a general perception and belief, and previous research has found that high perceived organizational support can effectively increase organizational commitment of employees and reduce their negative behaviors such as withdrawal (Rhoades et al., 2001). It is also critical to analyze the moderating effects of perceived organizational support on workload, psychological contract breach, emotional exhaustion, and user resistance. However, the moderating effects of individual perceived organizational support on workload, psychological contract breach, emotional exhaustion, and user resistance have been ignored (Medzo-M'Engone, 2021; Prysmakova & Lallatin, 2021). If users perceive organizational support and receive beneficial feedback from the organization (Zhu et al., 2017), it will, to some extent, slow down the generation of psychological contract breach and emotional exhaustion and reduce user resistance. Therefore, we in-

troduce the perceived organizational support as the moderating variable to explore its moderating role in triggering user resistance in workload-induced psychological contract breach and emotional exhaustion.

2.10 Research hypotheses

From the perspective of health professionals and hospital information system, based on the summary of existing literature, we hope to find out the relevant influencing factors, reasons and solutions to the "resistance of health professionals to the use of information system during the implementation stage of the information system. To find out answers to this question, we design two sub-studies. Data analysis 1 is an investigation of the impact on health professionals' work behavior, which examines the influencing factors of user resistance among the health professionals during the implementation stage of an information system from a holistic and macro perspective. Data analysis 2 is a cross-level investigation of the influence of perceived organizational support, which aims to examine the influence of workload on psychological contract breach and emotional exhaustion through the study of multilevel regression models, and examine the moderating role of organizational support at the hospital level and the individual level.

2.10.1 The reasons for the division into two studies

This thesis is divided into two studies according to the content of the research, one is a cross-level study for the variable of perceived organizational support, in which we explore the influence of workload on psychological contract breach and emotional exhaustion through a multilevel regression model, and test the moderating role of perceived organizational support at the hospital level and the individual level respectively; the other is an exploration of the influence of the work behavior of health professionals, in which we construct hypotheses and conceptual modeling diagrams to test the influences among the variables of workload, user resistance, emotional exhaustion, and psychological contract breach.

There are several reasons for the division into two studies. The first study focuses on the work behaviors of healthcare workers and addresses the influence of workload, emotional exhaustion, and psychological contract breach on user resistance. The second is the requirement for depth and detail in the study. Each study focuses on different dimensions and levels of exploration, although closely related. The second study focuses on a cross-level analysis that explores the relationship between workload, psychological contract breach, emotional exhaustion, and perceived organizational support, which requires an in-depth analysis of the dynamic

interactions at different levels (such as the individual level and organizational level). Division into two studies allows each study to explore its particular theoretical framework and hypotheses in greater depth, increasing the quality and depth of the research. In addition, given the complexity of the research questions, the two studies, while both studies explore the factors influencing health professionals' resistance to information system implementation, their research questions and purposes have different complexities. The first study is more focused on the exploration of actual behavior. The cross-level nature of the second study calls for a more comprehensive perspective of analysis, taking into account not only feelings and behaviors at the individual level, but also influences at the organizational level. Division into two studies allows for a clearer definition of the scope and objectives of each study and is more helpful in clarifying theoretical contributions.

2.10.2 Reasons for designing cross-level studies

Traditional organizational studies usually cut organizations into individual, group and organizational levels. Researchers tend to emphasize either a macro perspective or a micro perspective. The macro perspective comes mainly from sociology, which emphasizes the collective common psychological and behavioral responses, while the micro perspective comes mainly from psychology, which puts more emphasis on individual psychological and behavioral differences. However, an organization is a complex system with multiple and interlocking levels. Individuals exist in teams, teams exist in departments, departments exist in companies, companies exist in industries, and industries exist in certain cultures. Individuals, teams, departments, companies, industries and cultures interact with each other to create outputs. Therefore, researchers should view organizations as an integrated system. As scholars have noted over the years, adopting only a macro or micro view does not provide a comprehensive explanation of organizational behavior. Generally speaking, the macro view pays little attention to differences between individuals and ignores the processes by which individuals' personalities, emotions, behaviors, and interactions may be elevated to higher levels, while the micro view similarly pays little attention to the context in which an individual finds himself/herself and potentially ignores the effects of that context on the individuals.

In order to address the above issues, over the past two decades of organizational research, the multilevel perspective has matured, confirming that organizations belong to both the macro- and micro-levels, and there are two scenarios that should be taken into account in the research methodology. The first is how group, organizational, and other situational factors may affect the outcome variables at the individual level in a top-down manner, and the second is how

individual perceptions, attitudes and behaviors are shaped in a bottom-up manner so as to form groups, units and organizations. In terms of the impact of organizational structure, organizations are made up of individuals, but organizations themselves have unique structures and cultures. A multilevel research approach allows researchers to consider both the individual and organizational levels to better understand how organizational structure affects individual behavior. From an organizational culture and climate perspective, multilevel analysis helps to examine the impact of organizational culture and climate on individual behavior and satisfaction. By considering organization-level variables, it is possible to better understand how organizational culture shapes employee attitudes and behaviors. From the perspective of teamwork and efficacy, multilevel methods can help researchers understand how individuals interact within teams and how factors at the team level affect team efficacy, such as leadership style and team climate.

The multilevel research approach can provide a more comprehensive understanding of the impact of internal and external organizational factors on the behavior of individuals and the organization as a whole, help build a more comprehensive and in-depth understanding of organizational and individual research that takes into account the different levels of factors, and provide strong support for the development of more effective management and intervention strategies. Therefore, in this study, a multilevel research approach will be used. The importance and necessity of the multilevel analytical approach in management and organizational behavior research has been further emphasized in recent years, especially by exploring complex issues such as organizational culture, team composition, leadership, and the interaction between individuals and organizations.

Mathieu and Chen (2011) reviewed the origins and development of the multilevel research paradigm in management research, emphasizing the importance of this methodology for a deeper understanding of organizational phenomena. Through multilevel analysis, researchers are able to simultaneously consider variables at different levels, such as individual, team, and organizational, thereby providing a more comprehensive explanation of the complex relationships in organizational behaviors and management practices. Schneider et al. (2017) explores the history of organizational climate and cultural constructs, highlighting the important role of multilevel analysis in uncovering how these constructs exert influences at different organizational levels. This approach allows researchers to identify how organizational culture and climate are transmitted from the top levels of an organization to individual employees and the impact of this transmission process on employee behavior and attitudes. Bell et al. (2018) discuss the impact of team composition on team effectiveness, demonstrating the value of applying a multilevel analytic approach to team research. This approach can help researchers understand

how diversity within teams affects overall team performance and collaborative effectiveness. Hoch and Dulebohn (2017) propose a theoretical framework that explores the impact of team personality composition on leadership in virtual teams, and further confirm the importance of multilevel analysis in research on leadership. By considering personality differences within teams, researchers can better understand how leadership functions in different team environments. Lanaj et al. (2016) demonstrate the application of cross-level analysis in studying leadership effectiveness by investigating leader behaviors and need fulfillment on a daily basis. This analysis reveals how leader behavior impacts employees at different points in time and how this impact loops back to the leader's own behavior and decision-making.

In summary, the importance and necessity of multilevel analysis design in the study of management and organizational behavior cannot be overstated. Through multilevel analysis, researchers are allowed to explore the interactions of variables across different levels, revealing the complexity of organizational phenomena and providing insights for understanding and improving management practices.

2.10.3 Research hypotheses for Study 1

H1: Workload exerts a significant positive influence on user resistance;

H2: Psychological contract breach exerts a significant positive influence on user resistance;

H4: Psychological contract breach mediates the relationship between workload and user resistance;

H6: Emotional exhaustion exerts a significant positive influence on user resistance;

H7: Emotional exhaustion mediates the relationship between workload and user resistance；

H8: Organizational support negatively moderates the relationship between workload and psychological contract breach. In other words, the higher the organizational support, the weaker the positive correlation between workload and psychological contract breach;

H10: Organizational support negatively moderates the relationship between workload and emotional exhaustion, more specifically, the higher the organizational support, the weaker the positive correlation between workload and emotional exhaustion.

2.10.4 Research hypotheses for Study 2

H3: Workload exerts a significant positive influence on psychological contract breach;

H9: Organizational support at the hospital collective level has a stronger relationship with workload (H9a) and psychological contract breach (H9b) than organizational support at the

individual employee level.

H5: Workload exerts a significant positive influence on emotional exhaustion;

H11: Organizational support at the hospital collective level has a stronger relationship with workload (H11a) and emotional exhaustion (H11b) than organizational support at the individual employee level.

2.11 Conceptual model

In summary, the conceptual model diagram of user resistance to influencing factors is shown in Figure 2.1.

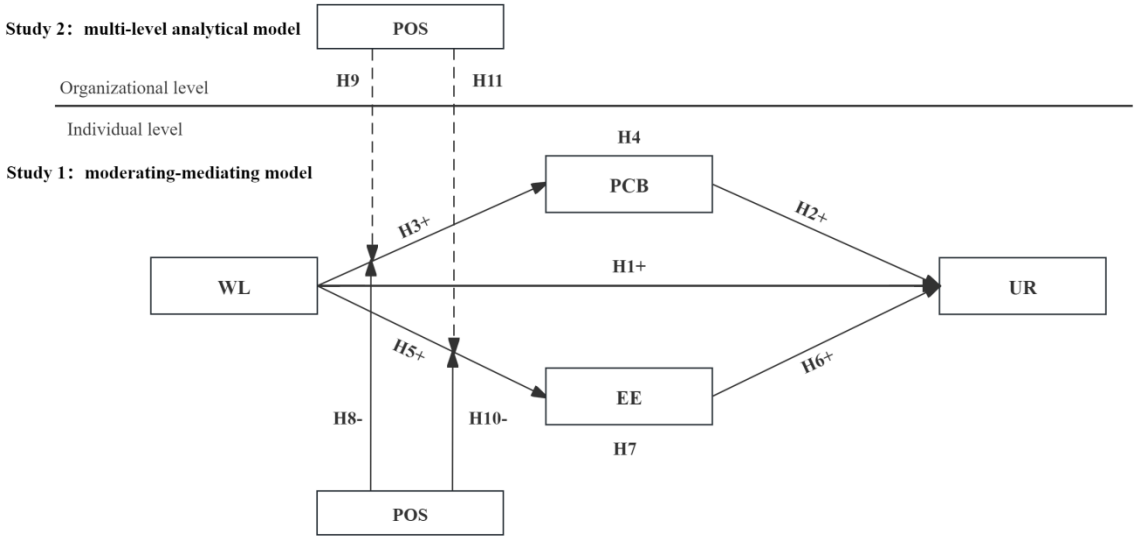

Figure 2.1 Conceptual model of factors affecting user resistance

Note: WL: workload; PCB: psychological contract breach; EE: emotional exhaustion; POS: perceived organizational support; UR: user resistance.

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Chapter 3: Research Design and Data Collection

3.1 Questionnaire Method

As a quantitative analysis, this research is designed to explore the factors influencing the workload of medical workers in tertiary hospitals in Guizhou on their resistance to the implementation of information system. We adopt the questionnaire survey method to obtain data through distribution of questionnaires, and the standardization of the questionnaire design and data collection process will directly affect the research results. When designing the questionnaire, we proposed a research model and hypotheses based on the research problem and literature review. Taking the purpose, target and method of the survey into consideration, we used clear and easy-to-understand language, and avoided the use of excessively professional or difficult language to prevent the respondents from feeling difficult to understand the question items, which will affect their answers. In addition, we gave due consideration to the structure of the questionnaire to ensure that respondents participated voluntarily and understood the purpose, risks and rights of the study. An informed consent form was also designed to ensure that the respondents were fully informed.

3.1.1 Research idea of the questionnaire design

Based on the literature review and the framework of the research model, we plan to design the questionnaire with reference to the well-established scales in the existing literature. In the process of questionnaire design, we first follow the principle of applicability and select the scales that are suitable for the needs of this study based on the background of this study and the conceptualization of the research variables. Second, we adhere to the principle of completeness and make no modifications to the question items in the original scale to ensure the reliability and validity of the scale. In addition, as the study is conducted in tertiary hospitals in Guizhou Province, we take into consideration the relevant studies that have been actually conducted in the local areas in the formulation of question items, hoping to ensure the quality of the questionnaire.

On this basis, and in conjunction with the research model of this study, the variables involved in the questionnaire include gender, age, education, workload, psychological contract

breach, emotional exhaustion, user resistance, and perceived organizational support. In order to better match the variables involved in this study, we have developed well-designed question items, aiming to explore the results of related studies from multiple perspectives. In this study, we have referred to well-established domestic and foreign scales, and foreign scales have been translated and polished up to question items that are in line with Chinese reading habits, thus ensuring high reliability and validity, as well as the scientific nature and rationality of the scale.

3.1.2 Questionnaire design process

The questionnaire is designed to explore the factors influencing the workload of medical workers in tertiary hospitals in Guizhou on their resistance to the implementation of information systems, so as to understand the impact of workload on the attitudes and behaviors of medical workers in their use of information system. This survey is targeted at the group of medical workers in tertiary hospitals in Guizhou, including doctors and nurses. Review of relevant literature helps understand the research progress and theoretical framework in the field of workload and information system resistance, which serves as the foundation for the questionnaire design.

Based on the CAPS research model and related theoretical framework, we identify the variables to be measured in this study. The variables include gender, age, education, workload, psychological contract breach, emotional exhaustion, perceived organizational support and user resistance. The questions are sequenced according to the logical relationship of the research variables to ensure that the questionnaire is logically clear and easy for the respondents to understand and answer. The questionnaire is then organized by grouping the questions and adding appropriate headings, paragraphs and separators. Appropriate question types and options shall be selected based on the nature of the question and the type of data required. For example, there can be single choice questions, multiple choice questions, and rating questions. The options shall be encompassing and mutually exclusive, and the scoring or rating criteria shall be consistent. For questions that require explanation or background information, relevant instructions and guidance shall be added to help respondents better understand the questions and provide accurate responses. We also pay attention to data confidentiality and privacy protection by using encryption technology and anonymous survey method to ensure that respondents' privacy is adequately protected.

After the questionnaire design is completed, we also carry out internal testing and revisions to ensure the accuracy and practicality of the questionnaire. We choose six professors in the field of information management and a small group of medical workers in the hospitals to pre-

test the questionnaire, check the comprehensibility of the questions, the order of the questions, and the fluency of the questions, collect their feedback and make necessary revisions and adjustments based on the results of the test to form the final questionnaire.

3.1.3 Principles of questionnaire distribution

The principles of questionnaire distribution include selecting appropriate target groups, ensuring randomness and representativeness, providing adequate instructions and explanations, flexibility and convenience, appropriate timing, reasonable reminders and follow-up, data confidentiality and anonymity.

3.1.4 Selection of participants for the study

The study is designed to analyze the impact of the workload of medical workers in tertiary hospitals in Guizhou on their resistance to the implementation of information systems.

Guizhou has 9 prefecture-level administrative regions, including 6 prefecture-level cities (Guiyang, Zunyi, Bijie, Liupanshui, Tongren, and Anshun) and 3 autonomous prefectures (Qiandongnan Miao and Dong Autonomous Prefecture, Qianxinan Buyi and Miao Autonomous Prefecture, Qiunnan Buyi and Miao Autonomous Prefecture). It has 88 county-level administrative regions, including 50 counties, 11 autonomous counties, 10 county-level cities, 16 districts, and 1 special district. The resident population of Guizhou was 38.56 million at the end of 2022. There were 29,150 medical and healthcare institutions in Guizhou at the end of 2022, of which 2,826 were hospitals and health centers. There were 344 professional public health institutions, of which 101 were centers for disease prevention and control. There were 309,703 beds in Guizhou at the end of 2022, of which 290,489 beds were in the hospitals and health centers. There were 321,400 medical personnel at the end of 2022, including 109,400 practicing (assistant) physicians and 147,100 registered nurses.

The main research targets of this study are the medical workers of tertiary hospitals in Guizhou, and in order to collect relevant data, we have obtained data from the official website of Guizhou Provincial Bureau of Statistics and reviewed relevant research literature. Up to now, there are 90 tertiary hospitals in Guizhou, mainly located in its cities and autonomous prefectures. To be specific, there are 33 tertiary hospitals in Guiyang, 7 in Liupanshui, 18 in Zunyi, 3 in Anshun, 5 in Bijie, 10 in Tongren, 4 in Qiandongnan Buyi and Miao Autonomous Prefecture, 4 in Qiandongnan Miao and Dong Autonomous Prefecture, and 6 in Qiandongnan Buyi and

Miao Autonomous Prefecture. The total number of medical workers amount to 93,016 according to statistics of data from the official websites of these hospitals.

In order to ensure the representativeness and scientific validity of the research data, a combination of stratified census and convenience sampling will be used in this study. Stratified census involves dividing the whole population into different strata according to certain characteristics (e.g. geographic location, hospital size, etc.) and then conducting a comprehensive survey for each stratum. This method ensures that each stratum is adequately represented and reduces sampling bias. Within each stratum, individuals or units that are easily accessible are then selected for survey based on convenience. Convenience sampling involves selecting a sample based on the convenience of the researcher and does not require a strict randomisation process. Individuals or units that are easily accessible are usually selected for the survey. Specific steps include selecting easily accessible individuals or units to be surveyed and then collecting data from the selected sample. The advantage of convenience sampling is that it is simple and low-cost, and is suitable for situations where resources are limited or time is of the essence. However, its disadvantage lies in the fact that due to the arbitrariness of sample selection, it may lead to unrepresentative samples, which are prone to sampling bias, affecting the reliability and validity of the research results.

In this paper, we study the impact of the workload of healthcare workers in tertiary hospitals in Guizhou Province on their resistance to the implementation of information systems by dividing 90 tertiary hospitals in Guizhou Province into strata according to geographic location (prefecture-level cities and autonomous prefectures), and then, dividing the hospitals into strata based on their geographic location, distributing questionnaires to the local hospitals in a variety of ways without mandating the number of people to fill out the questionnaires. After recovering the questionnaires, they were screened and invalid questionnaires were eliminated to finally get a valid sample.

3.1.5 Distribution method of the questionnaire

Guizhou Province is a large province (about 176,167 square kilometres), and tertiary hospitals are scattered. In order to improve the efficiency of the survey, we used a third-party platform, such as Questionnaire Star, to distribute and collect the questionnaires online. The following are the main advantages and disadvantages of online questionnaires and the corresponding remedial measures:

Online questionnaires have the advantages of convenience and cost-effectiveness. The researcher can quickly distribute the questionnaire to a large number of recipients without face-

to-face interaction, and the questionnaire can be retrieved quickly, so that a large amount of data can be collected in a short period of time. Compared to paper questionnaires, online questionnaires have virtually no printing and mailing costs, and data can be exported directly to a spreadsheet, saving data entry and processing time. Wide coverage is another major advantage of online questionnaires. It can cover respondents from different regions and is particularly suitable for cross-regional or international studies. Online questionnaires also have the advantage of data quality, with the ability to set up skip-question logic and validation rules to reduce invalid data, respondents can submit their feedback immediately, and researchers can view and analyse the data in real time. Anonymity is also an important advantage, as respondents can fill out the questionnaire anonymously, increasing the authenticity and honesty of responses.

Nevertheless, online questionnaires have some disadvantages. Sample representativeness may be compromised as online questionnaires are more likely to be answered by people with Internet access and usage habits, resulting in a non-representative sample where some respondents may ignore or refuse to complete the questionnaire. To remedy this problem, random or stratified sampling techniques can be used to ensure a diverse and representative sample. At the same time, technological limitations are also a problem. Some respondents may not be able to access or complete the questionnaire due to unstable network or device limitations, and functional limitations of different platforms may also affect questionnaire design and data collection. Providing technical support, such as a counselling phone number, to help respondents solve technical problems; simplifying the questionnaire design, reducing the reliance on complex technology, and making the questionnaire easy to access and complete can effectively address these issues. Data quality issues are another challenge with online questionnaires. Respondents may answer randomly, especially in the absence of external monitoring, and there may be invalid or inconsistent data despite automated logical controls. To address these issues, small-scale pre-testing can be conducted prior to official release to collect feedback and improve the questionnaire design, incorporate logic checks to identify and filter invalid responses, and provide appropriate incentives, such as prize draws or gift cards, to improve respondent engagement and response quality. In addition, security and privacy issues require equal attention. Data security and privacy protection on online platforms is an important issue, and there is a need to ensure that security measures are in place on the platform and that it complies with relevant data protection laws and regulations. Encrypting collected data to ensure its security during transmission and storage, as well as clearly informing respondents of the purpose of data use and privacy protection measures to increase transparency and trust, can effectively address

these issues. Finally, technology dependency is also a potential risk. Researchers need to rely on the quality of service and stability of third-party platforms, which may affect the data collection process if there are problems with the platform. Choosing a reputable third-party platform, such as the Questionnaire Star software used in this questionnaire survey, which ensures the quality and stability of its services, and backing up the data on a regular basis to ensure that even if there are problems with the platform, it will not result in the loss of the data, is an effective measure to cope with this problem.

With regard to questionnaire recall rates, in general, online questionnaire recall rates vary widely across industries and sectors, usually ranging from 5% to 30%. B2B questionnaires typically have recall rates between 23% and 32%, while B2C questionnaires have rates between 13% and 16%. The response rates of online questionnaires can be significantly improved through careful design and implementation. Recall rates for online questionnaires can be significantly improved through careful design and implementation, as shown by Dillman (2007), who noted that online questionnaire recall rates can be increased to more than 40% through careful design and implementation, and Cook et al. (2000), who found that personalised emails and follow up reminders can significantly increase the recall rate of e-questionnaires. Nulty (2008) noted that although face-to-face and telephone surveys typically have higher recall rates than online questionnaires, online questionnaires can achieve acceptable levels with proper design and implementation of strategies.

Incentives are an effective way to increase recall rates. The use of monetary incentives can significantly increase questionnaire recall rates. A systematic review and meta-analysis by PLOS found that monetary incentives can increase recall rates by 25 per cent. In addition, clear and easy-to-understand questions, a logical structure, and appropriate formatting can positively affect recall rates. Avoiding complex language and technical jargon can increase questionnaire completion rates by reducing respondent confusion. Shorter questionnaires (completed in 10 minutes or less) usually result in higher response rates, as prolonged completion of questionnaires can lead to respondent fatigue, which can reduce response rates. Rationalising the frequency and point in time at which questionnaires are sent is also critical, as sending questionnaires too frequently can lead to respondent fatigue, while choosing to send them at a time when respondents are likely to be satisfied can increase response rates.

Therefore, by adopting the above measures, the various shortcomings of online questionnaires can be effectively dealt with, and the quality and reliability of data collection can be improved, thus obtaining more representative and scientific research results. The survey was completed anonymously using an electronic questionnaire, and respondents were provided with

an informed consent form prior to the distribution of the questionnaire explaining that the questionnaire would be used for academic research purposes only, the data would be kept strictly confidential and would not be publicly disclosed, and leakage of their personal information would be impossible. Such an approach was intended to allay the concerns of the respondents and ensure that their participation was voluntary. Only after obtaining the respondents' consent, would they be allowed to fill in the questionnaires, with an aim to obtaining authentic and high-quality sample data.

3.1.6 Control of questionnaire bias

Controlling questionnaire bias is one of the key steps in ensuring the reliability and validity of the questionnaire. The question items used in this study are all subjective, and the following eight steps have been taken to control the questionnaire bias. First, implement clear and unambiguous instructions; second, arrange the questions in a randomized order; third, avoid the use of double negatives and complex statements; fourth, maintain neutral and balanced expression; fifth, ensure the comprehensiveness of the options; sixth, set a reasonable questionnaire length and time constraint; seventh, implement a pre-test and revising the questionnaire; and lastly, adopt appropriate statistical analysis and test methods.

3.1.7 Content of the questionnaire

The questionnaire used in this study consists of four parts, including informed consent form, survey on the use of hospital information systems and personal situation, question items in the measured variable scale, and basic personal information.

3.1.8 Informed consent form

An informed consent form is a document used in the research to inform respondents of the purpose, process, risks and rights of the research. It is a code of ethics designed to ensure that research participants have due information about the research and give their informed consent to participate voluntarily in the research.

First, we clarified to the respondents that the original purpose of this survey was to explore the impact of workload on user resistance in the ongoing implementation phase of hospital information system. Based on the analysis results, the factors affecting user resistance can be identified fill potential gaps in the research on the influencing factors of user resistance in the ongoing implementation phase of hospital information system, thus improving the effectiveness

of medical informatization.

Second, we also provided the respondents with the risk assessment of this survey in the informed consent form. The survey will be conducted anonymously and your personal identity will be kept strictly confidential, so you do not need to worry about the leakage of personal information. The questionnaire is designed to explore the impact of workload on user resistance during the ongoing implementation phase of hospital information system and does not involve sensitive, distressing or uncomfortable topics.

Third, we also clearly informed respondents of their rights. You have the right to freely choose to terminate your participation in the study at any time and may refuse to answer any questions you do not wish to answer. We will strictly comply with relevant laws and regulations to protect your rights and privacy. In addition, you have the right to obtain the research results free of charge in order to understand the final results of this survey.

3.1.9 Ethical review

Before conducting this study, we submitted the relevant application and obtained approval from the Ethics Committee of the Affiliated Cancer Hospital of Guizhou Medical University. This study strictly followed ethical principles and ensured that the rights and interests of the respondents were protected through ethical review. Ethical review is an important measure to ensure that the study complies with ethical standards and laws and regulations. We will do our best to ensure the legality, morality and reliability of the research process and protect the privacy and rights of the respondents.

3.2 Data collection and organization

In order to ensure that the data collection method fits the characteristics of the respondents and the purpose of the study, we chose the "wjx.cn" online survey website according to our actual situation, which encompasses the design, distribution, completion, collection and preliminary analysis of the questionnaire. After the questionnaires were returned, we screened them according to some questionnaire criteria, such as "whether they were completely filled out, whether the rules for filling out the questionnaires were clear, and whether the questionnaires were filled out in a similar way". After the screening, the unqualified and irregular questionnaires were excluded to ensure the quality of the data. After the data collection was completed, the quality

of the questionnaires was controlled. Qualified questionnaires were coded and data were entered and verified by two persons to ensure data accuracy. Finally, in order to provide a basis for subsequent data analysis, a standardized database was created based on analytical needs.

SPSS and AMOS 28.0 model were used to statistically process the collected data.

(1) Reliability analysis

Reliability analysis assesses the degree of consistency of results when the same method is used to measure the same object for multiple times. Cronbach's α coefficient is usually used to analyze the internal consistency of the scale. It is generally accepted that a Cronbach's α coefficient greater than 0.70 indicates that the reliability of the scale is relatively good. If the Cronbach's α coefficient is greater than 0.8, it indicates very good reliability, 0.7 to 0.8 indicates fair reliability, and less than 0.7 indicates inadequate reliability. The higher the reliability, the better the consistency and stability of the scale (Hu et al., 2020).

(2) Validity analysis

Validity analysis is used to assess the reasonableness and accuracy of the designed questionnaire to measure the reasonableness and accuracy of the designed items. We analyze the validity of the scale through factor analysis. The KMO test and Bartlett's test of sphericity are used to determine whether the scale satisfies the conditions of factor analysis. The KMO value must be greater than 0.5 and the p value of the Bartlett's test of sphericity must be less than 0.05, which is the prerequisite for factor analysis (J. W. Zhang et al., 2019). In this research, we use the principal component analysis to extract the factors. Principal component analysis is a commonly used multivariate statistical analysis that attempts to recombine the original variables into a new set of independent variables while extracting as many composite variables as practically necessary to reflect as much information as possible about the original variables (Han et al., 2012; Lin & Du, 2013).

(3) Statistical description and correlation analysis

We use mean ± standard deviation for statistical description and adopt Spearman's correlation analysis to analyze the correlation between variables.

(4) Structural equation modeling

This study uses structural equation modeling (SEM) to test hypothetical models. Compared with traditional methods of data analysis, SEM allows for easier handling of relationships between variables and it can calculate the measurement error for indicators as well as the measurement indexes and latent variables in the model. Nine hypotheses related to workload, user resistance, emotional exhaustion, psychological contract breach, and perceived organizational support have been formulated based on structural equation modeling (SEM). (1) Workload has

a significant positive effect on user resistance; (2) workload has a significant positive effect on psychological contract breach; (3) psychological contract breach has a significant positive effect on user resistance; (4) workload has a significant positive effect on emotional exhaustion; (5) emotional exhaustion has a significant positive effect on user resistance; (6) psychological contract breach mediates the relationship between workload and user resistance; (7) emotional exhaustion mediates the relationship between workload and user resistance; (8) perceived organizational support negatively moderates the relationship between workload and psychological contract rupture, namely, the higher the perceived organizational support, the weaker the positive correlation between workload and psychological contract breach; (9) perceived organizational support negatively moderates the relationship between workload and emotional exhaustion, namely, the higher the perceived organizational support, the weaker the positive correlation between workload and emotional exhaustion. In addition, based on the theoretical hypotheses, we propose a corresponding theoretical model with workload as the independent variable, psychological contract breach and emotional exhaustion as the mediating variables, perceived organizational support as the moderating variable, and user resistance as the dependent variable. The AMOS 28.0 model is used to estimate and test the path coefficients, and the model's fit indexes are used to determine the degree of fit between the actual data structure and the theoretical structure. The test result shows that $\alpha = 0.05$.

3.2.1 Basic personal information and usage of hospital information system

This section begins with an explanatory description of the hospital information system to give the respondents an understanding of the various boards and related systems, followed by a survey of the information system implementation phases and tasks in which they have been involved, and concludes with a survey of the individual's specialty, department, and length of service.

3.2.1.1 Demographic statistics

Among the medical workers using information systems in Guizhou's tertiary hospitals, there are 1,317 doctors, accounting for 42.16%, and 1,807 nurses, accounting for 57.84%. According to the data in Annex G, the proportion of nurses is higher, and this difference may reflect the proportion of occupational distribution of doctors and nurses using information systems in the healthcare industry. Nurses usually outnumber doctors because they play key nursing and clinical support roles in hospitals. In addition, nurses need to collect clinical care data of the patients,

and they use the hospital information systems more frequently in their work, so the proportion of nurses will be higher.

Among the medical workers involved in the hospital information system, 862 (27.59%) are male and 2,262 (72.41%) are female. According to the data in Annex H, the proportion of female medical workers is significantly higher, and this difference may reflect the reality of the gender ratio in the medical field. The medical industry usually has a high percentage of female practitioners, including nurses, obstetricians, and medical assistants, which should be considered as part of the diversity in the implementation of information systems.

The distribution of the educational background of medical workers using the information systems in Guizhou's tertiary hospitals is as per Annex I. There are 24 people with middle school education or below, accounting for 0.77%; there are 344 people with high school (vocational high school) education, accounting for 11.01%; there are 2,581 people with bachelor's degree, accounting for 82.62%; there are 159 people with master's degree, accounting for 5.09%; and there are 16 people with doctoral degree, accounting for 0.51%. According to the data, many of the medical workers using the information system have a bachelor's degree, accounting for 82.62%. Those with education of high school and below account for a relatively low percentage of 11.78%. This educational distribution reflects the demand for workers with bachelor's degree or above in the healthcare industry, as it usually requires highly specialized and technical knowledge, so the percentage of workers with the educational background of high school and below is relatively low.

Among those using the hospital information system, there are 232 resident physicians (18.35%), 160 attending physicians (12.66%), 76 chief physicians (6.01%), 465 nurse practitioners (36.79%), 282 nurses-in-charge (22.31%), and 49 chief nurses (3.88%) (See Annex J).

The data shows that the proportions of nurse practitioners and nurses-in-charge are relatively high, accounting for 36.79% and 22.31% respectively, followed by the resident physicians and attending physicians, accounting for 18.35% and 12.66% respectively. The proportions of chief physicians and chief nurses are relatively low, accounting for 6.01% and 3.88% respectively.

Differences in the proportions of medical workers with different job positions may be due to their different roles and responsibilities in the implementation of information systems, and it is not necessarily because one position is more or less involved than the others. Such differences are usually meant to meet the job requirements and responsibilities of different positions to ensure that the information systems can support all aspects of medical care and management.

In general, nurse practitioners and nurses-in-charge may need to interact with the information system more frequently in their daily nursing work and need to interact more with the system in the areas of nursing records, patient monitoring, and medical order management, hence their proportions are relatively high. Resident physicians and attending physicians are usually more directly involved in clinical care and may need to interact more with the information system to record patient data and medical orders. The chief physicians are more concerned with clinical decision making and more focused on management and instruction, with little direct interaction with the system. The hierarchical structure within the hospital may also affect the involvement of medical workers with different positions in the hospital information system. Nurse practitioners, nurses-in-charge, resident physicians, and attending physicians may be closer to front-line medical care, while chief physicians may be more active at the management and leadership level.

According to Annex K, among the medical workers participating in the hospital information system, there are 324 from the Surgery Department, accounting for 25.63%, 293 from the Internal Medicine Department, accounting for 23.18%, 56 from the Pediatrics Department, accounting for 4.43%, 70 from the Obstetrics and Gynecology Department, accounting for 5.54%, 117 from the Oncology Department, accounting for 9.26%, 80 from the Medical Technology Department, accounting for 6.33%, and 324 from other departments, accounting for 25.63%.

From the data, it can be seen that medical workers from the Surgery Department and Internal Medicine Department account for the highest proportions of 25.63% and 23.18% respectively. The proportion of medical workers from other departments is also relatively high at 25.63%. The proportions of medical workers from the Pediatrics Department and Obstetrics and Gynecology Department are relatively low at 4.43% and 5.54% respectively. These differences may reflect the specificity of different departments in terms of information system use and needs. Surgery and Internal Medicine usually deal with a wide range of diseases and therefore require more extensive information system support. In addition, they are relatively large departments that may involve more patients and medical staff and therefore require more information system support. Medical Technology may require specialized information system support, as they play a key role in the maintenance of medical equipment and technology. In contrast, Pediatrics and Obstetrics and Gynecology may involve patients of specific age groups and genders and therefore have lower needs.

3.2.1.2 Statistics related to the participation of medical workers in the implementation of hospital information systems

According to data in Annex L, 12.5% of the medical workers are in the pre-implementation stage (which includes project approval and planning, conduction of survey, identification of development strategies, analysis of demands, study of feasibility and exploration of alternatives, selection of providers, and communication with information system users); 40.6% are in the during-implementation stage (the system has not yet been put into practical use. Installation, configuration, training, and testing have been completed in order to deliver a fully functional system to users); 46.99% are in the post-implementation stage (system maintenance after the information system is officially launched. Maintainers ensure the functionality, security and performance of the system, and perform some upgrades to meet business needs. Tasks include monitoring, troubleshooting, data backup and user training).

There are relatively few medical workers in the pre-implementation stage, while there are a relatively large number of medical workers in the during-implementation and post-implementation stage. In the pre-implementation and during-implementation stages, the system may be in the process of testing, debugging and gradual deployment, and may have problems or instability and have not been widely put into use, which may result in the low number users in these two stages. In the post-implementation stage, the system is usually more stable, and the medical workers become proficient with the system with the relevant training, and the usage rate will increase and stabilize. In addition, hospitals usually adopt a progressive approach when introducing a new system, so they gradually introduce the new system to the workflow rather than fully implement it all at once, which may also lead to a relatively small number of users in the during-implementation stage and a gradual increase in the post-implementation stage.

As for the use of various hospital information systems, the following information systems are now commonly used in major tertiary hospitals in Guizhou.

Hospital Information System (HIS). It is mainly used to support the information technology tools and information systems of the diagnosis and treatment, management, and logistics, and it has the functions of charges, drug distribution, and issuance of medical advice.

Laboratory Information System (LIS). It is mainly used by the Laboratory Department, and the core function is to obtain information from a variety of testing instruments, and then generate test reports to be transmitted to the HIS.

Picture Archiving and Communication System (PACS). It is equipped with the functions of

obtaining picture data from medical picture examination equipment, and then processing, storing, retrieving, and presenting. It also has the function of intelligent recognition of medical pictures.

Radiology Information System (RIS). It addresses the business process of scheduling, registering, reporting, and approving radiologic examinations.

Enterprise Resource Planning (ERP). This system is an enterprise-centered comprehensive information system that integrates various business modules within the enterprise, including purchasing, sales, warehouse management, production planning, and financial management. The main function of ERP system in hospitals is to achieve information integration and process optimization within the hospital to improve its management efficiency and operational efficiency.

Electronic Medical Record (EMR). The system mainly helps doctors to complete the admission records, discharge records, medical records, and surgical records. The records are the situations written by the doctor, mainly free texts or fixed-format forms to record the patient's disease diagnosis and treatment process, and it is usually finished by the "electronic medical record editor". In addition, it also records all the information generated by the patient's diagnostic and therapeutic activities during his or her outpatient or inpatient treatment.

Diagnosis Related Groups (DRGs). It is a system that divides patients into several diagnostic groups for management based on factors such as patient age, disease diagnosis, comorbidities, complications, and treatment modalities, severity of disease and prognosis of disease. Medical insurance payers will set payment standards based on the diagnostic groups and make direct settlement with hospitals, while the patients will experience no changes in the payment method and reimbursement rate.

According to the statistical results in Annex M, the current information system usage of medical workers in tertiary hospitals in Guizhou in the during-implementation stage is as follows. HIS system has a total of 924 visits, accounting for 73.1%; LIS system has a total of 196 visits, accounting for 15.51%; PACS system has a total of 211 visits, accounting for 16.69%; RIS system has a total of 104 visits, accounting for 8.23%; ERP system has a total of 83 visits, accounting for 6.57%; EMR system has a total of 133 visits, accounting for 10.52%; DRGs system has a total of 147 visits, accounting for 11.63%; DIP system has a total of 273 visits, accounting for 21.6%; and other systems have a total of 159 visits, accounting for 12.58%.

To be specific, HIS, PACS, and DIP systems are the most commonly used among the medical workers, accounting for 73.1%, 16.69%, and 21.6% respectively. These systems are more widely used because HIS and PACS can be applied to a wide range of scenarios and are more

maturely developed, which can help improve the quality of patient care and the work efficiency of the hospital. HIS can track a patient's medical history and treatment plan, and ensure that medical workers have accurate and real-time patient information, so that they can better coordinate care and make medical decisions. PACS is used to manage and store medical pictures, allowing doctors to view and interpret radiological images more quickly, thereby improving the accuracy of clinical decisions. In addition, HIS can automate processes such as patient registration, queuing, appointment scheduling and medical charges, reducing tedious work that is originally done by human. PACS reduces the cost of processing and storing pictures, and also provides remote access so that doctors can quickly view patient pictures. In terms of information sharing, HIS allows patient information to be shared between various departments within a hospital, thereby improving collaboration and communication. PACS also enables medical images to be electronic, allowing doctors to easily share pictures and diagnostic results, not only within the hospital, but also with external healthcare providers or specialists for remote collaboration. The widespread use of PACS is related to policy support. In 2017, the General Office of the State Council issued the Guiding Opinions on Further Deepening the Reform of Basic Medical Insurance Payment Methods, which called for the full implementation of the multi-dimensional and composite medical insurance payment methods based on DRGs. In 2020, the Central Committee of the Communist Party of China (CPC) and the State Council issued the Opinions on Deepening the Reform of the Medical Security System, calling for the establishment of an effective and efficient medical insurance system. According to the document, the National Healthcare Security Administration launched a pilot project in October 2020 in 71 areas to implement the Big Data Diagnosis-Intervention Packet (DIP).

In contrast, the use of ERP and RIS is relatively low, accounting for 6.57% and 8.23% respectively. It is because the two systems of ERP and RIS are more targeted, with RIS usually used in medical imaging, and ERP used in corporate resource management. The use of these two systems is usually limited to specific areas, so they are not as widely used as some general-purpose systems. A hospital or organization may only need RIS for specific departments or workflows, while ERP may only be used for financial or resource management.

According to statistical results in Annex N, for medical workers in the during-implementation stage of the hospital information system, the types of tasks they participate in vary. A total of 371 respondents participate in "evaluation and acceptance of new technologies or techniques", accounting for 29.35%; 418 respondents participate in "establishment of departmental operational standards and workflow templates", accounting for 33.07%; 458 respondents par-

ticipate in "confirmation forms", accounting for 36.23%; 380 respondents participate in "departmental implementation plans", accounting for 30.06%; 539 respondents participate in "training on the new system", accounting for 42.64%; 507 respondents participate in "departmental training", accounting for 40.11%; 362 respondents participate in "provision of feedback on clinical processes and workflow", accounting for 28.64%; 343 respondents participate in "cooperation with relevant implementation teams", accounting for 27.14%; 161 respondents participate in "maintenance and management of system hardware and software", accounting for 12.74%; 445 respondents participate in "data entry and management", accounting for 35.21%; 348 respondents participate in "validation and verification of forms and documents", accounting for 27.53%; 171 respondents participate in "protection of information system security and confidentiality", accounting for 13.53%.

As can be seen from the data, there are differences in the proportion of different tasks. The high proportions of options such as training on the new system, validation of forms, departmental training, and data entry and management indicate their importance in the implementation of an information system. This is because training is a critical part of the successful implementation of a new information system, and the high proportion indicates that the hospital emphasizes on staff training to ensure that the medical workers can use the new system effectively. Data entry and management is critical to the daily operations of the hospital, and validation of confirmation forms and documents is also related to compliance in patient care, which is also an important quality control activity in health care. The high proportions reflect the fact that the medical workers need to enter and manage patient information, medical orders, and other data in the new system to provide patient care.

On the contrary, the proportions of protection of information system security and confidentiality and maintenance and management of system hardware and software are relatively low, because these two types of tasks are generally involved by the hospital information department or medical staff with the background of computer science.

According to statistical results in Annex O, changes in the working hours of the medical workers during their participation in the implementation of the information system are as follows. 757 medical workers feel "no change", accounting for 59.89%; 331 medical workers feel "an increase of 1 hour per day than usual", accounting for 26.19%; 131 medical workers feel "an increase of 2 hours per day than usual", accounting for 10.36%; 17 medical workers feel "an increase of 3 hours per day than usual", accounting for 1.34%; 28 medical workers feel "an increase of 4 hours or more per day than usual", accounting for 2.22%. It can be seen from the data that the working hours of most medical workers (59.89%) during the implementation of

the information system have not changed. However, still 40.11% of medical workers feel an increase in their working hours. Those who do not feel an increase of working hours are likely to be proficient in the use of relevant hospital information systems. Therefore, objectively speaking, the implementation of the hospital information system will increase the workload of the medical workers to different degrees.

3.2.2 Measured variable

In order to ensure that this study is conducted in accordance with scientific standards, we choose mature domestic and international scales as the measurement tools, and based on the research reality of tertiary hospitals in Guizhou, we translate the foreign scales and polish up the expressions to make them conform to the domestic reading habits.

Based on the literature review and the research model constructed for this study, we need to measure the following key variables.

In this research, we refer to mature foreign scales such as the User Resistance Scale (Kim & Kankanhalli, 2009), Workload Scale (Peterson et al., 1995), Psychological Contract Breach Scale (Robinson & Morrison, 2000), Emotional Exhaustion Scale (Watkins et al., 2015), and the Perceived Organizational Support Scale (Rhoades et al., 2001). The foreign mature scales are translated and polished to conform to Chinese reading habits, so as to ensure both reliability and validity, as well as the scientific nature and rationality. All items will be scored using a 5-point Likert scale. The measurement items used are attached in Table 3.1.

Table 3.1 Items in the scale of key variables

Variable	SN	Item
A: User resistance	(1)	I will not comply with the change to the new way of working with the information system.
	(2)	I will not cooperate with the change to the new way of working with the information system.
	(3)	I oppose the change to the new way of working with the information system.
	(4)	I do not agree with the change to the new way of working with the information system.
B:Workload	(1)	There is a need to reduce some parts of my role.
	(2)	I feel overburdened in my role.
	(3)	I have been given too much responsibility.
	(4)	My workload is too heavy.
	(5)	The amount of work I have to do interferes with the quality I want to maintain.
C:Psychological contract breach	(1)	The hospital has not honored all the promises made to me at the time of recruitment.
	(2)	I feel that the hospital has not honored most of the promises made to me at the time of recruitment.
	(3)	The hospital has done a very poor job of honoring its initial commitment.
	(4)	I have made a contribution but the hospital does not fully honor its initial

Variable	SN	Item
		promise of return.
	(5)	I have honored the promises I made to the hospital when I was hired, but the hospital has broken many of the promises it made to me when I was hired.
D:Emotional exhaustion	(1)	Work makes me feel emotionally drained.
	(2)	Work exhausts me.
	(3)	I feel exhausted just thinking about tomorrow's work.
E:Perceived organizational support	(1)	My hospital will take my opinion into consideration.
	(2)	My hospital takes my interests into account.
	(3)	My hospital respects my goals and values.
	(4)	The hospital will help me if I ask for it.
	(5)	My hospital is happy to offer a helping hand.
	(6)	My hospital cares a lot about me.

(1) Workload

This variable measures the amount of stress and tasks faced by the medical workers at work. We will use a validated workload scale to assess the degree of load experienced by the medical workers at work.

Workload is an important concept in organizational behavior, which involves a number of factors such as time stress, work difficulty, task requirements, employee ability, and work skills (Hao et al., 2015). Caplan and Jones (1975) argue that workload can be quantified, and it is the specific amount of work tasks that an employee can complete at a given work time. Scholars such as Veltman and Gaillard (1996), Maslach et al. (2001), Lean and Shan (2012), DiStaso and Shoss (2020) and Van Leeuwen et al. (2019) have also demonstrated that workload exerts an impact on user resistance.

A widely used measure of workload is the five-item questionnaire developed by Peterson, with examples of main items such as "Today I think it is necessary to reduce some of my work tasks". It has a Cronbach's α coefficient of 0.90 (Peterson et al., 1995).Karasek et al. (1998) developed a five-item self-report scale with examples of questions such as "I often have a lot of work to do" and "I need to make extra efforts to accomplish some of my tasks", and it has a Cronbach's α coefficient of 0.90. NASA developed a revised version of the National Aeronautics and Space Administration Task Load Index (NASA-TLX), which is a modified version of the original version and consists of four items including mental demands, physical demands, time demands, and efforts. Each item is represented by a straight line divided into 20 equal parts, with the scores of 0 to 20, and the ends of the line are labeled "low" and "high", with higher scores indicating higher workloads and lower scores indicating lower workloads. In this research, we adopt the mature scale developed by Peterson et al. (1995), and use a 5-point Likert scale to capture responses, with 1 representing strongly disagree and 5 representing strongly agree, we formulate the question items of workload.

(2) Psychological contract breach

This variable measures the extent to which medical workers perceive the promises and expectations provided by the organization. We will use a validated psychological contract breach scale to assess the medical workers' perceived contract with the organization.

The definition of psychological contract breach is based on the concept of psychological contract. Psychological contract is a psychic link between the organization and the employee, which embodies the implicit exchange relationship between them. Argyris (1960) first proposed the concept of "psychological work contract" in 1960, which refers to the informal and implicit relationship between the worker and the organization. Levinson et al. (1962), Rousseau (1995), Morrison and Robinson (1997) have also studied the psychological contract.

According to Robinson (1996), Morrison and Robinson (1997), Van Leeuwen et al. (2019), Xie et al. (2021), Zhong et al. (2020), Ma et al. (2017), and Cao and Li (2016), implementation of information systems will increase the workload of medical workers, which leads to the perception of psychological contract breach. The perception is then gradually manifested in behavior, inducing resistance of the medical workers to information systems (user resistance behavior).

In summary, workload may trigger user resistance behavior by affecting the process of cognitive change, i.e., leading to the user's psychological contract breach. With reference to the mature scale developed by Robinson and Morrison (2000), the scale in this study uses a 5-point Likert scale to capture responses, with 1 representing strongly disagree and 5 representing strongly agree, we formulate the question items of psychological contract breach.

(3) Emotional exhaustion

This variable measures the degree of emotional fatigue and mental exhaustion experienced by the medical workers at work. A validated emotional exhaustion scale will be used to assess the emotional state of the medical workers.

The focus on emotional exhaustion can be trace back to the study of burnout. Since the concept of burnout was proposed, the phenomenon of emotional exhaustion has also attracted the attention of scholars. Freudenberger (1974) first proposed the concept of "burnout". Leiter and Maslach (1988) noticed the phenomenon of burnout at work and regarded emotional exhaustion as a manifestation of burnout, believing that emotional exhaustion is a reaction to excessive workload. Many scholars have defined emotional exhaustion, but none of them are essentially different. There are also a number of scholars who follow the definition of emotional exhaustion given by Maslach and Jackson (1981). In this research, we also adopt their definition that emotional exhaustion is a feeling of exhaustion in which individuals feel that their resources

and energies have been depleted at work.

It has been proved by Yan et al. (2020), Qi et al. (2020), Hobfoll (2004), Chen et al. (2020); Dong et al. (2020) that users in the state of emotional exhaustion will reduce their effort, decrease their workload, or avoid unfavorable changes to protect and compensate for their resources, cope with stress and vent their emotions, which in turn is likely to result in resistance to the implementation of information systems. With reference to the mature scale of Watkins et al. (2015), we adopt a 5-point Likert scale to capture responses, with 1 representing strongly disagree and 5 representing strongly agree, we formulate the question items of emotional exhaustion.

(4) User resistance

This variable measures the degree of resistance of the medical workers to the implementation of the information system. We will use a validated user resistance scale to assess the attitudes and behaviors of the medical workers towards information system implementation.

In this research, user resistance mainly refers to resistance of the medical workers to the hospital information system in the during-implementation stage, so we adopt Markus (1983) definition that user resistance refers to an individual's attempt to prevent the implementation or use of an information system through a variety of implicit or explicit behaviors.

Based on the actual situation of the medical workers in tertiary hospitals in Guizhou, we refer to the mature scale developed by Peterson et al. (1995) and use a 5-point Likert scale to capture responses, with 1 representing strongly disagree and 5 representing strongly agree with the question items.

(5) Perceived organizational support

This variable measures the extent to which the medical workers perceive organizational support. We will use a validated perceived organizational support scale to assess the degree of perceived organizational support among the medical workers.

Perceived organizational support is a theory first proposed by social psychologist Eisenberger in 1986, and it is a concept that reflects an employee's feelings about the organization's commitment to him or her. Eisenberger defined perceived organizational support as employees' beliefs concerning the extent to which their organization cares about their well-being and values their contributions. In 1986, Eisenberger et al. (1986) developed the Survey of Perceived Organizational Support to measure the perceived organizational support. In 2001, the scale developed by Rhoades et al. (2001) was widely used. In addition, Chinese scholars Ling et al. (2006) developed the Chinese Employee's Perceived Organizational Support Scale, which has gained extensive attention.

According to Mischel and Shoda (1995), Rhoades and Eisenberger (2002), Chiaburu et al. (2015), Rhoades et al. (2001), and L. Zhang et al. (2016), high perceived organizational support can effectively alleviate the psychological pressure caused by workload to employees, and the degree of employees' psychological contract breach can also be weakened. On the contrary, employees with low perceived organizational support are less likely to receive encouragement, respect and rewards from the organization, and they believe that the organization has a low degree of recognition of their own ability and value.

In summary, in the face of high workload, employees with high perceived organizational support tend to have relatively low psychological contract breach. Therefore, we refer to the mature scale developed by Rhoades et al. (2001) and use a 5-point Likert scale to capture the responses, with 1 representing strongly disagree and 5 representing strongly agree, formulate the question items of perceived organizational support.

3.2.3 Basic information of valid questionnaires

We have received 3,124 questionnaires from various hospitals and kept 1,118 questionnaires through initial screening by removing blank and incomplete questionnaires. Then we removed those with abnormal data, and finally obtained 750 valid questionnaires. Among the 750 questionnaires, 37.73% of the respondents are doctors and 62.27% are nurses; 72.66% of the respondents have been working for 1-15 years; 82.27% of the respondents are in their middle age, and are the "main force" of the hospitals. Therefore, this sample seems to be suitable to test our theoretical model. Table 3.2 summarizes the demographic data of the valid respondents.

Table 3.2 Sample characteristics

Name	Option	Frequency	Percentage (%)
Gender	1	283	25.31
	2	835	74.69
Age	25 and below	75	6.71
	26 to 45	923	82.56
	46 to 60	120	10.73
Education	Middle school and below	2	0.18
	High school (vocational school)	121	10.82
	Bachelor's degree	927	82.92
	Master's degree	60	5.37
	Doctoral degree	8	0.72
Length of service	1 year and below	85	7.60
	1 to 15 years	816	72.99
	16 to 30 years	192	17.17
	31 to 45 years	25	2.24
Occupation	Doctor	420	37.57
	Nurse	698	62.43
Hospital	Guizhou Aviation Industry Group 302 Hospital	56	5.01

Name	Option	Fre-quency	Percentage (%)
	Xishui County People's Hospital	66	5.90
	Liupanshui Municipal People's Hospital	77	6.89
	Xingyi People's Hospital	42	3.76
	Yinjiang Miao and Tujia Autonomous County People's Hospital	32	2.86
	Weining County People's Hospital	38	3.40
	Anshun People's Hospital	45	4.03
	Bijie First People's Hospital	56	5.01
	Shuikuang Hospital	75	6.71
	Shuigang Hospital	36	3.22
	The Second Affiliated Hospital of Guizhou University of Traditional Chinese Medicine	48	4.29
	The Third Affiliated Hospital of Guizhou Medical University	38	3.40
	Affiliated Hospital of Guizhou Medical University	51	4.56
	Baiyun Hospital of Guizhou Medical University	32	2.86
	Tumor Hospital of Guizhou Medical University	126	11.27
	Guizhou Provincial People's Hospital	73	6.53
	Guiyang Second People's Hospital	47	4.20
	The Affiliated Hospital of Zunyi Medical University	60	5.37
	Jinsha County Hospital of Traditional Chinese Medicine	37	3.31
	Qiandongnan Hospital of Traditional Chinese Medicine	51	4.56
	Qiannan Hospital of Traditional Chinese Medicine	32	2.86
Total		1118	100.00

3.3 Reliability and validity analysis of the questionnaire

Based on the analysis of the collected questionnaire data, we calculate the Cronbach's alpha coefficients for the dimensions of workload, user resistance, emotional exhaustion, psychological contract breach and perceived organizational support. The results are shown as per Table 3.3.

Table 3.3 Final results of confirmatory factor analysis

Model construct	Measurement item	Factor loading	t value	Cronbach's α	AVE	CR
Emotional exhaustion	EE1	0.947	176.90***	0.944	0.899	0.954
	EE2	0.959	220.28***			
	EE3	0.938	152.19***			
Psychological contract breach	PCB1	0.880	63.68***	0.944	0.816	0.953
	PCB2	0.914	101.24***			
	PCB3	0.897	64.47***			
	PCB4	0.903	86.22***			
	PCB5	0.922	107.48***			
	POS1	0.877	61.20***	0.956	0.820	0.962

Model construct	Measurement item	Factor loading	t value	Cronbach's α	AVE	CR
Perceived organizational support	POS2	0.916	109.91***			
	POS3	0.910	101.89***			
	POS4	0.905	70.93***			
	POS5	0.919	88.63***			
	POS6	0.907	78.81***			
User resistance	UR1	0.855	48.23***			
	UR2	0.907	73.01***			
	UR3	0.898	83.61***	0.914	0.795	0.927
	UR4	0.905	66.54***			
Workload	WL1	0.636	21.61***			
	WL2	0.877	86.92***			
	WL3	0.854	62.19***	0.893	0.706	0.920
	WL4	0.915	108.90***			
	WL5	0.889	96.11***			
KMO value		0.932				
Bartlett's test of sphericity	Approximate Chi-squared	18915.084				
	df	253				
	p value	0.000				

3.3.1 Reliability analysis

Cronbach's α is used to assess the internal consistency of the proposed structures. Table 3.3 has summarized the factor loadings and Cronbach's α values for each of the dimensions. All the alpha values range from 0.89 to 0.96, which are higher than the level of 0.70 suggested, so the structure can be considered reliable.

As suggested by Hair et al. (2013), construct reliability can be judged by CR (composite reliability) and AVE (average variance extracted). If both indicators reach the standard value, it indicates that the study has good construct reliability. According to Nunally (1978), the value of CR should be greater than 0.7, and the higher value of CR, the more likely it will be for the items to generate consistent results. The CR values of all the constructs in Table 3.3 are greater than 0.7. In summary, the results of the statistical indicators show that there is a strong internal consistency in the constructs corresponding to the question items of the model, and the reliability is high.

3.3.2 Validity analysis

3.3.2.1 Convergent validity

Convergent validity is measured by examining significant factor loadings for each construct through factor analysis. According to Anderson and Gerbing (1988), convergent validity is established when there are significant loadings on the latent variables specified for each construct.

There are two types of factor analysis methods, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Exploratory factor analysis (EFA) does not assume in advance the relationship between the factors and the measured items, and analyzes the data through the components. Principal component analysis and common factor analysis are typical methods of EFA. Confirmatory factor analysis (CFA) is used to test whether measures of a construct are consistent with a researcher's understanding of the nature of that construct (or factor). As such, the objective of confirmatory factor analysis is to test whether the data fit a hypothesized measurement model. This hypothesized model is based on theory and/or previous analytic research. Therefore, CFA is more suitable for our research.

We have conducted the confirmatory factor analysis (Bentler, 1989) to examine the convergent validity of each construct. We examined a five-structure CFA model in which workload, psychological contract breach, emotional exhaustion, perceived organizational support, and user resistance are all included (constructed using Smart PLS 4.0). The standardized CFA loadings are all greater than 0.7, demonstrating convergent validity among the factors, and the results also indicate significant correlations.

The average variance extracted (AVE) is also the average of the explanatory power of the latent variables over the dependent variable. High value of AVE indicates high convergent validity of the construct. Fornell and Larcker (1981) suggest that the value of AVE should be greater than 0.5, and if the AVE value is between 0.36 and 0.5, it is also acceptable. The AVE values for all the constructs are greater than 0.7, which means that the model has sufficient convergent validity for each construct.

3.3.2.2 Discriminant validity

Discriminant validity is another aspect of construct validity and it means that when different methods are applied to measure different constructs, the values observed should be distinguishable from one another. Discriminant validity can be inferred when the measures of each construct converge to their respective true scores (Churchill, 1979). Discriminant validity can be assessed by testing the factor correlations (Kling, 2001) and whether the square root of the average variance extracted (AVE) for each construct is greater than their correlations with other factors (Gefen et al., 2000). In addition, the heterotrait-monotrait ratio (HTMT) can also be used. It involves calculating the average correlation between indicators of different constructs (heterotrait correlations) and comparing it to the average correlation between indicators of the same construct (monotrait correlations). If the HTMT value is less than 0.85, it indicates that there is discriminant validity between the two factors.

The diagonal bolded numbers are the square roots of the AVE, and the square roots are significantly higher than the correlation between any pair of factors (the values of the bolded numbers are all greater than the values of the correlation coefficients below the diagonal line), which confirms the good discriminant validity of the scale. As shown in Table 3.4.

Table 3.4 Descriptive statistical indicators

Variable	Mean	SD	1	2	3	4	5
1. EE	2.75	1.21	0.90				
2. PCB	2.19	1.11	0.52***	0.82			
3. POS	3.49	1.04	-0.51***	-0.51***	0.82		
4. UR	2.05	1.06	0.13***	0.31***	-0.16***	0.80	
5. WL	3.10	1.01	0.60***	0.40***	-0.38***	0.24***	0.71

According to the HTMT analysis results, all the HTMT values are less than 0.85, implying that there is good discrimination between the factors, which also confirms the good discriminant validity of the scale. As shown in Table 3.5 Heterotrait-monotrait ratio (HTMT).

Table 3.5 Heterotrait-monotrait ratio (HTMT)

	EE	PCB	POS	UR	WL
EE					
PCB	0.544				
POS	0.538	0.537			
UR	0.144	0.336	0.171		
WL	0.641	0.424	0.403	0.268	

In summary, the model has strong internal consistency, with good convergent validity and discriminant validity, as well as good reliability and validity. The data from the model can be used and subsequent in-depth research can be conducted.

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Chapter 4: Data analysis 1 – An Exploration of the Impact on the Work Behavior of Health Professionals

4.1 Review of Hypotheses of Data analysis 1

In the literature review section, we have proposed the following hypotheses of research 2.

H1: Workload exerts a significant positive influence on user resistance;

H2: Psychological contract breach exerts a significant positive influence on user resistance;

H4: Psychological contract breach mediates the relationship between workload and user resistance;

H6: Emotional exhaustion exerts a significant positive influence on user resistance;

H7: Emotional exhaustion mediates the relationship between workload and user resistance；

H8: Organizational support negatively moderates the relationship between workload and psychological contract breach. In other words, the higher the organizational support, the weaker the positive correlation between workload and psychological contract breach;

H10: Organizational support negatively moderates the relationship between workload and emotional exhaustion, more specifically, the higher the organizational support, the weaker the positive correlation between workload and emotional exhaustion.

In order to test these hypotheses, we propose a corresponding theoretical model, with workload as the independent variable, psychological contract breach and emotional exhaustion as the mediator variable, and user resistance as the dependent variable. Structural model results are shown as per Figure 4.1.

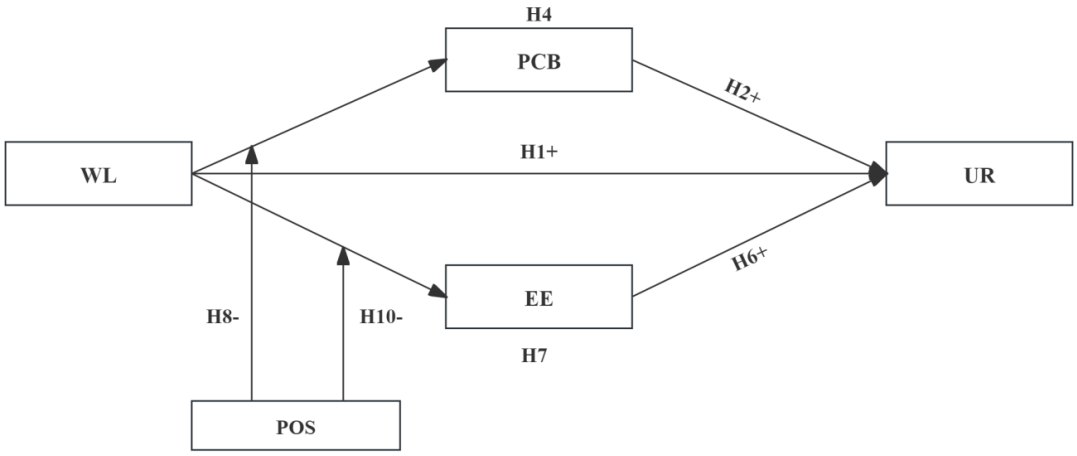

Figure 4.1 Structural model of the factors influencing work behaviors of health professionals in data analysis 1

Note: WL: workload; PCB: psychological contract breach; EE: emotional exhaustion; POS: perceived organizational support; UR: user resistance.

4.2 Model analysis and hypothesis testing of Data analysis 1

The test results of the basic statistical analysis in Chapter 3 show that the measurement model has good reliability and validity. On this basis, we establish a structural model of Data analysis 1 based on the previously proposed theoretical model, analyze the fitting indexes of the structural model, and test the research hypotheses.

4.2.1 Structural modeling path analysis of Data analysis 1

Constructing structural equation models (SEM) using AMOS (Analysis of Moment Structures) can improve research reliability and transparency and is suitable for dealing with complex models and multivariate relationships. AMOS provides an intuitive graphical interface that enables users to visually construct SEM models and easily plot the relationships between potential variables, which helps to understand and interpret the model. In addition, AMOS can estimate the parameters in the model and provide fit indexes, such as the Chi-Square Goodness of Fit and the Root Mean Square Error of Approximation (RMSEA), to assess the fitness of the model. Therefore, based on the previously proposed theoretical model, we establish a structural equation model (SEM) using AMOS 28.0. The overall fit of the model is also evaluated and the path of the structural model is analyzed. The structural model is examined using AMOS 28.0 and the model fitting results are shown as per Table 4.1.

Table 4.1 Fitting results of the structural model

Fit indexes	Fitting results	Criterion	Fit or not
χ^2	711.440	-	-
df	220	-	-
χ^2/df	3.231	<5	Yes
CFI	0.978	>0.9	Yes
TLI	0.974	>0.9	Yes
GFI	0.945	>0.9	Yes
NFI	0.968	>0.9	Yes
AGFI	0.930	>0.9	Yes
RMSEA	0.045	<0.05	Yes
SRMR	0.023	<0.05	Yes

As for the fit indexes of the structural model, the value of chi-square is 711.44, the value of degree of freedom is 220, and the ratio of chi-square to degree of freedom is 3.234, which is close to 3, indicating that the fit is good. The value of CFI is 0.978, the value of TLI is 0.974, the value of GFI is 0.945, the value of NFI is 0.968, and the value of AGFI is 0.930, all of them are greater than 0.9, indicating that they meet the fit criteria. The RMSEA value is 0.045 and the SRMR value is 0.023, both less than 0.05, indicating a good fit. In general, the structural model has a high degree of fitness. Structural equation modeling diagram are shown as per Figure 4.2.

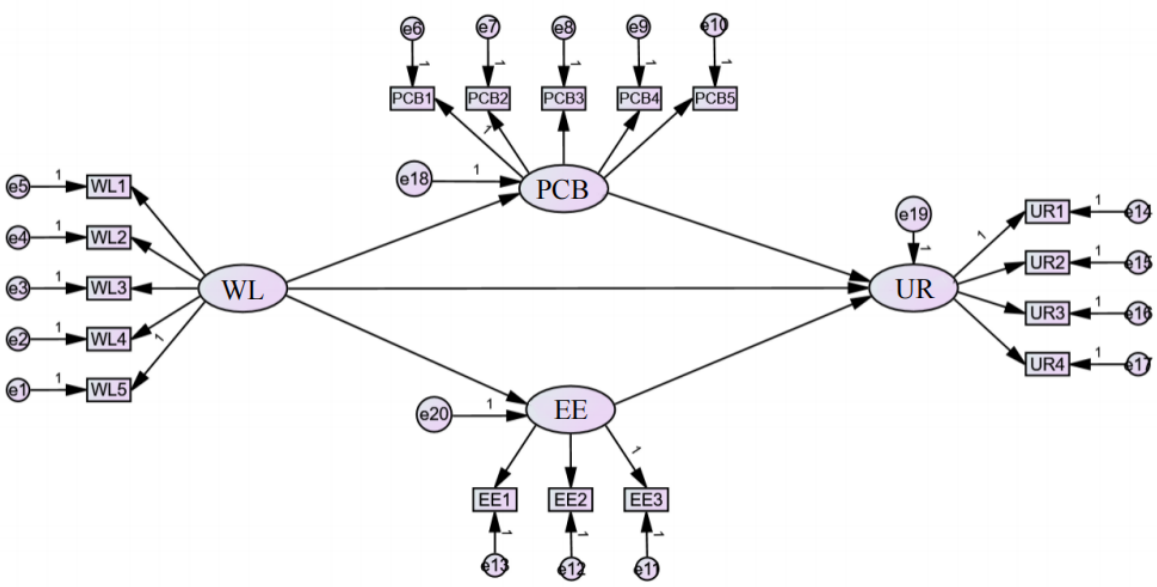

Figure 4.2 Structural equation modeling diagram

Note: WL: workload; PCB: psychological contract breach; EE: emotional exhaustion; UR: user resistance.

The path relationships of the variables show that workload, psychological contract breach, and emotional exhaustion have a significant positive effect on user resistance in the implementation stage of the hospital information system; workload has a significant positive effect on user resistance, so H1 is supported; psychological contract breach has a significant positive effect on user resistance, so H2 is supported; and emotional exhaustion has a significant positive

effect on user resistance, so H6 is supported. The path analysis results of the structural model are shown as per Table 4.2.

Table 4.2 Structural model path analysis results

Path relationship			Standardized coefficient β	S.E.	C.R.	p
WL	→	UR	0.069	0.037	2.033	0.042
PCB	→	UR	0.393	0.029	13.769	0.000
EE	→	UR	0.141	0.029	4.414	0.000

The results of the path analysis support the positive impact of workload, psychological contract breach, and emotional exhaustion on user resistance, and the paths of workload, psychological contract breach, and emotional exhaustion on user resistance are all valid as shown in Figure 4.3.

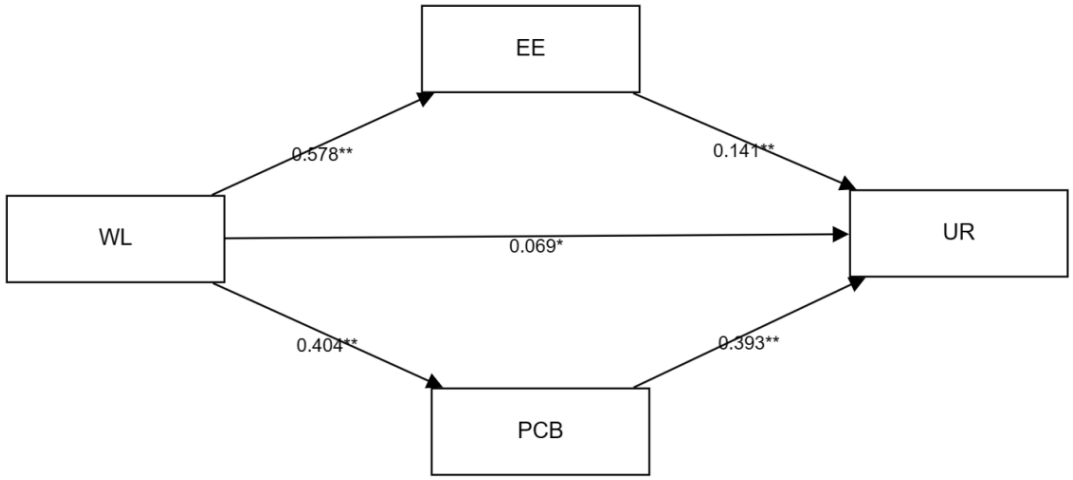

Figure 4.3 Structural equation modeling path analysis

Note: WL: workload; PCB: psychological contract breach; EE: emotional exhaustion; UR: user resistance.

4.2.2 Mediation effect analysis

On the basis of direct effect, we further analyze the indirect effect of medical workers' workload on user resistance, namely, the mediation effect test. Baron and Kenny (1986) pointed out that the mediation effect explains "how" and "why" the independent variable affects the dependent variable, and the existence of the mediation effect must satisfy the following three conditions. First, the independent variable X has a significant impact on the mediator variable M (path a); second, the mediator variable M has a significant impact on the dependent variable Y (path b); and third, when the paths a and b are controlled, the relationship between the independent variable and the dependent variable becomes no longer significant. The mediation effect is strongest when the impact of the independent variable on the dependent variable (path c) is zero. Sobel (1982) proposed the Sobel test for the mediation effect, arguing that in addition to paths a and b being significant, the product of the two should also be significant before we confirm

the existence of the mediation effect. Hayes (2009) pointed out that the Sobel test, although more rigorous, requires that the product of paths a and b be in accordance with a normal distribution. However, in practice, a and b are asymmetric and the skewness and kurtosis are not zero, so the self-help method (Bootstrap) is preferred for the test of mediation effect. Bootstrapping is a type of resampling where large numbers of smaller samples of the same size are repeatedly drawn for at least 1000 times (at least 5,000 times is recommended), with replacement, from a single original sample. The a*b estimates are sorted from smallest to largest, and the 2.5th percentile and 97.5th percentile form a confidence interval with a confidence level of 95%. If the confidence interval does not contain 0, it means that a*b is significant and the mediation effect exists; otherwise, it means that the mediation effect does not exist. This test is called the non-parametric percentile Bootstrap method, which has a higher testing power than the Sobel test. If the confidence intervals are bias-corrected, or if the bias-corrected nonparametric percentile Bootstrap method is used, the testing power of the mediation effect will be further promoted. Bootstrap has been embedded into many structural equation modeling software such as AMOS, and allows mainstream programs such as SPSS and Smart PLS to obtain indirect effects through Bootstrap. It is recognized as a relatively desirable mediation effect test method.

Therefore, we use AMOS 28.0 to analyze the multiple mediation model of this research based on the bias-corrected non-parametric percentile Bootstrap method (the amount of sampling is set at 5,000). The confidence intervals for the total and direct effects of workload on user resistance do not contain 0, indicating that the mediation effect is significant and it is partially mediated. The results obtained are shown as per Table 4.3.

Table 4.3 Results of the mediation effect

Path	Symbol	Meaning	Point estimation	Bias-corrected percentile 95% CI		z value/ *t* value	*p* value	Conclusion	Proportion
				Lower	Upper				
Test of the mediation effect of PCB									
WL→PCB	a	X→M	0.370	0.311	0.428	12.417	0.000		
PCB→UR	b	M→Y	0.415	0.350	0.480	12.594	0.000		
WL→PCB→UR	a*b	Indirect effect	0.153	0.100	0.179	7.509	0.000	Partial mediation	46.88%
WL→UR	c'	Direct effect	0.085	0.016	0.154	2.406	0.016		
	c	Total effect	0.327	0.263	0.392	9.936	0.000		
Test of the mediation effect of EE									
WL→EE	a	X→M	0.636	0.578	0.695	21.443	0.000		
EE→UR	b	M→Y	0.140	0.075	0.205	4.235	0.000	Partial mediation	27.22%
WL→EE→UR	a*b	Indirect effect	0.089	0.030	0.128	3.573	0.000		
WL→UR	c'	Direct	0.085	0.016	0.154	2.406	0.016		

c	effect Total effect	0.327	0.263	0.392	9.936	0.000

The confidence interval of mediation path for psychological contract breach is (0.100, 0.179), not containing 0 and presenting a significant mediation effect. The mediation effect size is 0.153, so H4 is supported. The confidence interval of mediation path for emotional exhaustion is (0.030, 0.128), not containing 0 and presenting a significant mediation effect. The mediation effect size is 0.089, so H7 is supported.

Psychological contract breach and emotional exhaustion each explain 46.88% and 27.22% of the total mediation effect, with psychological contract breach having the strongest mediation effect. The results of the mediation effect test indicate that the path of health professionals' workload affecting user resistance through the mediators of psychological contract breach and emotional exhaustion holds true, which means that H4 is supported; and emotional exhaustion plays a mediating role in the relationship between workload and user resistance, which means that H7 is supported. The effect of the path is stronger after the mediators are added, which further illustrates the importance of psychological contract breach and emotional exhaustion on user resistance.

4.2.3 Moderation effect analysis

It is believed that the organizational environments of different hospitals can affect the psychology of medical workers at work. In order to explore the differences in the formation of user resistance among medical workers under different organizational support, we incorporate the environmental factor of perceived organizational support into the research model. When medical workers perceive a high sense of organizational support, their psychological contract breach and emotional exhaustion will be moderated to be lower. We further analyze the differences in the effects of workload on psychological contract breach and emotional exhaustion and in turn on user resistance at different levels of perceived organizational support. The structural model of the moderation effect are shown as per Figure 4.4.

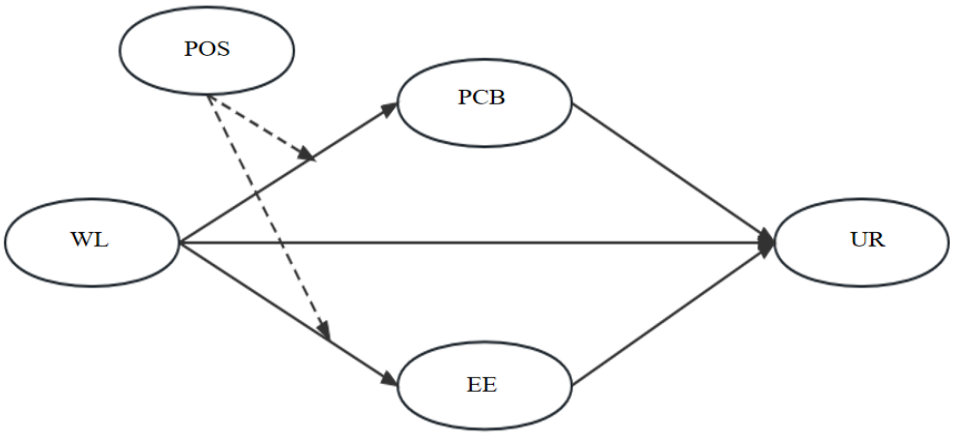

Figure 4.4 Structural model of the moderation effect

Note: WL: workload; PCB: psychological contract breach; EE: emotional exhaustion; POS: perceived organizational support; UR: user resistance.

If the variable M takes on different levels of value, the independent variable affects the dependent variable to different degrees, then M is believed to play a moderating role between the independent variable X and the dependent variable Y, and the variable M is called a moderator variable. The moderation effect reflects the extent to which the relationship between the independent variable X and the dependent variable Y depends on M, and explains "when" and "how" the independent variable affects the dependent variable. Wen et al. (2005) proposed the steps to test the moderation effect by using hierarchical regression analysis. First, standardize the independent variables and moderator variables, perform the regression of the dependent variable on the independent variables and moderator variables, and obtain the coefficient of determination R_1^2; second, perform the regression of the dependent variable on the independent variables, the moderator variables, and the interaction terms of the dependent variables and the moderator variables, and obtain the coefficient of determination R_2^2; third, perform significance analysis of the moderation effect, if R_2^2 is significantly higher than R_1^2, it indicates that the moderation effect is significant, and vice versa.

According to the method of hierarchical regression analysis using SPSS proposed by Wen et al. (2005), we analyze the moderation effect of the variable of perceived organizational support through hierarchical regression using SPSS 27.0.

(1) The moderation effect of perceived organizational support on the path from workload to psychological contract breach

In order to test the moderation effect of perceived organizational support on the path from workload to psychological contract breach, we take workload as the independent variable and psychological contract breach as the dependent variable, and mean centering is performed to each variable. The steps to conduct the moderation effect test are as follows. First, analyze the

influence of the independent variable workload on the dependent variable psychological contract breach (the moderator variable is not considered in model 1); then add the moderator variable perceived organizational support to model 1 to get model 2, and add the interaction term of the independent variable workload and the moderator variable perceived organizational support to model 2. If the change of R2 is significant when model 2 changes to model 3, it means there is a moderation effect; if the interaction term shows significance in model 3, it also means there is a moderation effect. From the table, it can be seen that from model 1 to model 3, the values of R2 are 0.163, 0.214, and 0.221 respectively, and the R2 values increase significantly in order. The results of the moderation effect analysis show that the interaction term of workload and perceived organizational support has a significant negative impact on psychological contract breach (β=-0.08, p<0.01), indicating that there is a negative moderation effect. To be specific, perceived organizational support negatively moderates the relationship between workload and psychological contract breach, namely, the higher the perceived organizational support, the weaker the positive correlation between workload and psychological contract breach. Therefore, H8 is supported. The moderation effect of perceived organizational support on the path from workload to psychological contract breach is shown as per Table 4.4.

Table 4.4 Analysis results of moderation effect 1 (n=1118)

	Model 1					Model 2					Model 3				
	B	Std. error	t value	*p* value	β	B	Std. error	t value	*p* value	β	B	Std. error	t value	*p* value	β
Constant	2.44	0.03	81.25	0.000	-	2.44	0.03	83.84	0.000	-	2.42	0.03	81.29	0.000	-
WL	0.44	0.03	14.73	0.000	0.40	0.37	0.03	12.42	0.000	0.34	0.38	0.03	12.74	0.000	0.35
POS						-0.27	0.03	-8.56	0.000	-0.24	-0.28	0.03	-8.86	0.000	-0.24
WL*POS											-0.08	0.03	-2.98	0.003	-0.08
R^2	0.163					0.214					0.221				
F value	F (1,1116) =216.875, p=0.000					F (2,1115) =152.107, p=0.000					F (3,1114) =105.089, p=0.000				

Note: dependent variable: PCB *p<0.05, **p<0.01

In order to explain more intuitively the moderation effect of perceived organizational support on the path from workload to psychological contract breach, we follow the suggestion of Aiken and Sloane (1997), and adopt the pick-a-point approach to group the moderator variables according to the criterion of mean value plus or minus one standard deviation. We then perform the regression of the dependent variable on the independent variable. As shown in Table 4.5 and Figure 4.5.

Table 4.5 Influence of workload on psychological contract breach under different levels of perceived organizational support

Moderator variable level	Regression coefficient β	Std. error	t	p	95% CI	
Mean	0.381	0.030	12.743	0.000	0.323	0.440
High level (+1SD)	0.306	0.037	8.364	0.000	0.234	0.378
Low level (-1SD)	0.457	0.042	10.978	0.000	0.375	0.538

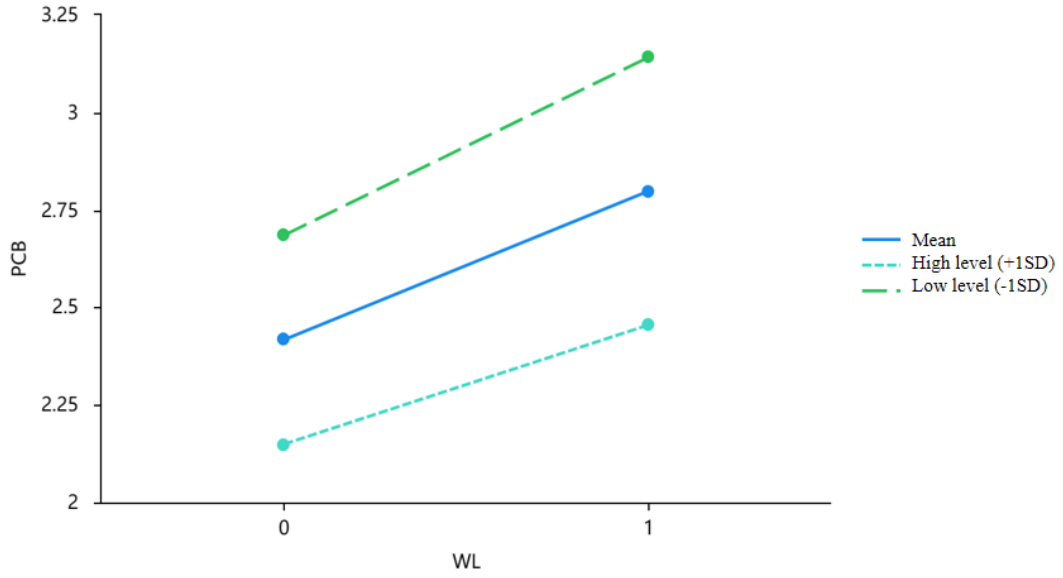

Figure 4.5 The moderation effect of perceived organizational support on the relationship between workload and psychological contract breach

Note: WL: workload; PCB: psychological contract breach; POS: perceived organizational support.

We distinguish three levels of perceived organizational support according to M-1SD, M, and M+1SD, and analyze the direct influence of workload on psychological contract breach under different levels of perceived organizational support. Demonstrates the difference in the magnitude of the influence of the independent variable workload on the dependent variable psychological contract breach when the moderator variable perceived organizational support is at different levels. When the value of perceived organizational support is M+1SD, the regression coefficient of workload on psychological contract breach β is 0.306 (p<0.05). When the value of perceived organizational support is M-1SD, the regression coefficient of workload on psychological contract breach β is 0.457 (p<0.05). There will be different slopes depending on whether the level of perceived organizational support is high or low, indicating that the moderation effect is significant. The analysis results show that workload has a stronger direct effect on psychological contract breach when the perceived organizational support is low, namely, perceived organizational support has a negative moderation effect on workload and psychological contract breach. Workload has a stronger positive effect on psychological contract breach

under low perceived organizational support, and the slope line is relatively steep; the positive effect of workload on psychological contract breach becomes smaller under high perceived organizational support, and the slope line is less steep. Thus, H8 is more fully supported.

(2) The moderation effect of perceived organizational support on the path from workload to emotional exhaustion

In order to test the moderation effect of perceived organizational support on the path from workload to emotional exhaustion, we take workload as the independent variable and emotional exhaustion as the dependent variable, and mean centering is performed to each variable. The steps to conduct the moderation effect test are as follows. First, analyze the influence of the independent variable workload on the dependent variable emotional exhaustion (the moderator variable is not considered in model 1); then add the moderator variable perceived organizational support to model 1 to get model 2, and add the interaction term of the independent variable workload and the moderator variable perceived organizational support to model 2. If the change of R2 is significant when model 2 changes to model 3, it means there is a moderation effect; if the interaction term shows significance in model 3, it also means there is a moderation effect. From the table, it can be seen that from model 1 to model 3, the values of R2 are 0.334, 0.363, and 0.368 respectively, and the R2 values increase significantly in order. The results of the moderation effect analysis show that the interaction term of workload and perceived organizational support has a significant negative impact on emotional exhaustion (β=-0.07, p<0.01), indicating that there is a negative moderation effect. To be specific, perceived organizational support negatively moderates the relationship between workload and emotional exhaustion, namely, the higher the perceived organizational support, the weaker the positive correlation between workload and emotional exhaustion. Therefore, H10 is supported. The moderation effect of perceived organizational support on the path from workload to emotional exhaustion is shown as per Table 4.6.

Table 4.6 Analysis results of moderation effect 2 (n=1118)

	Model 1					Model 2					Model 3				
	B	Std. error	t value	p value	β	B	Std. error	t value	p value	β	B	Std. error	t value	p value	β
Constant	2.91	0.03	98.31	0.000	-	2.91	0.03	100.48	0.000	-	2.89	0.03	97.56	0.000	-
WL	0.69	0.03	23.64	0.000	0.58	0.64	0.03	21.44	0.000	0.53	0.65	0.03	21.72	0.000	0.54
POS						-0.22	0.03	-7.12	0.000	-0.18	-0.23	0.03	-7.34	0.000	-0.18
WL*POS											-0.08	0.03	-2.98	0.003	-0.07
R^2	0.334					0.363					0.368				
F value	F (1,1116) =558.696, p=0.000					F (2,1115) =317.115, p=0.000					F (3,1114) =215.875, p=0.000				

Note: dependent variable: EE * p<0.05, ** p<0.01

In order to explain more intuitively the moderation effect of perceived organizational support on the path from workload to emotional exhaustion, we follow the suggestion of Aiken and West (1991), and adopt the pick-a-point approach to group the moderator variables according to the criterion of mean value plus or minus one standard deviation. We then perform the regression of the dependent variable on the independent variable, and draw a simple slope diagram as per Figure 4.6.

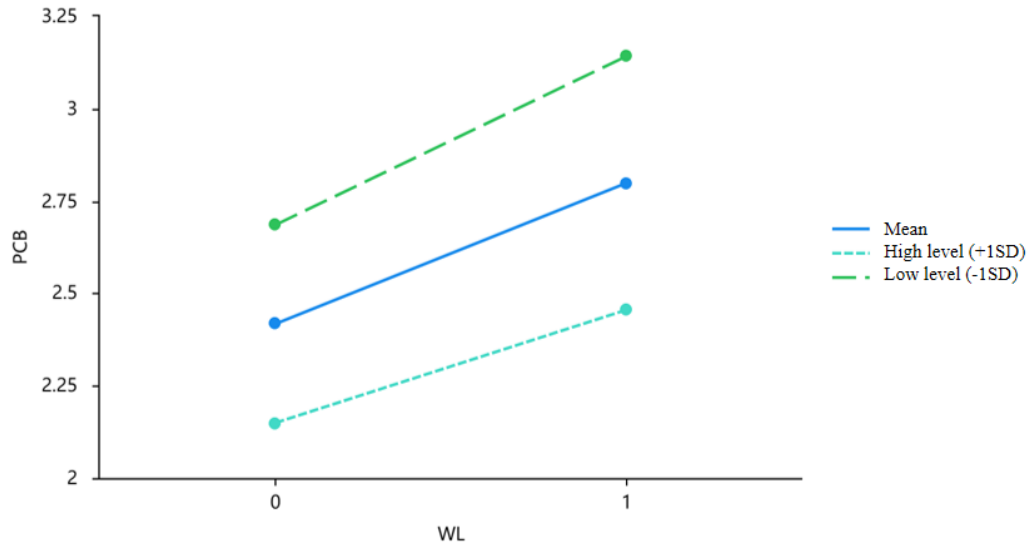

Figure 4.6 The moderation effect of perceived organizational support on the relationship between workload and emotional exhaustion

Note: WL: workload; EE: emotional exhaustion; POS: perceived organizational support.

We distinguish three levels of perceived organizational support according to M-1SD, M, and M+1SD, and analyze the direct influence of workload on emotional exhaustion under different levels of perceived organizational support. Demonstrates that the difference in the magnitude of the influence of the independent variable workload on the dependent variable emotional exhaustion when the moderator variable perceived organizational support is at different levels. When the value of perceived organizational support is M+1SD, the regression coefficient of workload on emotional exhaustion β is 0.573 (p<0.05). When the value of perceived organizational support is M-1SD, the regression coefficient of workload on emotional exhaustion β is 0.7237 (p<0.05). There will be different slopes depending on whether the level of perceived organizational support is high or low, indicating that the moderation effect is significant. The analysis results show that workload has a stronger direct effect on emotional exhaustion when the perceived organizational support is low, namely, perceived organizational support has a negative moderation effect on workload and emotional exhaustion. Workload has a stronger positive effect on emotional exhaustion under low perceived organizational support, and the

slope line is relatively steep; the positive effect of workload on emotional exhaustion becomes smaller under high perceived organizational support, and the slope line is less steep. Thus, H10 is more fully supported. As shown in Table 4.7.

Table 4.7 Influence of workload on emotional exhaustion under different levels of perceived organizational support

Moderator variable level	Regression coefficient β	Std. error	t	p	95% CI	
Mean	0.648	0.030	21.724	0.000	0.590	0.706
High level (+1SD)	0.573	0.036	15.712	0.000	0.501	0.644
Low level (-1SD)	0.723	0.041	17.437	0.000	0.642	0.804

4.3 Hypothesis testing results of Data analysis 1

Based on the results of the above analysis, all seven hypotheses have been validated by the model, as shown in Table 4.8.

Table 4.8 Hypotheses testing results of Data analysis 1

Hypotheses	Supported or not
H1: Workload has a significant positive impact on user resistance.	Supported
H2: Workload has a significant positive impact on psychological contract breach.	Supported
H4: Psychological contract breach mediates the relationship between workload and user resistance.	Supported
H6: Emotional exhaustion has a significant positive impact on user resistance.	Supported
H7: Emotional exhaustion mediates the relationship between workload and user resistance.	Supported
H8: Organizational support negatively moderates the relationship between workload and psychological contract breach. In other words, the higher the organizational support, the weaker the positive correlation between workload and psychological contract breach.	Supported
H10: Organizational support negatively moderates the relationship between workload and emotional exhaustion, more specifically, the higher the organizational support, the weaker the positive correlation between workload and emotional exhaustion.	Supported

Chapter 5: Data analysis 2- An Exploration of the Cross-Level Effects of Perceived Organizational Support

5.1 Review of Hypotheses of Data analysis 2

In the literature review in Chapter 2, the hypotheses of data analysis 2 are as follows.

H3: Workload exerts a significant positive influence on psychological contract breach;

H9: Organizational support at the hospital collective level has a stronger relationship with workload (H9a) and psychological contract breach (H9b) than organizational support at the individual employee level.

H5: Workload exerts a significant positive influence on emotional exhaustion;

H11: Organizational support at the hospital collective level has a stronger relationship with workload (H11a) and emotional exhaustion (H11b) than organizational support at the individual employee level.

5.2 Model analysis and hypothesis testing

In data analysis 2, we adopt multilevel modeling to examine the influence of workload and perceived organizational support on psychological contract breach and emotional exhaustion. In this study, perceived organizational support may have differences among individuals and may also be an organizational-level variable, because there may be large differences in organizational culture and climate, organizational system, and leadership styles across hospitals, and perceived organizational support may be embedded at a higher level because of homogeneity within hospitals caused the aforementioned factors (Liao & Chuang, 2004). Therefore, we use cross-level modeling to test the hypotheses (Raudenbush, 2004), as this analytical technique provides a more comprehensive and precise test of cross-level data structures. Stata 18.0 is used and a random intercept model is selected for multilevel regression analysis (McKibbin & Fernando, 2020; Raudenbush, 2004). The research model encompassing the organizational level and individual level is shown as per Figure 5.1.

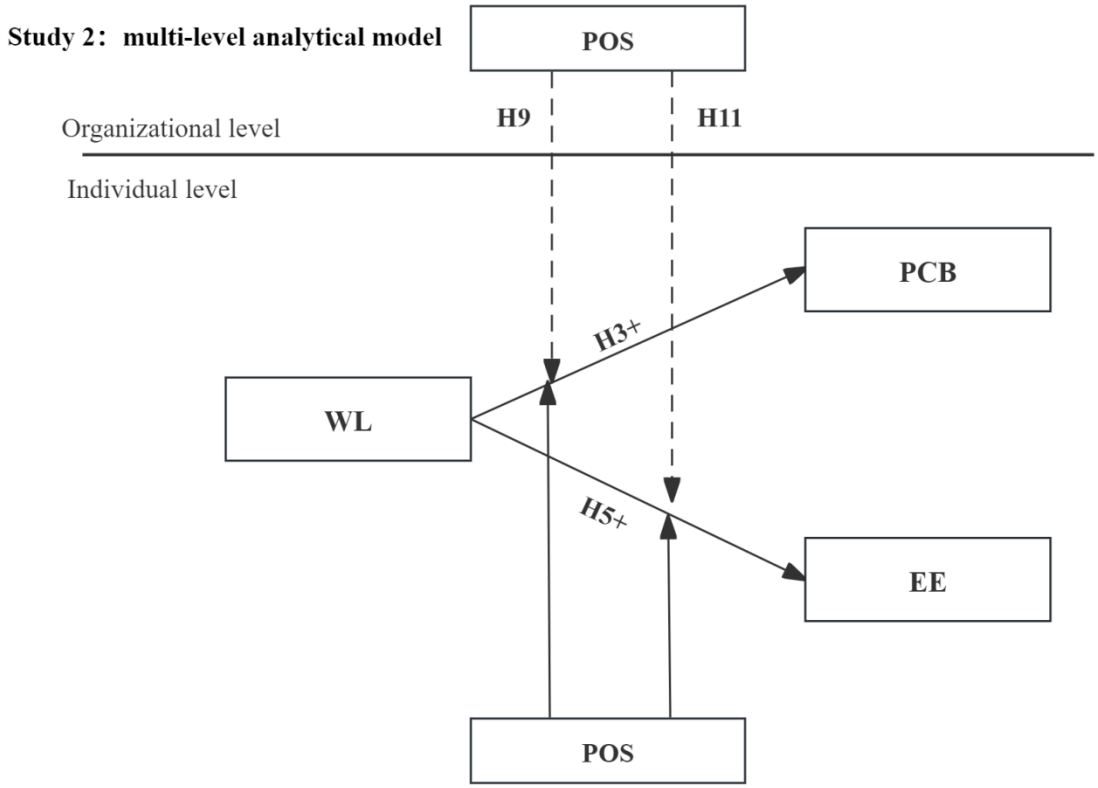

Figure 5.1 Model diagram for exploring the impact on health professionals' work behavior in data analysis 2

Note: WL: workload; PCB: psychological contract breach; EE: emotional exhaustion; POS: perceived organizational support; UR: user resistance.

5.2.1 Descriptive statistics and correlation analysis

Using a normal distribution model (James et al., 1984), this study examines the consistency of employee ratings of perceived organizational support within each hospital by calculating the reliability of inter-raters within groups (rwg). The mean value of rwg for perceived organizational support is 0.93 (the closer the rwg value is to 1, the higher the consistency), indicating that there is sufficient consistency within each hospital. However, the ICC1 value for perceived organizational support is less than 0.01 (the closer the ICC1 value is to 1, the higher the similarity between scores, namely, the better the consistency). Nonetheless, given the relatively high rwg and theoretical possibilities, this study still aggregates the perceived organizational support to the hospital level and tests whether it is a better predictor by model fitting. Descriptive statistics and correlations are shown in as per Table 5.1.

Table 5.1 Descriptive statistics and correlations between variables

	Mean	SD	EE	PCB	WL	POS (Individual level)	POS (Organizational level)	Gender	Age group 1	Age group 2	Job position	Length of service	Provincial-level dummy variable	City-level dummy variable
EE	2.91	1.21	1.00											
PCB	2.44	1.10	0.58*	1.00										
WL	3.01	1.01	0.58*	0.40*	1.00									
POS (Individual level)	3.42	0.97	-0.32*	-0.33*	-0.26*	1.00								
POS (Organizational level)	3.42	0.12	-0.07*	-0.07*	-0.08*	0.12*	1.00							
Gender	0.75	0.43	0.00	0.02	-0.01	-0.01	-0.05	1.00						
Age group 1	0.83	0.38	0.01	0.03	-0.01	-0.04	0.02	0.04	1.00					
Age group 2	0.11	0.31	0.03	0.02	0.08*	0.01	-0.05	-0.03	-0.75*	1.00				
Job position	0.62	0.48	-0.02	-0.08*	-0.10*	0.03	-0.10*	0.06	0.06*	-0.09*	1.00			
Length of service	10.60	7.74	0.04	0.06	0.11*	0.00	-0.04	-0.01	-0.41*	0.64*	-0.07*	1.00		
Provincial-level dummy variable	0.28	0.45	-0.06*	-0.03	-0.00	0.03	0.27*	-0.05	-0.04	0.02	0.05	0.04	1.00	

Note: The age group is a dummy variable, and the value is 0 or 1. Age group 1=1 means the employee is between 26 and 45 years old, and age group 1=0 means the employee is outside this range. Age group 2 means that the employee is over 46 years old, and age group 2 = 0 means that the employee is younger than 46 years old.
*p<0.05, **p<0.01, ***p<0.001

5.2.2 A cross-level analysis of the impact of psychological contract breach

The testing results of H3, H8, and H9, namely, the impacts of workload, perceived organizational support (individual level), and perceived organizational support (organizational level) on psychological contract breach. In Model 0, no variables are included in this study. In Model 1, only the individual level control variables are included, and both Model 0 and Model 1 serve as benchmark models. Control variables and workload are included in Model 2, and the analysis indicates a significant positive relationship between workload and psychological contract breach (β=0.43, p<0.001), which means that H3 is supported. Control variables and perceived organizational support (organizational level) are included in Model 3, and workload and perceived organizational support (organizational level) as well as their interaction term are included in Model 4. Model 5 incorporates organization-level dummy variables. However, the results of the cross-level analyses indicate that there is no significant correlation between the interaction term of workload and perceived organizational support (organizational level) and psychological contract breach (β=0.03, p>0.05). Model 6 incorporates control variables and perceived organizational support (individual level), Model 7 incorporates workload and perceived organizational support (individual level) and their interaction term, and Model 8 incorporates dummy variables at the organizational level. The results of the analysis show a significant correlation (β=-0.07, p<0.01) between the interaction term of workload and perceived organizational support (individual level) and psychological contract breach, which means that H8 is supported. Comparing Model 5 and Model 8, it is found that model 8 has a better model fit, and the moderating effect of perceived organizational support is tenable only at the individual level (Model 8), so H9 is not supported. A cross-level analysis of the impact of psychological contract breach is presented in Table 5.2.

Table 5.2 A cross-level analysis of the impact of psychological contract breach

	M0	M1	M2	M3	M4	M5	M6	M7	M8
Individual level variables - level 1									
Gender		0.06	0.07	0.06	0.06	0.06	0.06	0.06	0.06
		(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Age group 1		0.31*	0.20	0.30*	0.19	0.17	0.24	0.14	0.12
		(0.13)	(0.12)	(0.13)	(0.12)	(0.12)	(0.13)	(0.12)	(0.12)
Age group 2		0.22	0.09	0.20	0.08	0.06	0.18	0.05	0.03
		(0.19)	(0.18)	(0.19)	(0.18)	(0.18)	(0.18)	(0.17)	(0.17)
Job position		-0.19*	-0.10	-0.20*	-0.11	-0.10	-0.16*	-0.09	-0.08

	M0	M1	M2	M3	M4	M5	M6	M7	M8
		*		*					
		(0.07)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Length of service		0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0)	(0)
WL			0.43**		0.33	0.32		0.63**	0.63**
			(0.03)		(0.84)	(0.84)		(0.1)	(0.1)
POS (Individual level)							-0.36**	-0.05	-0.04
							(0.03)	(0.08)	(0.08)
WL#POS (Individual level)								-0.07**	-0.08**
								(0.03)	(0.03)
Organizational-level variables - level 2									
POS (Organizational level)				-0.65*	-0.46	-0.51			
				(0.31)	(0.8)	(0.8)			
WL#POS (Organizational level)					0.03	0.03			
					(0.25)	(0.25)			
Provincial-level dummy variable						-0.12			-0.14
						(0.08)			(0.08)
City-level dummy variable						-0.15*			-0.16*
						(0.07)			(0.07)
Intercept	2.45**	2.15**	0.96**	4.38**	2.54	2.83	3.42**	1.30**	1.40**
	(0.04)	(0.15)	(0.16)	(1.09)	(2.76)	(2.74)	(0.18)	(0.34)	(0.34)
Random effect									
log individual level variance	-2.19**	-2.11**	-2.54**	-2.49**	-2.81**	-16.52	-2.23**	-2.52**	-3.22
	(0.45)	(0.41)	(0.61)	(0.71)	(0.95)	(677.5)	(0.46)	(0.59)	(1.82)
log intercept variance	0.09**	0.08**	-0.00	0.08**	-0.00	-0.00	0.02	-0.04	-0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	1118	1118	1118	1118	1118	1118	1118	1118	1118
ICC	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.00
log likelihood	-1686.	-1677.	-1584.	-1676.	-1583.	-1581.	-1617.	-1545.	-1542.

	M0	M1	M2	M3	M4	M5	M6	M7	M8
	86	96	76	12	93	73	09	31	81
AIC	3379.	3371.	3187.	3370.	3189.	3189.	3252.	3112.	3111.
	72	93	52	24	86	47	18	62	62
BIC	3394.	3412.	3232.	3415.	3245.	3254.	3297.	3167.	3176.
	78	08	69	41	07	72	36	83	88
df	3.00	8.00	9.00	9.00	11.00	13.00	9.00	11.00	13.00
adj R-square		0.01	0.16				0.11	0.22	0.22

Standard errors in parentheses; *p<0.05, **p<0.01, ***p<0.001

5.2.3 A cross-level analysis of the impact of emotional exhaustion

The testing results of H5, H10, and H11, namely, the impacts of workload, perceived organizational support (individual level), and perceived organizational support (organizational level) on emotional exhaustion. In Model 9, no variables are included in this study. In Model 10, only the individual level control variables are included, and both Model 9 and Model 10 serve as benchmark models. Control variables and workload are included in Model 11, and the analysis indicates a significant positive relationship between workload and emotional exhaustion (β=0.7, p<0.001), which means that H5 is supported. Control variables and perceived organizational support (individual level) are included in Model 12, and workload and perceived organizational support (individual level) as well as their interaction term are included in Model 13. Model 14 incorporates organization-level dummy variables. The results of the analysis show a significant correlation (β=-0.08, p<0.01) between the interaction term of workload and perceived organizational support (individual level) and emotional exhaustion, which means that H10 is supported. Model 15 incorporates control variables and perceived organizational support (organizational level), Model 16 incorporates workload and perceived organizational support (organizational level) and their interaction term, and Model 17 incorporates dummy variables at the organizational level. However, the results of the cross-level analyses indicate that there is no significant correlation between the interaction term of workload and perceived organizational support (organizational level) and emotional exhaustion (β=-0.23, p>0.05). Comparing Model 14 and Model 17, it is found that model 14 has a better model fit, and the moderating effect of perceived organizational support is tenable only at the individual level (Model 14), so H11 is not supported. A cross-level analysis of the impact of emotional exhaustion is presented in Table 5.3.

Table 5.3 A cross-level analysis of the impact of emotional exhaustion

	M9	M10	M11	M12	M13	M14	M15	M16	M17
Individual-level variables - Level 1									
Gender		0.01	0.02	0.00	0.01	0.01	0.00	0.02	0.01
		(0.08)	(0.07)	(0.08)	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)
Age group 1		0.20	0.02	0.13	-0.03	-0.04	0.19	0.02	0.01
		(0.15)	(0.12)	(0.14)	(0.12)	(0.12)	(0.15)	(0.12)	(0.12)
Age group 2		0.22	0.01	0.17	-0.03	-0.04	0.20	-0.00	-0.01
		(0.21)	(0.17)	(0.20)	(0.17)	(0.17)	(0.21)	(0.17)	(0.17)
Job position		-0.05	0.08	-0.03	0.10	0.10	-0.07	0.08	0.09
		(0.08)	(0.06)	(0.07)	(0.06)	(0.06)	(0.08)	(0.06)	(0.06)
Length of service		0.00	-0.00	0.00	-0.00	-0.00	0.00	-0.00	-0.00
		(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
WL			0.70***		0.93***	0.93***		1.48	1.48
			(0.03)		(0.10)	(0.10)		(0.83)	(0.83)
POS (Individual level)				-0.39***	0.01	0.01	-0.72*	0.49	0.57
				(0.04)	(0.08)	(0.08)	(0.33)	(0.81)	(0.80)
WL#POS (Individual level)					-0.08**	-0.08**			
					(0.03)	(0.03)			
Organizational-level variables - Level 2									
POS (Organizational level)							-0.72*	0.49	0.57
							(0.33)	(0.81)	(0.80)
WL#POS (Organizational level)								-0.23	-0.23
								(0.24)	(0.24)
Provincial-level dummy variable						-0.20*			-0.19*
						(0.10)			(0.10)
City-level dummy variable						-0.09			-0.07
						(0.08)			(0.08)
Intercept	2.92***	2.71***	0.76***	4.09***	0.85*	0.94**	5.19***	-0.93	-1.09
	(0.04)	(0.17)	(0.16)	(0.20)	(0.34)	(0.34)	(1.14)	(2.78)	(2.76)
Random effect log individual level variance	-2.14*	-2.13*	-2.12*	-2.28*	-2.11*	-2.35*	-2.75*	-2.16*	-2.41*

	M9	M10	M11	M12	M13	M14	M15	M16	M17
	**	**	**	**	**	**		**	**
	(0.47)	(0.47)	(0.36)	(0.56)	(0.35)	(0.48)	(1.36)	(0.39)	(0.53)
log intercept variance	0.19**	0.19**	-0.02	0.13**	-0.05*	-0.05*	0.19**	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
N	1118.00	1118.00	1118.00	1118.00	1118.00	1118.00	1118.00	1118.00	1118.00
ICC	0.01	0.01	0.01	0.01	0.02	0.01	0.03	0.01	0.01
log likelihood	-1800.20	-1798.16	-1570.74	-1740.30	-1541.24	-1539.23	-1796.17	-1570.09	-1568.24
AIC	3606.40	3612.32	3159.48	3498.59	3104.49	3104.46	3610.34	3162.18	3162.49
BIC	3621.46	3652.47	3204.65	3543.77	3159.70	3169.71	3655.52	3217.39	3227.74
df	3.00	8.00	9.00	9.00	11.00	13.00			
adj R-square		-0.00	0.33	0.10	0.36	0.37			

Standard errors in parentheses; *$p<0.05$*, **$p<0.01$*, ***$p<0.001$*.

5.3 Discussion on results of Data analysis 2

Using a sample of 1,118 employees from 21 public hospitals in Guizhou Province, data analysis 2 explores the influence of workload on psychological contract breach and emotional exhaustion by means of a multilevel regression model, and tests the moderating roles of perceived organizational support at the hospital level and the individual level respectively. The results of the cross-level analysis indicate that workload leads to stronger psychological contract breach and more emotional exhaustion among employees, and individual-level perceived organizational support can mitigate these effects. However, contrary to our hypothesis, hospital-level perceived organizational support has no moderating effect. On the one hand, the ICC1 of perceived organizational support means that the variable has low convergent validity at the hospital level, suggesting that perceived organizational support of employees vary widely within each hospital and are difficult to converge, which reduces the predictive validity of the variable. In hospitals, employees may have different degrees of perceived organizational support due to a variety of factors such as individual cognitive-affective factors, job position, and professional title. On the other hand, the perceived organizational support at the individual level exerts a more direct impact on the cognitive and affective states of individual employees than at the organizational level, which can effectively alleviate employees' stress and negative emotions, and the variable has a higher predictive validity at the individual level. Therefore, we will focus on the variables and their effects at the individual level, and will further explore how workload

affects employees' work behaviors, or user resistance, by influencing their individual psychological states in data analysis 1. Based on the results of the above analysis, the hypothesis testing results are shown as per Table 5.4.

Table 5.4 Hypotheses testing results of Data analysis 2

Hypothesis	Supported or not
H3: Workload exerts a significant positive influence on psychological contract breach;	Supported
H5: Workload exerts a significant positive influence on emotional exhaustion;	Supported
H9: Organizational support at the hospital collective level has a stronger relationship with workload (H9a) and psychological contract breach (H9b) than organizational support at the individual employee level.	Not supported
H11: Organizational support at the hospital collective level has a stronger relationship with workload (H11a) and emotional exhaustion (H11b) than organizational support at the individual employee level.	Not supported

The initial analysis on this data analysis 2 fail to show a significant moderating effect of perceived organizational support at the hospital level. Possible reasons include the high degree of homogeneity within China's public hospital system, clarification of the role of hospitals in recent policy adjustments and attempts to narrow the gap between hospitals at different levels, and perceptions of diminishing differences in perceived organizational support between hospitals. These factors work together to result in relatively small differences in perceived organizational support among hospitals at the same level, and changes in policy orientation and equalization of resource allocation may mitigate the potential moderating effect of hospital level on perceived organizational support.

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Chapter 6: Discussion

6.1 Overview

1. Research on resistance behaviour during the ongoing implementation phase of an information system.

Generally speaking, user resistance behaviour occurs at any time, whether in the pre-implementation phase, the ongoing implementation phase and the post-implementation phase. The factors affecting user resistance are different at different stages of implementation. Only by accurately identifying the factors affecting user resistance at each stage of information system implementation can we accurately judge the degree of influence of each factor on user resistance, formulate corresponding policies and take effective actions to enhance user willingness to use and reduce the occurrence of user resistance. Most of the existing research analyses the factors affecting user resistance from the pre-implementation or post-implementation stage of information systems, and lacks research on the ongoing implementation stage of information systems.

2. Research on factors influencing boycott behaviour.

In the pre-implementation phase of an information system, which is the period between the deployment of the system and the time it is put into use, uncertainty costs, transitional costs, sunk costs, transfer benefits, and perceived value are the influencing factors of user resistance. On an individual level, that in the post-implementation phase of an information system, which is the period after the system is period after it has been put into use, user expectations, user training, and technology availability influence user resistance. User resistance is closely related to motivation and perception, and that factors such as entitlement status and intrinsic rewards have a more pronounced effect on whether users will resist during the pre-implementation and post-implementation phases of an information system. The implementation process of information systems tends to cause changes in four areas, i.e. increase or decrease in inputs and increase or decrease in outputs, and that in his view, the reason why users resist is mainly caused by bad changes, i.e. an increase in inputs or a decrease in outputs.

6.2 Discussion on the analysis results of workload

In the healthcare industry, the workload of health professionals is a critical factor because it directly affects the quality and efficiency of the healthcare services, as well as health professionals' attitudes and satisfaction with their work. Rahma et al. (2021) quantitatively analyzed the workload of nurses and concluded that heavy workload would affect the quality of inpatient services. Maghsoud et al. (2022) found that when the workload was increased, nurses were unable to satisfy some of the patient's needs despite their efforts. As a result, nurses do not have a positive attitude towards their performance, leading to low job satisfaction. According to Cimiotti et al. (2012) and Hall et al. (2016), the sources of stress and dissatisfaction among health professionals are varied and interrelated. These sources include financial pressures that affect staffing and workload, as well as pressure to provide quality patient care despite increased workload. The intensified stress affects the service efficiency and service quality of all the nursing staff. In this study, workload is defined as the number of tasks undertaken by health professionals at work, the stress of the job, and the amount of time and energy required to be invested during the work period. By implementing a questionnaire and statistically analyzing the collected data, this study reveals an important finding that there is a significant positive correlation between workload of the health professionals and their user resistance.

This result implies that resistance to healthcare information system is more pronounced among health professionals when they perceive higher workloads. The resistance behavior may be manifested as resistance to usage of the new system, delayed learning of the system operation, or avoidance of the usage of the system functions in their daily work. Simon et al. (2007) argue that on the one hand medical staff themselves are busy with patients' conditions and "the demands and pressures of providing office-based care may not allow them to spare time to learn the system," and on the other hand physicians also need to spend time and efforts to learn how to use the EMR system, which they may consider as a burden. Given this situation, they report lack of learning time because it slows down their workflow and increases their workload. Furthermore, medical information system includes complex hardware and software, so users (health professionals) are expected to have a certain level of computer skills. However, information system providers seem to underestimate the level of computer skills required by physicians, and the use of EMRs has introduced a new type of medical error: typing errors. In addition, not only physicians, but also other staff members in medical practices lack adequate computer skills (Meade et al., 2009). The system is not only perceived to be complicated but also

complicated in practice for these physicians. Therefore, these resistance behaviors not only reduce the efficiency of the use of healthcare information systems, but can also lead to data entry errors, delays in the delivery of information, and interruptions in the patient care process, generally hindering the widespread adoption of healthcare information systems (Boonstra & Broekhuis, 2010).

The reasons why increased workload leads to user resistance may be diversified. First, high workload often means increased time pressure and mental burden, which leaves health professionals with less time and energy to adapt to and learn new systems (Simon et al., 2007; Terry et al., 2008), which affects healthcare professionals' acceptance of change. In addition, when medical staff feel that the workload is already more than they can handle, they may resist any new changes or requirements that are perceived to further increase the workload, even if these changes may improve productivity in the long run. Kemper et al. (2006) found that more than half (58.1%) of the physicians who did not use EMR were skeptical that an EMR would improve patient care or clinical outcomes. Other researchers argue that those who are reluctant to use such systems are skeptical of claims that EMRs are successful in improving the quality of medical practice (Jha et al., 2009; Simon et al., 2007). This creates personal resistance to the adoption of EHRs (Vishwanath & Scamurra, 2007).

These findings raise important insights for the management of the healthcare organizations. In order to reduce user resistance, hospital administrators need to pay attention to the workload of the health professionals and take measures to manage the workload appropriately. Possible measures include optimizing workflows, providing additional resource support, and giving adequate training and transition periods when introducing new systems. In addition, the management should monitor the workload level to ensure that it remains within a reasonable range, so that the health professionals can effectively utilize the healthcare information system, thereby improving the overall quality of healthcare services and patient satisfaction. In this way, healthcare organizations can ensure that technology investments are maximized while the job satisfaction and well-being of the medical staff can be maintained.

6.3 Discussion on the analysis results of emotional exhaustion

In this study, emotional exhaustion is defined as a state of depletion of emotional resources due to prolonged emotional labor. This state is particularly common in the healthcare industry because health professionals need to invest a great deal of emotional labor in providing patient

care so as to maintain empathy and provide emotional support. However, emotional exhaustion arises when emotional labor is consistently excessive and not properly restored.

The results of the study reveal a significant positive correlation between emotional exhaustion and user resistance, suggesting that health professionals with high levels of emotional exhaustion are more inclined to resist healthcare information systems. The emotional exhaustion among health professionals is an intrinsic psychological issue that is often overlooked by researchers and administrators. Randeree (2007) mentions that the cultural change required to move from the use of printed health records to an EHR system has not occurred and the corresponding emotional exhaustion has been ignored as a result, which has led to the slow adoption of the EHR system. Laerum et al. (2001) commented that "technology alone is not sufficient to achieve well-functioning electronic information systems". To work successfully in new ways requires changes in certain organizational aspects. The resistance may take the form of rejection of new technology, resistance to changes in existing workflows, or simply a reduction in the use of the system. Emotional exhaustion may lead to a reduction in the sense of commitment and responsibility of health professionals to their work, which adversely affects the quality of patient care. According to Nantsupawat et al. (2016), increased emotional exhaustion among nurses increased the incidence of medication errors and infections, and decreased the quality of care. The results of another study showed that among the components of job burnout, emotional exhaustion had the strongest correlation with quality of care (Salyers et al., 2017). It may also lead to resistance to job changes, especially those that require additional learning and adaptation (Simon et al., 2007; Terry et al., 2008).

Such findings highlight the importance of health professionals' emotional states in influencing their work behaviors and prove the necessity to implement emotional management strategies in the workplace. Emotional management strategies may include providing emotional intelligence training, setting additional breaks, providing mental health support, and creating a work environment that is supportive and open to the expression of emotions. These measures can help health professionals deal with emotional stress more effectively and prevent the occurrence of emotional exhaustion, thereby reducing psychological stress that may lead to resistant.

Management of healthcare institutions should recognize that investing in the emotional well-being of employees not only helps reduce user resistance, but also exerts a positive impact on improving overall employee well-being, increasing employee satisfaction, and enhancing the quality of patient care. Therefore, emotional management should not be viewed as an optional supplement, but rather as a core component of healthcare organization management. By

implementing effective emotional management strategies, healthcare organizations can establish a more positive, productive, and humane work environment to remain competitive and efficient in the ever-changing healthcare industry.

6.4 Discussion on the analysis results of psychological contract breach

In this study, psychological contract breach is considered as an informal psychological contract between the health professionals and the healthcare organizations, involving expectations of both parties regarding working conditions, support, and rewards. When these expectations are not met, it can be considered as a psychological contract breach. The results of the study show that psychological contract breach plays a mediating role between workload and user resistance of the health professionals, and there is a significant positive correlation between psychological contract breach and user resistance.

To be specific, psychological contract breach will be triggered by a perceived sense of imbalance when health professionals feel that their efforts for the healthcare organizations are not properly recognized or rewarded. The psychological contract breach, in turn, increases employee resistance to the healthcare information system, which may be that they feel greater workload is unfair or they are unwilling to invest time and energy in adapting to a system that they feel there is no adequate support provided (Jha et al., 2009). Rani et al. (2017) explored the impact of psychological contract breach on organizational identity among health professionals, which occurs when these expectations and promises are not met. The study shows that psychological contract breach significantly affects organizational identity by increasing distrust. This means that when employees feel that the organization fails to fulfill its promises to them, their trust in the organization decreases, which in turn leads to a decline in their identification and involvement with the organization. This decreased identification and involvement may further manifest itself in resistance to organizational change, including resistance to newly introduced information systems.

Dissatisfaction and loss of trust triggered by the psychological contract breach may cause health professionals to reduce their use of healthcare information systems (Morrison & Robinson, 1997), and it is clear that the implementation of EHRs does imply a change in the way physicians work, and secondly there is a general initial fear of change and skepticism about its necessity(Simon et al., 2007). According to Davidson and Heslinga (2006), implementing EHR means switching from a paper-based system to an electronic system, which involves transferring records between the two systems. Some physicians view the task of record switching as

their responsibility, because "they are only satisfied with the handwritten notes and medical histories. According to Pizziferri et al. (2005), 92% of physicians feel that the use of EMRs interferes with their communication with patients. Physicians must resort to computers to complete spreadsheets during patient visits, which can be very time-consuming, especially if they have limited computer skills. In addition, Loomis et al. (2002) found that the use of computerized EHRs may negatively impact patient privacy. Physicians doubt whether EHRs can securely store patient information and records and are concerned that data in the system may be accessed by unauthorized persons. Even among physicians who use EHRs, the majority of them believe that there are more security and confidentiality risks among EHRs than printed records. In summary, these behaviors may negatively impact the continuity, efficiency, and safety of healthcare delivery, as user resistance may impede the flow of information and communication, which in turn affects the quality of patient care.

This finding is crucial for managers in healthcare organizations as it emphasizes the importance of maintaining the psychological contract. Managers need to ensure that communication with employees is clear, expectations of health professionals are appropriately managed, and promises are honored. In addition, healthcare organizations should strive to provide appropriate support and resources to maintain a positive psychological contract state. This includes timely feedback, praise, and recognition of employee contributions, as well as reasonable and fair workload. Through these measures, healthcare organizations can not only reduce user resistance, but also enhance job satisfaction of the health professionals, thereby improving the overall quality of healthcare services.

6.5 Discussion on the analysis results of perceived organizational support

In this study, perceived organizational support refers to the health professionals' perceptions of the resources and emotional support provided by the healthcare organizations as well as the organizational recognition of individual efforts. It is a multidimensional concept that encompasses various forms of support ranging from material resources to psychological comfort. The results of the study indicate that perceived organizational support play a significant moderating role between workload and psychological contract breach. This means that among health professionals with relatively high perceived organizational support, there are relatively few cases of psychological contract breach even with relatively high workload.

To be specific, when health professionals perceive that they are able to receive necessary support from the healthcare organization, whether it is emotional encouragement or resource

support, they appear to be more able to handle the challenges of their job and have lower perceptions of job stress. The perceived support reduces the sense of psychological contract breach caused by workload, which in turn reduces negative behaviors, such as user resistance, that result from the psychological contract breach. In addition, various studies have corroborated that perceived organizational support buffers against the deleterious effects of organizational mistreatment or high workplace demands (Lee & Peccei, 2007), and employees who have experienced a high level of perceived organizational support feel more controllable in the event of a negative event and are less likely to blame the organization for unmet expectations (Charoensukmongkol & Phungsoonthorn, 2021; McKibbin & Fernando, 2020). Delegach et al. (2022) concluded that the loss of resources and the subsequent increase in emotional exhaustion and decrease in affective commitment were in part caused by psychological contract breach and the subsequent emotional loss. In contrast, the positive correlation between workload and psychological contract breach and emotional exhaustion will be weakened when the perceived organizational support is high.

Thus, perceived organizational support can provide a psychological buffer that helps employees maintain a better mindset in the face of high workload. The health professionals may feel that even though the demands of the job are high, the support provided by the healthcare organizations gives them the ability to cope with these challenges, thus reducing psychological stress and resistance to new systems or processes. This support may include consideration for the employee's personal life, understanding of the difficulties encountered at work, provision of necessary training and development opportunities, and guarantee of employees' feeling that their contributions are recognized.

For healthcare organizations, this finding underscores the importance of fostering perceived organizational support. The management should aim to establish a supportive working environment, provide appropriate resources and training, and ensure that employees are recognized and rewarded for their hard work. In addition, management should focus on the emotional needs of employees by providing a safe and encouraging atmosphere where employees feel supported and valued.

By reinforcing the perceived organizational support, healthcare organizations can not only reduce employees' psychological contract breach and user resistance, but also increase overall employee satisfaction, enhance team cohesion, improve healthcare service quality, and ultimately improve patient satisfaction. Therefore, perceived organizational support should become a core component of management strategies in healthcare organizations to ensure the maintenance of employees' psychological well-being and work performance in high-pressure

environments.

6.6 Analysis of the reasons for the lack of moderating effect of perceived organizational support at the hospital level

The results show that perceived organizational support (POS) does not show a significant moderating effect at the hospital level. We explore the reasons from the following three aspects.

The first is the homogeneity of public hospitals and its effect on perceived organizational support. In China, public hospitals are classified and managed hierarchically through the bureaucratic system, and hospitals at each level are highly homogeneous in terms of organizational structure, management style, and resource allocation. This homogeneity within the same level often outweighs the differences between different levels, resulting in potentially small differences in perceived organizational support among hospitals within the same level. Since hospitals within the same level are highly similar on several key dimensions, this similarity may diminish the potential moderating effect of hospital level on the perceived organizational support, as intra-organizational and inter-organizational differences in the perceived support are not sufficient to generate statistical significance.

The second is recent policy adjustments and their impact on inter-hospital differences in perceived organizational support. Recent policy adjustments aim to clarify the roles of hospitals at each level and narrow the gap between hospitals at different levels through specific measures. These measures include providing more financial support to county hospitals, strengthening professional knowledge training programs for county hospital staff, adapting to changes in patients' medical habits during the COVID-19 epidemic, and encouraging patients to receive healthcare at local hospitals. These policies not only improve the service capacity of county hospitals and the professionalism of their staff, but may also enhance the perceived organizational support of the staff, thereby reducing the difference in their perceived organizational support with high-level hospitals. It suggests that changes in policy orientation and equalization of resource allocation play an important role in narrowing the differences in perceived organizational support among hospitals.

The last one is the narrowing of gaps in hospital perceived organizational support caused by new policies. While previous policies tend to favor development of high-level hospitals, recent new policies and resources targeting county hospitals may have further strengthened the perception of the public and health professionals in terms of the narrowing gaps in perceived organizational support among hospitals. The change in perception, coupled with actual policy

support and resource allocation, can help increase the perceived organizational support among county-level hospitals and their employees, making the differences in perceived organizational support among hospitals at different levels less significant.

In summary, the above analysis shows that no significant moderating effect on perceived organizational support at the hospital level may be due to a combination of the high degree of homogeneity within the public hospital system, the clarification of hospital roles as a result of policy adjustments, and changes in perceptions of differences in perceived organizational support among hospitals. These factors jointly contribute to the failure to observe a statistically significant moderating effect on perceived organizational support. Future research can further explore how to enhance the perceived organizational support within healthcare institutions through policy formulation and management practices, so as to promote healthcare service quality and improve healthcare work efficiency.

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Chapter 7: Conclusions and Suggestions

7.1 Research conclusions

This research comprehensively analyzes four key factors of workload, psychological contract breach, emotional exhaustion, and perceived organizational support, and reveals how they interact with each other and jointly influence health professionals' resistance to medical information system. To be specific, an increase in workload tends to lead to an increase in the psychological contract breach of the health professionals, which in turn increases the risk of emotional exhaustion, and these factors ultimately generate user resistance. However, this trend will be mitigated when health professionals feel relatively high perceived organizational support, suggesting that perceived organizational support plays a key moderating role in this process. These findings are extremely important for the healthcare industry because they are directly linked to service efficiency and quality, as well as patient satisfaction and safety. Therefore, healthcare providers and administrators can use these insights to improve the work environment, psychological contract, emotional state, and organizational support, so as to optimize healthcare delivery processes and enhance the patient experience.

7.2 Theoretical contributions

The purpose of this thesis is to explore the factors influencing health professionals' resistance to information system during the implementation stage of a hospital information system, with several theoretical contributions as follows.

First, based on the perspective of health professionals, this study identifies the key factors influencing user resistance in the implementation stage, filling a gap in the existing literature. Prior studies have focused on the factors influencing user resistance in the pre-implementation and post-implementation stages of information system (Kemp & Low, 2008; Y. J. Zhang et al., 2014), and there are relatively few in-depth studies on the implementation stage, which is a research gap that is filled by this study.

Second, this study provides insight into the impact of workload on user resistance during

the implementation stage of information system. The heavy workload faced by health professionals on a daily basis requires them to not only fulfill their daily duties but also learn and use the new system during the implementation stage of the information system. This enforced change in work style requires health professionals to invest more time and effort in acquiring relevant knowledge and skills (Lapointe & Rivard, 2005). The significant increase in work tasks at this stage places a significant burden on the users, thus exerting a more profound and direct impact on user resistance.

In addition, this study reveals the mediating role of psychological contract breach (cognitive dimension) and emotional exhaustion (affective dimension) in the relationship between workload and user resistance. Previous studies have demonstrated the link between negative emotions and user resistance (Y. J. Zhang et al., 2015), and the mediating role of perceived value in the relationship between transfer costs, transfer benefits and user resistance (Han, 2020). Based on the cognitive-affective processing system framework, this study explores how workload affects user resistance through a dual pathway, emphasizing the physical and psychological damages caused by workload to employees and its effects on psychological contract breach and emotional exhaustion (DiStaso & Shoss, 2020; Elsaied, 2022; Kuroda & Yamamoto, 2019; Liu et al., 2021).

Finally, with perceived organizational support as a moderating variable, this study explores its moderating role between workload, psychological contract breach, emotional exhaustion, and user resistance. Although previous studies have focused on the moderating role of individual employee traits, the moderating role of perceived organizational support has been insufficiently studied (Medzo-M'Engone, 2021; Prysmakova & Lallatin, 2021). This research shows that when users perceive organizational support and receive positive feedback, their psychological contract breach and emotional exhaustion can be mitigated to some extent, which in turn reduces the likelihood of user resistance.

7.3 Suggestions for management practice

The results of this study play an important role in deepening our understanding of healthcare management theories and specific strategies at the practical level are provided, with an aim to helping healthcare organizations improve the work environment and attitudes of the medical staff, particularly with respect to their resistance to the healthcare information system.

The results have provided important practical guidance for healthcare organizations. By

understanding the complex factors that influence health professionals' resistance to the information system, administrators can take targeted measures to reduce workload, decrease psychological contract breach, mitigate emotional exhaustion, and enhance perceived organizational support.

In addition, the results also emphasize the humanistic care that should be valued by the administrators during the implementation of healthcare information systems. Successful implementation of healthcare information systems requires not only technology and process optimization, but also full consideration of the psychological and emotional needs of the health professionals.

To this end, the administrators should first consider adjusting the workflow and reducing the workload. The hospital management should introduce more efficient workflow management tools and technologies, reassess and optimize the workflow, so as to cut down unnecessary workload and improve work efficiency, and reduce the work pressure of the health professionals in the information system implementation.

Second, when faced with high workload and the potential risk of psychological contract breach, perceived organizational support can significantly reduce the psychological stress of the health professionals and moderate the impact of negative emotions. Therefore, enhancing perceived organizational support not only helps increase employees' job satisfaction and loyalty, but also reduces the occurrence of user resistance. The hospital management can improve the quality of communication, create a fair and friendly work environment, and ensure that health professionals feel supported by their superiors and colleagues by establishing a supportive work environment. The hospital management can enhance the perceived organizational support by holding regular team-building activities, offering career development opportunities, establishing a fair reward and recognition system, and recognizing the contributions of the employees.

Third, strengthen the psychological contract. It is necessary to enhance communication between the hospital and the health professionals to clarify expectations and responsibilities of both parties. An open and transparent communication platform should be established, so that the health professionals feel that their opinions are valued and can influence the decision-making process.

Fourth, alleviate emotional exhaustion. Mental health support and stress management workshops should be offered on a regular basis to help the health professionals learn how to manage stress and emotions. The provision of emotional management training is particularly critical to alleviating emotional exhaustion among the health professionals. Studies have found a positive correlation between emotional exhaustion and user resistance, suggesting that

through effective emotional management, the health professionals can better cope with the challenges posed by emotional labor, thereby reducing resistance to information systems. Hospitals can help health professionals develop skills to cope with emotional challenges by implementing emotional intelligence training, providing counseling and stress management workshops. In addition, health professionals are encouraged to adopt healthy lifestyles, such as regular exercise and adequate rest, to improve their emotional resilience.

Fifth, humanistic care. During the implementation of healthcare information system, the administrators should pay more attention to the psychological and emotional needs of the health professionals. For example, by providing adequate training and support, the administrators can help the health professionals adapt to the new system and reduce the stress and anxiety caused by unfamiliarity with the system.

Sixth, occupational development and training opportunities: Providing health professionals with continuous education and training opportunities will not only help them improve their personal occupational skills, but also help increase their acceptance and utilization of the healthcare information system.

These strategies can not only be applied to daily healthcare delivery processes, but also play a key role in the implementation and optimization of healthcare information systems. For the management, understanding how to reduce user resistance through organizational support and emotional management is an important part of ensuring the successful adoption and effective use of healthcare information systems. In addition, these strategies can also contribute to establishing a more positive and healthy work environment, which not only enhances the efficiency of the health professionals, but also improves the service experience of patients.

7.4 Limitations and suggestions for future research

Although this study provides insights into understanding the complex factors behind the resistance of health professionals to healthcare information systems, its limitations also need to be fully recognized and addressed in future research.

First, limitations of the geographical distribution of the samples. The samples in this study are mainly several tertiary hospitals in Guizhou Province, which may not be fully representative of the healthcare environments across China or healthcare environments in other cultural contexts. Differences in work stress, organizational culture, and resource allocation across geographic regions may have different impacts on the psychological state and behavioral patterns of health professionals. Meyerson (1994) explored how institutional systems and organizational

cultures influence the experience of stress, indicating the importance of cultural context in understanding stress and burnout among health professionals. Spoorthy et al. (2020) found that some sociodemographic variables, such as gender, occupation, and workplace, are correlated with increased stress, anxiety, depressive symptoms, and insomnia among health professionals. In addition, psychological variables such as inadequate social support and self-efficacy are associated with these mental health problems. Therefore, the generalizability of the findings may be limited.

There are also limitations in data collection methods. We adopt online questionnaire method in this study, and the questionnaires are distributed and collected online. The questionnaire diffusion is based on the social relationship of the researcher, which may lead to limitations in the comprehensiveness and representativeness of the sample. Future research should expand sample collection scope to ensure coverage of a more diverse population to improve the reliability and generalizability of the study (Imai, 1998).

Second, the research design is largely based on cross-sectional data, which means that the data are collected at a single point in time, making it difficult to capture the dynamic relationships of variables over time. For example, the impacts of workload, psychological contract breach, and emotional exhaustion may vary over time and context, and cross-sectional studies cannot adequately reveal these dynamic processes.

We suggest that future studies can make improvements in the following areas.

First, we suggest to expand the sample size. Biau et al. (2008) discussed the importance of sample size in the planning and interpretation of medical research, emphasizing that expanding the sample size under the right conditions can control the report risk and improve the precision of the experiment. Delice (2010) explored issues related to samples in quantitative research, and pointed out the importance of determining the appropriate sample size.

Second, we suggest to use longitudinal design. Rutter (1994) discussed the important advantages of longitudinal data in measuring and testing the causes or processes of psychopathology. The study suggests that when designing a study, a cross-sectional study should usually be used first, and the use of longitudinal studies later can help provide a more accurate and in-depth explanation of the research questions. Galbraith et al. (2017) discussed the advantages of using longitudinal design, particularly its ability to conduct research across multiple levels. Thus, tracking behavioral and psychological changes among health professionals through longitudinal studies can provide a deeper understanding of the dynamic changes of factors such as workload, psychological contract breach, and emotional exhaustion over time as well as their impact on user resistance to healthcare information system.

Third, we suggest to collect data from multiple dimensions. Olivieri (2008) discusses the analytical advantages of multidimensional data processing, emphasizing the increased sensitivity and selectivity associated with the shift from univariate to multivariate data, as well as less occurrence of experimental error. Pedersen and Jensen (2001) emphasize the critical role of multidimensional database technology in data analysis, especially when analyzing large amounts of data in the decision-making process. Multidimensional modeling treats data as multidimensional cubes particularly suited for data analysis. As a result, a combination of quantitative questionnaires and qualitative research methods, such as in-depth interviews and focus groups, can help gain a deeper understanding of the subjective experience of health professionals and provide richer insights into the effective implementation of the healthcare information system.

By exploring these limitations and future research directions, we expect to reveal more comprehensively the influencing factors of the resistance of health professionals to the healthcare information system, provide more practical strategies and guidance for healthcare organizations in implementing and optimizing healthcare information system, and ultimately enhance the quality and efficiency of healthcare services.

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Annex A: Survey Questionnaire

Dear respondents,

Thank you for taking the time out of your busy schedule to fill out this questionnaire. This is a questionnaire for a study on information system resistance for healthcare professionals. Your support and cooperation will allow us to gain valuable insights from actual organizational settings and facilitate our targeted management recommendations.

The following are the four assurances from the researchers to make sure you can rest assurance in filling out the questionnaire.

1. This questionnaire will be used purely for academic research purposes.

2. The questionnaire data will be kept completely confidential and will not be disclosed to the public, nor will any records be left in your organization.

3. When writing academic results, we will only report the overall trends and no individual data will be exposed.

4. If you are interested in the results of this study, we promise to provide you with feedback on specific findings as soon as they are available.

Please read the instructions for each section in detail, think about the questions according to your personal feelings and thoughts, and tick "√" on the number from 1 to 5. Under normal circumstances, the time required to fill in the answers should be less than 15 minutes. Thank you again for your cooperation. I wish you good health and prosperous career.

Please tick "√" on the corresponding position from 1 to 5 according to your personal feelings and experiences (1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree)

Part I: The following is your basic personal information, please select or fill in.

1. Gender: ☐ Male ☐ Female

2. Age:__(years old)

3. Education: ☐ Middle school or below ☐ High school (vocational high school) ☐ Junior college and university ☐ Master's program ☐ Doctoral program

4. How long have you been working in the current organization:__(years)

Part II:

Statements about user resistance 1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree					
1. I will not comply with the change to the new way of working with the information system.	1	2	3	4	5
2. I will not cooperate with the change to the new way of working with the information system.	1	2	3	4	5
3. I oppose the change to the new way of working with the information system.	1	2	3	4	5
4. I do not agree with the change to the new way of working with the information system.	1	2	3	4	5
Statements about workload 1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree					
1. There is a need to reduce some parts of my role.	1	2	3	4	5
2. I feel overburdened in my role.	1	2	3	4	5
3. I have been given too much responsibility.	1	2	3	4	5
4. My work load is too heavy.	1	2	3	4	5
5. The amount of work I have to do interferes with the quality I want to maintain.	1	2	3	4	5
Statements about psychological contract breach 1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree					
1. Almost all the promises made by my employer during recruitment have been kept so far. (R)	1	2	3	4	5
2. I feel that my employer has come through in fulfilling the promises made to me when I was hired. (R)	1	2	3	4	5
3. So far my employer has done an excellent job of fulfilling its promises to me. (R)	1	2	3	4	5
4. I have not received everything promised to me in exchange for my contributions.	1	2	3	4	5
5. My employer has broken many of its promises to me even though I've upheld my side of the deal.	1	2	3	4	5
Statements about emotional exhaustion 1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree					
1. I feel emotionally drained from my work.	1	2	3	4	5
2. I feel burned out from my work.	1	2	3	4	5
3. I feel exhausted when I think about having to face another day on the job.	1	2	3	4	5
Statements about perceived organizational support 1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree					
1. My organization really cares about my well-being.	1	2	3	4	5
2. My organization strongly considers my goals and values.	1	2	3	4	5
3. My organization shows little concern for me. (R)	1	2	3	4	5
4. My organization cares about my opinions.	1	2	3	4	5

5. My organization is willing to help me if I need a special favor.	1	2	3	4	5
6. Help is available from my organization when I have a problem.	1	2	3	4	5
7. My organization would forgive an honest mistake on my part.	1	2	3	4	5
8. If given the opportunity, my organization would take advantage of me. (R)	1	2	3	4	5

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Annex B: Compilation of Policies for Medical Informationization Construction in China

Date	Issuing organization	Document	Main contents and significance
2002.11	Ministry of Health	National Health Informatization Development Plan Outline 2003-2010, National Public Health Information System Construction Plan (draft)	Informatization is incorporated into the overall plan for the development of health services.
2009.03	CPC Central Committee, The State Council	Opinions on Deepening the Reform of the Medical and Health System	It is clearly proposed to focus on hospital management and electronic medical records, accelerate the construction of medical and health information systems, and begin to promote the new medical reform.
2010.02	Ministry of Health	Basic Specifications for Electronic Medical Records (Trial)	After accumulating considerable experience in the construction of hospital informatization, China has begun to explore and promote the construction of electronic medical records.
2011.01	The State Council, Ministry of Health	2011-2015 Health Informatization Development Plan, Basic Specifications and Functional Specifications of Electronic Medical Records, Basic Structure and Data Standards of Electronic Medical Records, Evaluation Methods and Standards for the Application Level of Electronic Medical Records System Functions, Technical Solutions for the Construction of Hospital Information Platform Based on Electronic Medical Records	The medical reform is comprehensively initiated. In accordance with the requirements of "maintaining the basics, strengthening the grassroots, and establishing mechanisms", the five key reforms have been promoted in a coordinated manner, and major phased results have been achieved, providing a strong institutional and mechanism guarantee for the scientific development of health services.
2011.04	Ministry of Health	Criteria for Evaluation of Tertiary General Hospitals (2011 Edition)	For the first time, the degree and specific requirements that must be met by the informatization application of tertiary hospitals are clarified.
2012.10	The State Council	Twelfth Five-Year Plan for Healthcare Development	For the first time, the promotion of medical and health informatization is included in

Date	Issuing organization	Document	Main contents and significance
			the plan. It is proposed to promote the construction of the grass-roots medical and health system, and establish a telemedicine system for tertiary hospitals and county-level hospitals.
2013.11	National Health and Family Planning Commission, National Administration of Traditional Chinese Medicine	Guiding Opinions on Accelerating the Construction of Population Health Informatization	It is clearly pointed out that by the end of the "Twelfth Five-Year Plan", the information network security interconnection of various health and family planning institutions at all levels will be basically realized. The Third Plenary Session of the 18th Central Committee of the Communist Party of China put forward important instructions on the role of informatization in deepening the medical reform, requiring to establish a scientific medical performance evaluation mechanism, improve a rational hierarchical diagnosis and treatment model, make full use of informatization means, and promote vertical flow of high-quality medical resources.
2015.01	National Health and Family Planning Commission	Action Plan for Further Improvement of Medical Services	It is required to use informatization as a means to play its due scientific and technological supporting role in deepening reforms, optimizing processes, improving services, establishing mechanisms, improving quality, and promoting communication. It also puts forward requirements for the information system.
2016.10	The State Council	Outline of the Healthy China 2030 Plan	This is the grand blueprint and action plan for advancing the construction of a healthy China in the next 15 years. In addition, the 13th Five-Year Plan period is the decisive stage for China to build a moderately prosperous society in an all-round way, and it is the beginning stage of the construction of a healthy

Date	Issuing organization	Document	Main contents and significance
			China. The deepening of medical reform continues to advance in depth, and the healthcare industry is facing new situations and higher requirements.
2016.11	National Development and Reform Commission	National Health Security Project Construction Planning	The document is issued to further improve the medical and health service system, realize that everyone enjoys basic medical and health services, and promote the construction of a healthy China. It is required to realize the data aggregation and business coordination of the six major business systems.
2016.12	The State Council	The 13th Five-Year Plan for Deepening the Reform of the Medical and Health System	The informatization development requirements for scenarios such as hospital management, medical collaboration, medical security, and drug supply have been upgraded.
2017.01	National Health and Family Planning Commission	National Population Health Informatization Development Plan During the 13th Five-Year Plan	Population health informatization and the application of health big data are emphasized.
2017.04	The State Council	Guiding Opinions on Promoting the Construction and Development of Medical Alliances	The government encourages the integration of medical resources from top to bottom, the efficient cooperation of medical alliances, and the improvement of the overall efficiency of the medical service system.
2017.12	National Health and Family Planning Commission	Technical Guidelines for Hospital Informatization Construction Application (2017 Edition) (Trial)	It is required to promote and standardize the informatization construction of secondary and tertiary hospitals, and improve the application level of hospital informatization technology.
2018.04	National Health Commission	National Hospital Informatization Construction Standards and Specifications (Trial)	It clarifies the construction content and construction requirements of hospital informatization, and promotes and standardizes hospital informatization development.
2018.04	The State Council	Opinions on Promoting the Development of "Internet + Healthcare"	It improves the construction of "Internet + healthcare" and strengthens supervision and related standards.

Date	Issuing organization	Document	Main contents and significance
2018.08	National Health Commission	Notice on Further Promoting the Informatization of Medical Institutions with Electronic Medical Records as the Core	It is clarified that by 2020, tertiary hospitals should achieve full coverage of electronic medical records in all diagnosis and treatment services, realize information interconnection of various diagnosis and treatment links in the hospital, and reach the level 4 of the standardized maturity assessment of hospital information interconnection. After logging in at any terminal of any department, you can access the information of the relevant diagnosis and treatment links according to your authority. To establish a closely-knit medical alliance, the electronic medical record information system of each medical institution in the medical alliance shall be interconnected.
2019.01	The State Council	Opinions of the General Office of the State Council on Strengthening the Performance Evaluation of Tertiary Public Hospitals	It is clearly pointed out that by 2020, a relatively complete performance appraisal system for tertiary public hospitals will be basically established, the internal management will be more standardized, the overall efficiency of medical services will be effectively improved, efficiency and quality will be improved, and the comprehensive reform of public hospitals will be accelerated.
2019.07	CPC Central Committee, The State Council	Outline of the Healthy China 2030 Plan	It is proposed to strengthen and promote the sharing of health-related information between departments and regions.
2020.04	National Health Commission	Notice on Further Promoting the Development and Standardized Management of Internet Medical Services	It is necessary to promote the rapid and healthy development of Internet medical services such as Internet diagnosis and treatment, Internet hospitals, telemedicine services, and appointment diagnosis and treatment.
2020.05	National Health Commission	Notice on Further Complete	It is required to speed up the

Date	Issuing organization	Document	Main contents and significance
		the Appointment and Treatment System and Strengthen the Construction of Smart Hospitals	establishment and improvement of the appointment system for diagnosis and treatment, to innovate and improve the smart hospital system, and to vigorously promote the development of Internet diagnosis and treatment and Internet hospitals.
2020.07	National Health Commission	Notice on Printing and Distributing the Standardization Maturity Evaluation Plan for Hospital Information Interconnection (2020 Edition)	It identifies the two links and four stages of hospital evaluation, and seven levels of hospital information interconnection evaluation.
2020.12	National Health Commission, National Administration of Traditional Chinese Medicine	Notice on Printing and Distributing the Standards and Norms for National Public Health Informatization Construction (Trial)	It is required to comprehensively standardize the construction of public health informatization, improve the informatization construction and application capabilities of public health institutions, and rely on the national health information platform to carry out public health informatization construction.
2020.12	National Health Commission	Notice on Printing and Distributing the Evaluation Standards for Tertiary Hospitals (2020 Edition)	It is required to strengthen the construction of hospital information platform based on electronic medical records to meet the needs of medical quality management and control.
2021.09	The State Council	Notice on Printing and Distributing the "14th Five-Year" National Medical Security Plan	Build a standardized and information-based national medical security platform, and popularize and apply medical insurance information business coding standards and medical insurance electronic certificates.
2021.10	The State Council	Action to Promote High-quality Development of Public Hospitals (2021-2025)	Build a "three-in-one" smart hospital and realize regional medical informatization.
2021.11	General Office of Ministry of Industry and Information Technology, General Office of National Health Commission	Notice on the Announcement of the 5G+ Medical and Health Application Pilot Project	Pilot and promote new products, new formats, and new models of 5G smart healthcare that can be replicated and promoted.
2021.12	National Development and Reform Commission	National Informatization Plan During the Fourteenth Five-Year Period	Actively explore operational informatization methods to optimize the medical service

Date	Issuing organization	Document	Main contents and significance
			process; accelerate the construction of major medical infrastructure platforms and medical exclusive cloud, promote data sharing and business collaboration of information systems of medical institutions at all levels, and build interconnected national health information platforms at all levels.
2022.01	National Health Commission	Health Standardization Work Plan During the Fourteenth Five-Year Period	The guiding ideology, basic principles and development goals of health standardization are clarified, and its six main tasks and six key areas are proposed.
2022.02	National Health Commission, National Health Insurance Administration, National Administration of Traditional Chinese Medicine, Health Bureau of the Logistics Support Department of the Central Military Commission	Administrative Measures for the Mutual Recognition of Inspection and Test Results of Medical Institutions	It is required that medical institutions should strengthen the construction of hospital information platforms with electronic medical records as the core in accordance with the standards and specifications of hospital informatization construction.
2022.03	National Health Commission, National Development and Reform Commission, Ministry of Civil Affairs	Notice on Carrying out the Action to Improve the Ability of Integrating Medical Care and Nursing in the Community	The role, significance and work focus of "improving the level of informatization" are clearly put forward: to give full play to the role of "Internet + healthcare", "Internet + nursing service" and "Internet + elderly service", and to carry out smart health elderly services. It can rely on higher-level hospitals in the medical alliance to establish a telemedicine service system.
2022.04	National Health Commission, National Administration of Traditional Chinese Medicine	Guidelines for Informationization of Operation and Management of Public Hospitals	By guiding the construction of informatization, it is possible to promote the scientific, standardized and refined business management and economic management of public hospitals.
2022.04	National Health Commission	National Nursing Career Development Plan (2021-2025)	It is required to make full use of information technology, integrate the development of smart hospitals and "Internet + healthcare", and strive to

Date	Issuing organization	Document	Main contents and significance
			strengthen the construction of nursing informatization. Informatization means are used to innovate the nursing service model so as to provide patients with convenient and efficient nursing services. The nursing service process is optimized to improve the efficiency of clinical nursing work, reduce the unnecessary workload of nurses, and gradually achieve the modernized, scientific and refined management of nursing service.
2022.05	The State Council	Key Tasks for Deepening the Reform of Medical System in 2022	We should promote the construction of a closely-knit county-level medical community and the reform of the system and mechanism, implement the multiple complex medical insurance payment method based on DRGs, and further promote the "Internet + Healthcare" and "Five Ones" service actions.
2022.06	National Health Commission	Interim Provisions on Quality Management of Outpatient Clinics in Medical Institutions	This document promotes the use of electronic medical records in outpatient clinics.

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Annex C: Information System Resistance Behavior Definition

	Author	Definition of information system resistance
The perspective of behavioral manifestations	Huang and Peng (2018)	Information system resistance is an attempt to prevent system implementation or system use, or an attempt to prevent the system designer from achieving his or her designed goals.
	Wang and Wang (2019)	User resistance to the implementation of information systems has a variety of behavioral manifestations, and the most common one is to find ways to hinder the use and implementation of information systems, or find ways to prevent the information system developers from achieving the established goals.
	Wu et al. (2011)	The more common manifestations of user resistance, such as complaints, deliberate delays, continued use of legacy systems, deliberate sabotage, and refusal to use alternative systems, occur when the targets (employees) attempt to avoid performing the behavior they are asked to do.
The perspective of behavioral causes	Keen (1981)	Resistance is a signal of system equilibrium. Equilibrium is the perception (by individuals) that the cost of change is higher than the corresponding benefits.
	DeSanctis and Courtney (1983)	Resistance to MIS occurs when people experience a change in the content of their work or a change in their power compared to others.
	Krovi (2011)	Information system implementation can trigger emotional responses from users, and they tend to resist information system implementation when experiencing unpleasant negative emotions such as sadness, anger, pain, disgust, and fear.
	Ang and Pavri (1994)	Resistance to change is a general psychological reaction when people anticipate a negative outcome.
	Zhao (2020)	Resistance is a recalcitrant and covert behavior of users due to their path dependence on the original technology when new technology invades their original stable world

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Annex D: Categories and Manifestations of User Resistance

Scholar	Year	Categories	Manifestations
Dickson and Simmons (1970)	1970	Aggression	Aggressive towards the system
		Projection	Complain difficulty caused by the system
		Avoidance	Avoid using the system
Mcgrath et al	1998	Cultural resistance	No specific manifestation
		Social resistance	No specific manifestation
		Organizational resistance	No specific manifestation
		Psychological resistance	No specific manifestation
Lauer and Rajagopalan (2002)	2002	Passive resistance	Continued use of legacy systems, reluctant acceptance of alternative systems, sabotage of alternative systems
		Active resistance	Complaint, turnover
Lapointe and Rivard (2005)	2005	Apathy	Inaction, alienation
		Passive resistance	Complaint, procrastination
		Active resistance	Public expression of improper opinions, instigation of others
		Aggressive resistance	Strikes, joint boycotts, sabotage
Oreg (2006)	2006	Affective resistance	No specific manifestation
		Behavioral resistance	No specific manifestation
		Cognitive resistance	No specific manifestation
Joseph (2010)	2010	Passive resistance	Apathy, indifference
		Active resistance	Explicit refusal, deliberate delay
Shang (2012)	2012	Non-destructive resistance	Turnover, absenteeism, negative emotions
		Positively destructive resistance	Carelessness, refusal to cooperate, job burnout, continued use of legacy systems
		Negatively destructive resistance	Sabotage, strike
Seol et al. (2017)	2017	Active resistance	Personal concerns about and objections to the system, unwilling to adapt to the new system and leave the organization
		Passive resistance	Reluctantly accept the system and deliberately cause it to malfunction
Shirish and Batuekueno (2021)	2021	Non-destructive resistance	Application for job transfer, resignation, absenteeism, work procrastination
		Destructive resistance	Deliberate disruption of the workflow, deliberate creation of errors
Malm-Nicolaisen et al. (2022)	2022	Apathy	Inaction, lack of interest
		Passive resistance	Delay tactics, excuses, persistence of previous behavior, withdrawal of system use
		Active resistance	Expressing opposing views
		Aggressive resistance	Infighting, threat, joint resistance, sabotage

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Annex E: Literature Analysis of Factors Influencing User Resistance

Source	Influencing factors	Research level	Implementation stage	Research method
Markus (1983)	Personality traits, cognitive styles, system design flaws, power loss	Individual level/Team level	Pre/post-implementation stage	Qualitative research
Hirschheim and Newman (1988)	Conservatism, uncertainty, lack of management support, resource reallocation, system design flaws	Individual level	Pre/post-implementation stage	Qualitative research
Joshi (1991)	Net fairness	Individual level/Team level/Organizational level	Pre/post-implementation stage	Qualitative research
Krovi (1993)	Job insecurity, unrealistic expectations, lack of control	Individual level	Pre-implementation stage	Qualitative research
Martinko et al. (1996)	Negative outcome expectations or efficacy expectations	Individual level	Pre-implementation stage	Qualitative research
Merakas and Hormik (1996)	Threat, pressure	Individual level	Pre-implementation stage	Qualitative research
Gobbin (1998)	Cultural adaptability	Individual level	Pre/post-implementation stage	Qualitative research
Jiang et al. (2000)	Loss of power, uncertainty, job insecurity, changes in job content, interpersonal relationships, and decision-making styles	Individual level	Pre/post-implementation stage	Qualitative research
Enns et al. (2003)	Perceived stress; coalition	Individual level	During-implementation stage	Quantitative research
Shang (2012)	Egoism, lack of trust, low tolerance, sense of work load	Individual level	During-implementation stage	Qualitative research
Lapointe and Rivard (2005)	Perceived threat	Individual level/Team level	Pre-implementation stage	Qualitative research
Oreg (2006)	Power and position, job security,	Individual level	Pre/post-implementation stage	Quantitative research

Source	Influencing factors	Research level	Implementation stage	Research method
	intrinsic compensation, social influence			
Lapointe and Rivard (2005)	Loss of power	Team level	Pre/post-implementation stage	Qualitative research
Bhattacherjee and Hikmet (2007)	Perceived threats	Individual level	During-implementation stage	Quantitative research
Kemp and Low (2008)	User expectation	Individual level	Pre-implementation stage	Qualitative research
Kim (2010)	Uncertainty costs, transitional costs, sunk costs, transfer benefits, perceived value	Individual level	During/post-implementation stage	Quantitative research
Sarini (2013)	Employee frustration; employee engagement	Individual level	During-implementation stage	Quantitative research

Annex F: Summary of Research on Resistance

Source	Research topic	Research theory	Resistance level	Research conclusion
Joshi (1991)	People's resistance to changes brought by MIS	Equity theory	Individual level	The users analyze the changes brought about by the information system at three levels, first by analyzing the changes in their own benefits, second by comparing their relative benefits with others in the organization, and finally by comparing their benefits with users in other related organizations, and if the comparison results are unfavorable, they will resist the changes.
Martinko et al. (1996)	How users' past experience with IT affects the use of new technologies	Attribution theory	Individual level	The impact of the individuals on the success or failure of implementation, and how this process influences user resistance.
Jiang et al. (2000)	Differences in users' reasons for resistance to different types of systems and the ways to reduce resistance	Three theories to explain resistance	Individual level	The reasons for user resistance are not the same for different systems, and the strategies for promotion of the system are also different.
Kim and Kankanhalli (2009)	Reasons for user resistance to information systems	Cognitive bias theory	Individual level	It is believed that switch cost is the main reason for resistance, and switch cost and failure cost will directly increase user resistance.

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Annex G: Occupation Distribution of Health Professionals Using Hospital Information Systems

Occupation	Subtotal	Proportion
Doctor	1,317	42.16%
Nurse	1,807	57.84%
Valid responses	3,124	

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Annex H: Gender Distribution of Health Professionals Using Hospital Information Systems

Gender	Subtotal	Proportion
Male	862	27.59%
Female	2262	72.41%
Valid responses	3124	

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Annex I: Educational Background Distribution of Health Professionals Using Hospital Information Systems

Education	Subtotal	Proportion
Middle school and below	24	0.77%
High school (vocational school)	344	11.01%
Bachelor degree	2581	82.62%
Master's degree	159	5.09%
Doctoral degree	16	0.51%
Valid responses	3124	

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Annex J: Usage of Hospital Information Systems by Health Professionals in Different Positions

Job positions	Subtotal	Proportion
Resident physician	232	18.35%
Attending physician	160	12.66%
Chief physician	76	6.01%
Nurse practitioner	465	36.79%
Nurse-in-charge	282	22.31%
Chief nurse	49	3.88%
Valid responses	1264	

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Annex K: Usage of Hospital Information Systems by Health Professionals in Different Departments

Department	Subtotal	Proportion
Surgery	324	25.63%
Internal medicine	293	23.18%
Pediatrics	56	4.43%
Obstetrics and gynecology	70	5.54%
Oncology	117	9.26%
Medical technology	80	6.33%
Other departments	324	25.63%
Valid responses	1,264	

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Annex L: Status of Hospital Information Systems at Various Stages

Stage	Subtotal	Proportion
Pre-implementation	392	12.55%
During-implementation	1264	40.46%
Post-implementation	1468	46.99%
Valid responses	3124	

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Annex M: Usage of Different Types of Information Systems by Health Professionals

Information system	Subtotal	Proportion
HIS	924	73.1%
LIS	196	15.51%
PACS	211	16.69%
RIS	104	8.23%
ERP	83	6.57%
EMR	133	10.52%
DRGs	147	11.63%
DIP	273	21.6%
Other system	159	12.58%
Valid responses	1264	

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Annex N: Task Types of Health Professionals Using Information Systems

Type of tasks	Subtotal	Proportion
Evaluation and acceptance of new technologies or techniques	371	29.35%
Establishment of departmental operational standards and work-flow templates	418	33.07%
Confirmation forms	458	36.23%
Departmental implementation plans	380	30.06%
Training on the new system	539	42.64%
Departmental training	507	40.11%
Provision of feedback on clinical processes and workflow	362	28.64%
Cooperation with relevant implementation teams	343	27.14%
Maintenance and management of system hardware and software	161	12.74%
Data entry and management	445	35.21%
Validation and verification of forms and documents	348	27.53%
Protection of information system security and confidentiality	171	13.53%
Valid responses	1264	

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Annex O: Impact of Health Professionals' Use of Hospital Information Systems on Working Hours

Change of working hours	Subtotal	Proportion
No change	757	59.89%
An increase of 1 hour per day than usual	331	26.19%
An increase of 2 hours per day than usual	131	10.36%
An increase of 3 hours per day than usual	17	1.34%
An increase of 4 hours or more per day than usual	28	2.22%
Valid responses	1264	