# Relationship Between Medical Personnels' Technical Behavior Attributes and Evaluation of Information Integration of Public Health Service Platform

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**Abstract.** Background: The medical service cooperation model based on the regional public health information platform constructed with intelligent computing technology, thanks to the realization of information integration, promotes the sharing of cross-regional medical resources and business cooperation. In addition, through the intelligent calculation and analysis technology of integrated data, more accurate, specific, scientific and timely medical services can be offered to regional residents. Relevant studies have shown that differences in user personality attributes will affect user technology adoption and application behavior. Purpose: To explore whether Personal Innovativeness In Technology (PIIT) and Technology Characteristics Perception (TCP) affect individual cognition and evaluation of innovative technology. Method: This study selected doctors from hospitals in Guangdong Province that have established regional medical data platforms as the survey respondents. A total of 220 questionnaires were distributed to evaluate their PIIT and TCP levels and understand their cognition and evaluation of information integration. Results: Both PIIT and TCP play a positive affection on public health information integration.

**Keywords:** Regional public health Service; information integration; personnels' technical behavior Attributes; PIIT; Technology Characteristics Perception

## 1 Introduction

With the improvement of the national economy, the area where people live and commute has become increasingly wider, and the people's demands for medical services are also increasing and diversifying, presenting a common feature of demands for cross-regional services. Therefore, in the new era oriented by patient needs, there are higher requirements for the service radiation capabilities of medical institutions, and it


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is difficult for the island-type services carried out by a single medical organization to meet the needs of development [1]. Digital information era has seen Chinese medical institutions lose their dominant position in medical informatization. The focus gradually moves from medical services to medical service consumers [2]. With information technology, we are able to deliver our message quickly and reach a wide audience. The close integration of information and communication technologies such as cloud computing, Internet of Things, mobile communication and big data has brought innovative service models to traditional medical and health services. This integration breaks the time and space constraints of medical services, reduces operating costs, and completely subverts the traditional way of medical services [3]. To be specific, intelligent computing technology plays an important role in improving medical service experience and enhancing medical service and management quality because it can realize high-efficiency computational analysis of medical-related integrated data.

The goal of this paper is to analyze the relationship between individual attributes on the perceived effectiveness of IS integration in terms of individual psychological perception, understanding, and application ability. It is hoped that this study will be used to develop a relational framework to evaluate the effectiveness of innovative information technology applications from an individual perspective. It will help information technology providers and healthcare administrators to more closely match the needs of users, so that information of technology artifacts could be more effectively compatible with healthcare services and better contribute to the advancement of healthcare reform goals. In the following section, we will introduce each aspect from the construction of the research model, the formulation of the research hypothesis, the establishment of the instruments, the implementation of the research study and the analysis of the research results.

### 1.1 Medical information System Integration

As the business model of data-driven decision-making has gradually become the mainstream of the times, the medical industry has also caught the free ride of big data [4]. Medical documents traditionally drafted on paper have been converted into electronic formats and applied in large quantities to various platforms and devices. Due to the rapid popularity of medical and health information systems and digital diagnosis and treatment equipment, traditional paper medical records have become massive electronic medical databases. These data come from various sources, including drug data, clinical medical records, laboratory test data, medical equipment inspection image data, medical expense data, and personal health data generated by wearable devices with embedded sensors and conducted based on IoT technology. With diversified formats, these data are generated in huge quantities in an astonishing speed at every moment, which has been in line with the characteristics of big data. However, since these data come from medical organizations in different regions and are scattered in various information systems and equipment, if these data cannot be interconnected or effectively compatible and only stay at the level of information silo, they will be like broken pieces and cannot play the due role. To achieve effective IS integration and meet the goals of compatibility and integration, storage space has become the primary

challenge that needs to be addressed. With the help of new Internet technologies, we can break through traditional barriers, space differences are no longer a barrier with cloud technology, and provide flexible storage functions according to needs. In order to achieve interoperability and standardization, systems and equipment must be interoperable. the massive medical data they generate can be automatically uploaded to the cloud, so as to achieve the integration goal of multi-source normalization and fully integrate the resources and potential of data. Healthcare workers and patients can now access information in electronic medical records remotely, enabling the sharing of patient care data between different healthcare facilities. Medical institutions can convert and manage information from different departments, which makes medical services more coherent, the diagnosis and treatment process more convenient, and the quality of medical care is better guaranteed [5].

### 1.2 Intelligent Computing and Integration of Medical Data

After the public health medical data are integrated, in order to make them really play a role and realize their value, we have to resort to intelligent computing processing. At present, data analysis generally relies on machine learning and data mining techniques, both of which are closely related to artificial intelligence. Use data or historical experience to optimize the performance standards of computer programs by improving the performance of specific algorithms [6]. Data mining uses a variety of technical means to achieve its goals, including statistical analysis, online analytical processing, intelligent retrieval, machine learning, expert systems and pattern recognition methods [7]. In the integrated medical data, there are hidden important clues that can optimize patient diagnosis and treatment, support medical staff decision-making, and help patients rehabilitation and health protection. By performing predictive analysis on these integrated data, early signs of patients' diseases can be discovered and monitored, and early prevention can be implemented measure. Through data analysis, we can also discover the correlation between medical data, dig out new problems or new solutions, realize precision medicine, and provide support for medical decision-making. Medical staff can also improve the best treatment methods in a more targeted manner, avoiding harm to patients [8].

The regional public health information platform is based on the data integration and interconnection of residents' health records. The platform can collect and store health records information, automatically generate, distribute and push work task lists, and provide a health information platform supporting medical and health service activities of various health institutions in the region. The information platform regional public medical service cooperation model constructed based on intelligent computing technology, thanks to the realization of IS integration, promotes the sharing of cross-regional public health resources and business cooperation. In addition, through the intelligent calculation and analysis technology of integrated data, more accurate, specific, scientific and timely public health services can be offered to regional residents. In recent years, China has actively introduced supporting policies to promote the integration of medical resource data and business, and further achieve the ideal goal of precise and efficient medical care. However, relevant studies show that in practice,

there are still some challenges in the construction of regional public health information platform, including the inconsistency of cross-regional information standards, the low level of information technology in some grass-roots hospitals, and the insufficient application functions of the information platform. These problems limit the full sharing of regional public health information to some extent and affect the overall quality of medical services [9]. In addition, relevant studies have shown that personnels' technical behavior attributes (such as demographic indicators, Personal Innovativeness In Technology, and Technology Characteristics Perception) affect their evaluation and application of information technology [10]. Therefore, with physicians of hospitals in Guangdong that has established the regional public health information platform as respondents, an attempt of the study is made to understand how an individual's perception and evaluation of integrating information relates to specific technical behavior attributes.

## 2 Research Model

By reviewing relevant literature, we learn that individuals are more inclined to accept and recognize technologies that suit their needs [11, 12]. It turns out that the diffusion and application of innovations depend heavily on individuals' perceptions and adoption behaviors [13, 14]. The words used to describe individuals vary among different scholars and studies. For example, in the concept of affordance, it is called human, actor or human agency [15]. In Complex Adaptive Systems Theory, it is called agent [16]. There are also various other names used to describe the users of the technology such as human actor [14]. Although the descriptive names are different, we can see that in many previous theories or research models, individual factors are generally regarded as the main factors affecting technology adoption and application behavior. Therefore, this study assumes that the attributes of individuals affect how they perceive and evaluate the information and integration of processes in the regional public health information platform.

### 2.1 Individual Characteristics

#### 2.1.1 Personal Innovativeness in Technology.

In order to identify the antecedents that influence individual technology acceptance beliefs, Agarwal and Prasad put forward the concept of Personal Innovativeness In Technology (PIIT) in 1998. In the context of information technology applications, PIIT is defined as an individual's willingness to try innovative information technologies. In their view, individuals are capable of forming beliefs based on symphonizing information from multiple sources about new technologies. PIIT symbolizes tendencies of certain people such as taking risks and making attempts, and this trait is not available to all people [17]. According to him, PIIT refers to an individual's willingness and ability to try new technologies. It is determined by relevant individual attributes. As Davis and Silva point out, several individual characteristics can influence a person's capacity for creativity and innovation, including relevant skills, relevant knowledge, and motivation

[18]. Most of the research on information technology in academia is based on the background of technology application. Among them, two attributes of information technology are the most concerned, one is computer playfulness, and the other is PIIT. These two attributes are related to individuals' attitudes, beliefs, and intentions toward technology adoption and application [19].

### 2.1.2 Technology Characteristics Perception.

In Innovation Diffusion Theory, after individuals complete the cognitive stage of innovative technology, they need to combine the characteristics of technological innovation to analyze the feasibility of adopting the innovation. This stage is defined as the persuasion stage [8]. Innovation has five important characteristics which are directly related to the acceptance behavior of organizations or individuals towards innovation: relative advantage, compatibility, complexity, observability and trialability [8]. It has been found that the knowledge of innovation characteristics is significantly correlated with the acceptance of innovations [20]. The persuasion stage is the key to the innovation diffusion model. Whether an individual accepts innovative technologies depends to a large extent on the individual's cognitive ability to the innovation characteristics in the persuasion stage. Individuals' terminal acceptance of an innovation will be affected directly by these emotions and can be positively or negatively impacted by this. That is, whether an individual adopts innovation depends on his or her attitude toward it [21]. Technology innovation characteristics as perceived and evaluated by human agency, and technology's impact on adaptation and implementation have also been confirmed in previous research [21, 22]. In relevant research, each individual perceives technology characteristics differently, as a kind of personal attribute, has different effects on the adoption intention of individual information technology innovation [10, 21].In this research, we refer to Wu's study to name this personal attribute Technology Characteristics Perception (TCP) [23].

## 2.2 Information System Integration

It is apparent that the impact of information technology integration on an organization is most evident when the organization realizes the process chain (supply chain in manufacturing) activities [24]. Organizational process chains integrate internal and external activities and components related to organizational operations. Through review of literature on the impact of IS integration on the organizational process chain, we can find that the impact of IS integration is mainly reflected in two aspects: the seamless connection and sharing of information and data within an organization or between different organizations, and the optimization of business processes. Some scholars believe that the impact of IS integration should not be limited to the technical level (that is, data integration capabilities). Instead, the focus should be on its improvement of cooperate performance [25].

### 2.3 Research Model

With reference to literature review, we learned that PIIT and TCP, as individual attributes, play an important role in individual technology evaluation and ultimate adoption behavior. IS integration is one of the core objectives of modern medical digitization construction. The effective diffusion and application of digital technology is not mainly determined by the expected results of IS integration, but by users' objective estimation and cognition of the actual and practical effect. This study further proposes a research model, as shown in Figure 1.

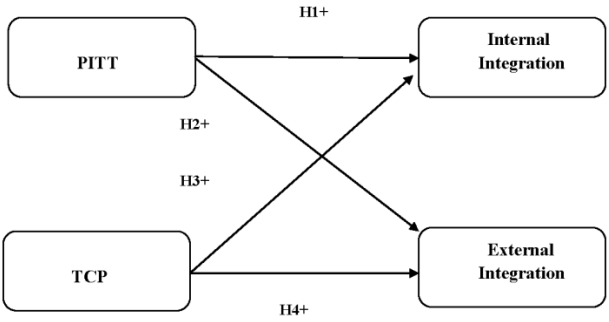


**Fig. 1.** Hypothesized Model

We propose research hypotheses as follows: H1: There is a positive correlation between PIIT and Internal Integration. H 2: There is a positive correlation between PIIT and External Integration.H3: There is a positive correlation between TCP and Internal Integration. H 4: There is a positive correlation between TCP and External Integration.

## 3 Methods

### 3.1 Participants and Study Design

The location of this study is Guangdong Province, China. Guangdong Province occupies a considerable proportion of China's health service system. Taking primary medical services as an example, over 10% of the hospitals in Guangdong Province provide community medical services, and nearly 25% of all medical services are provided by community hospitals. Therefore, it is fairly representative to choose Guangdong as the location of survey. The research subjects are physicians from two secondary and above hospitals and six primary hospitals that have established the regional public health information platform in Guangdong, aging from 18 to 60 years old. This study was carried out in July 2022, and printed questionnaires and electronic ques-

tionnaires were used simultaneously for complementation. The data were organized into a database by designated persons and were checked by two people independently.

### 3.2 Measures

On the basis of the research model as well as the literature review, we established four dimensions of the scale, and formulated four sub-scales with reference to the items of mature scales applied in previous research (see Table 1 for detail). The items that meet the research design goals are incorporated into an item pool using Excel. Two experts with good knowledge of information technology applications and familiarity with the public health service process were commissioned to classify and sort the items according to the research design using the Q-sorting method. Through the three rounds of sorting, scholars had basically the same opinions on sorting and classification. We conducted face-to-face interviews with six respondents selected at random who met the inclusion criteria. Interview results indicated that the questionnaire contents were fair representations of the research goals. We revised the questionnaire based on their feedback and finally finalized the official version (Measurement items were in Chinese). Translated from the original Chinese and proofread by two bilingual translators, the English version was translated from the original Chinese. All statement items of the scale were designed in the form of Likert seven-point scale, in which 1 point means "strongly disagree" and 7 points means "strongly agree". Please refer to Annex for the questionnaire items (The items in sub-scales and dataset of the survey could be checked via https://www.scidb.cn/en/s/7NF3iy).

### 3.3 Data Analysis

Spss21.0 was used to carry out statistical analysis on the survey data. The operation contents include data entry, correlation analysis, difference analysis, and reliability analysis. AMOS 20.0 was used to perform confirmatory factor analysis and build structural equation models.

**Table 1.** Research Framework

| Variables | Sources |
|---|---|
| PIIT | [26], [27] |
| TCP | [28] |
| Internal Integration | [29], [30] |
| External Integration | [29], [30] |

## 4 Results

### 4.1 General Description

This survey distributed 220 questionnaires, and 214 questionnaires were collected, accounting for 97.2%. As for the respondents, in terms of gender, there are 92 males

and 122 females. In terms of the highest education qualification, five respondents had a master's degree or above, 148 respondents had a bachelor's degree, and 61 respondents had a college degree or below. There is a wide range of age distribution among the doctors selected for this survey, 40 people aged between 21 and 30, 100 people aged between 31 and 40, 68 people aged between 41 and 50, and 6 people aged over 51.

### 4.2 Reliability and Validity Analysis

The measurement results of each dimension and the overall Cronbach's Alpha in this analysis were all greater than 0.8, indicating that the reliability of the scale was good (TCP:0.84, PIIT:0.915, Internal Integration:0.903, External Integration:0.898, Overall:0.872). Confirmatory factor analysis was used to evaluate the validity of the scale. The results showed that the composite reliability (CR) values were all greater than 0.7 (TCP: 0.843, PIIT:0.916, Internal Integration: 0.906; External Integration:0.899), and the average variance extracted (AVE) values were all greater than 0.4. In summary, it can be seen that each measurement indicators had high reliability and convergent validity.

### 4.3 Correlation Analysis

According to the results of Pearson correlation analysis, TCP had a significant positive correlation with Internal Integration ($r=0.737$, $p<0.05$); TCP had a significant positive correlation with External Integration ($r=0.786$, $p<0.05$); PITT had a significant positive correlation with Internal Integration ($r=0.823$, $p<0.05$); PITT had a significant positive correlation with External Integration ($r=0.717$, $p<0.05$).

### 4.4 Construction of Structural Equation Model

As shown in the Figure 2, a structural equation model was established by AMOS20.0 according to the research model and the survey scores of each sub-scale. It can be seen from Table 2 that the fit degree of each index was within a reasonable range.TCP had a positive effect on both Internal Integration and External Integration, and the normalized weights were 0.403 and 0.736 respectively ($p< 0.01$). PITT had a positive effect on both Internal Integration and External Integration, and the normalized weights were 0.772 and 0.415 respectively ($p< 0.01$).

**Table 2.** Model fit measures

| | Statistical test index | Operation results | Fit criterion | Fit judgment |
|---|---|---|---|---|
| Absolute fit indices | X2/df | 2.307 | <5 | fit |
| | RMSEA | 0.078 | <0.08(reasonable fit) | fit |
| Incremental fit indices | TLI | 0.896 | >0.9 | close |
| | CFI | 0.907 | >0.9 | fit |
| | IFI | 0.908 | >0.9 | fit |

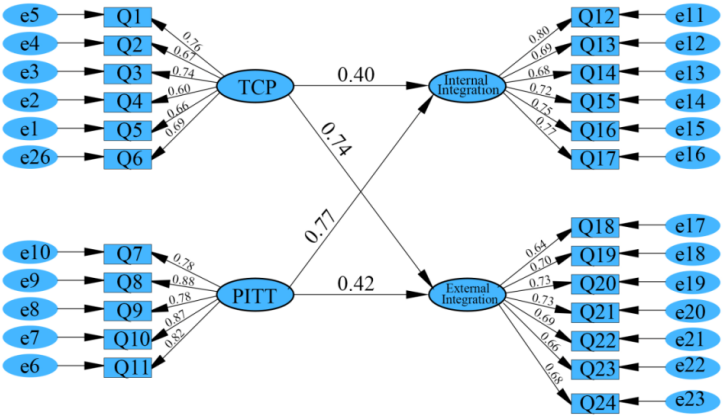


**Fig. 2.** Structural equation model

### 4.5 Influence of Gender, Age and Educational Background on Variables

Through the analysis of the results, there was no significant difference in the scores of the respondents of different genders and education background in each variable ($p$> 0.05). It can be seen from Figure 3 and Figure 4 that the scores of various age groups (21-30,31-40,41-50,51 and above) in the four variables were all significantly different with statistical significance (($F_{21\text{-}30}$:3.898, p:0.010; $F_{31\text{-}40}$:9.441, p:0.000; $F_{41\text{-}50}$:9.657, p:0.000; $F_{51\text{ and above}}$:5.923, p:0.001). The means of the scores of "51 and above" on the corresponding sub-scales of all variables are all lowest, the differences are significant with statistical significance ($p$<0.05).

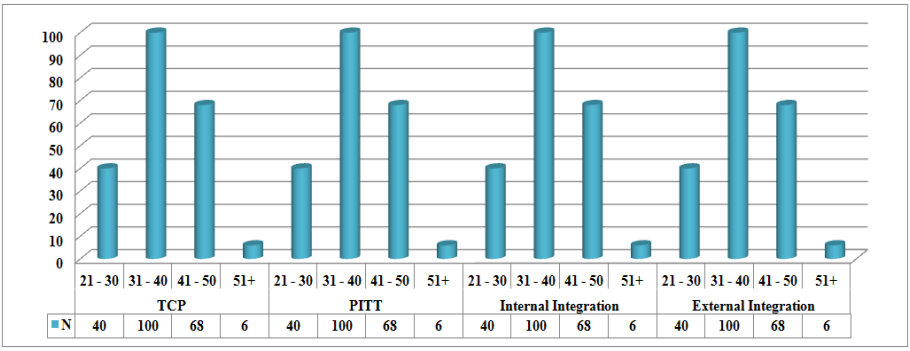


**Fig. 3.** Distribution of respondents by age groups

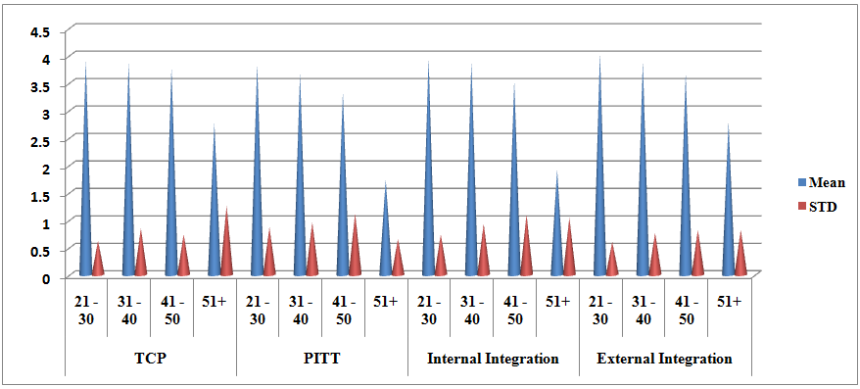


**Fig. 4.** Influence of age on scores of each variable

# 5 Discussion

## 5.1 Discussion of Results

According to the results of the statistical analysis of the sample survey data, we can see that the PIIT and TCP levels of the surveyed physicians do affect their perception and evaluation of the regional medical information platform IS integration. As a result of their investigation, Dutta et al. examined the effect of individual PIIT on perceived feasibility and perceived desirability [6]. Agarwal and Karahanna believe that PIIT affects the application of innovative technologies by individuals because individuals are more inclined to recognize and apply innovative technologies [26]. Agarwal also used PIIT as one of the new indicators of individual characteristics, revised the original Technology Acceptance Model, and confirmed through research that individuals with a higher PIIT level are more likely to evaluate innovation's compatibility, usability, and advantages [7]. In addition, individuals tend to accept technological innovations more readily if they consider the innovation characteristics of a specific technology to be ideal, which has also been confirmed in many previous studies [31]. The results of this study are basically consistent with previous studies. By analyzing the differences in the scores of respondents of different age groups in each sub-scale, we can know that the younger the respondents, the stronger their individual technological innovation ability, the more recognition they have towards the innovative characteristics of the regional medical data platform, and the higher awareness and evaluation they have toward the external and internal IS Integration realized in the platform. Previous studies show that technology acceptance is generally influenced by an individual's age, and the results of this survey are also in line with expectations.

The research results show that young medical personnel show stronger technological innovation ability and higher awareness of emerging technology characteristics, and thus have higher recognition and evaluation of information integration of regional medical data platform. This age-related difference in technology adoption is largely due to differences in the speed of adoption, cognitive ability and usage habits of dif-

ferent age groups [32]. In the future, the development of public health information system should pay more attention to the diversity of user groups, and the design should consider the needs and preferences of different age groups to ensure the ease of use and accessibility of the system. In addition, in view of age differences, multi-level and targeted technical training and education programmes should be implemented to promote IT literacy and technology adoption among healthcare personnel of different ages. The platform should also support a variety of operating interfaces and interaction methods to adapt to the operation habits of users of different ages and enhance user experience and satisfaction.

## 5.2 Practical Recommendations Based on Our Results

### 5.2.1 Enhance Personnel Training and Education in Emerging Technologies.

Given the significant positive correlation between PIIT and TCP with information integration evaluation, it is evident that personnel who are more open to innovative technologies and have a better understanding of technology characteristics tend to evaluate information integration more favorably. To harness this, healthcare organizations should prioritize training and educational programs aimed at enhancing medical personnel's awareness and proficiency in emerging technologies, such as big data analytics, cloud computing, and machine learning.

### 5.2.2 Foster a Culture of Innovation and Technological Exploration.

Encouraging a culture that embraces technological advancements and experimentation can help stimulate PIIT among medical personnel. Organizations can achieve this by recognizing and rewarding personnel who actively engage in technological innovations and by creating opportunities for cross-disciplinary collaborations that foster creative problem-solving.

### 5.2.3 Promote Awareness of Technology Characteristics and Benefits.

By increasing medical personnel's TCP, they can better appreciate the innovative characteristics and advantages of the regional public health information platforms. Healthcare administrators should conduct regular workshops and seminars to educate personnel about the technical specifications, capabilities, and potential benefits of these platforms. This will empower personnel to make informed evaluations and contribute to the successful adoption and integration of new technologies.

### 5.2.4 Enhance Platform Functionality and User Experience.

Based on medical personnel's feedback, healthcare administrators should continuously evaluate and improve the user experience of public health information platforms. This includes streamlining data entry processes, enhancing data visualization and analytics capabilities, and providing intuitive user interfaces that cater to the diverse needs of medical personnel. Regular updates and enhancements will ensure that the platforms remain relevant and effective in supporting healthcare delivery.

## 6 Conclusion

Due to the continuous progress of Internet technology and the facilitation of digital information technologies such as big data, cloud computing, machine learning, and the Internet of Things, medical services have also benefited from information technology platforms developed by developers. The regional public health information platform constructed by regional primary and, second-class and third-class medical institutions can realize the information interconnection and integration between medical organizations within the region and among all levels of departments within the organization, thereby effectively promoting the integration of diagnosis and treatment service processes within and between medical institutions. It is found that as system users, PIIT and TCP of medical staff are important factors affecting their perception and evaluation of IS integration. Therefore, the cognitive literacy and ability of medical personnel in innovative technology deserve the attention of medical managers and technology developers. How to strengthen the personal innovation enthusiasm and innovation ability of medical personnel is a topic that needs to be solved in the next step.

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