

Performance evaluation on the implementation of Pre-established Medical Processes for nurse practitioners in the hospitals

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ABSTRACT

In 2015, Taiwan announced the establishment of “Pre-established Medical Processes” and related regulations to assist nurse practitioners in the clinical tasks, maintain medical quality and patient safety, and provide protection in clinical practice. However, the effectiveness of implementation still needs to be improved and strengthened. This study adopts the TAM and the TTF as the research framework, and a cross-sectional design. The questionnaires are administered to the professional nurse practitioners in the hospitals of central Taiwan. A total of 300 questionnaires were distributed, and Smart PLS 3.0 and SPSS 24.0 were both applied to verify interpretability. The questionnaire recovery rate was 88.3%, and the overall predictive power was 65.2%. Technological characteristics and TTF had a significant impact on perceived usefulness.

Keywords: Nurse Practitioners, Pre-established Medical Processes, Computerized Provider Order Entry, Technology Acceptance Model, Task-Technology Fit.

INTRODUCTION

With the rapid development of information, the continuous advancement of various information technologies, the continuous adjustment of the national health insurance and the increasing competition in the overall medical environment, hospitals have begun to develop into smart hospitals, and have successively built Healthcare Information Systems. To assist clinical medical and administrative operations to reduce the risk of treatment errors, prevent the occurrence of medical errors, save medical costs, improve the quality of medical services and patient safety, and allow patients to receive appropriate treatment and preventive health services (Dana *et al.*, 2021). In 2000, Taiwan incorporated nurse practitioners into the Nursing Personnel Act, giving them a legal basis for their practice. However, the incomplete legal norms and connection systems affected the role function orientation and work content consensus and even led nurse practitioners to face challenges. With the doctors and nurses' joint efforts and the Ministry of Health and Welfare's successive amendments to regulations, the “Regulations Governing Nurse Practitioners Carrying out Medical Activities under the Supervision of a Physician” were announced in October 2015 to standardize the content of medical services that nurse practitioners can perform under the supervision of doctors. Concomitantly, it was clearly stipulated that the medical procedures and related regulations must be pre-established by physicians (Law & Regulations Database of The Republic of China [Taiwan], 2017). In the current medical environment, nurse practitioners play an important role between medical treatment and nursing. The work content is complex and professional. The establishment of "Pre-established Medical Processes" can help nurse practitioners achieve practical work, thereby reducing clinical work pressure. A good information system must have a user-friendly interface to enable smooth operation (Huang *et al.*, 2021). If the design is poor, the system interface lacks fluency, or the connection with the surrounding information system is missing, it will not be able to play its effectiveness, and may also lead to medical negligence. Therefore, the system should have corrected clinical guidelines, conform to clinical usage habits, and interface design for ease of use, in order to effectively use the "Pre-established Medical Processes" to improve system satisfaction and work efficiency.

LITERATURE REVIEW

Development and practice status of nurse practitioners

The origin of Taiwan's nurse practitioner's system lies in the shortage of doctor manpower supply, changes in the medical payment system and the continuous increase in demand for nursing care, so senior nurses who are familiar with medical procedures are used to perform part of the medical work to maintain the balance of medical supply and demand and the health of the people. care needs, and cooperate with physicians to provide continuous and integrated medical and nursing care (Qiu, 2016). According to the Department of Healthcare of the Ministry of Health and Welfare, as of 2021, 13,341 have passed the screening and obtained the certificate of specialist nurse practitioner. Currently, 98% of them provide medical and nursing professional services in relevant medical places (Department of Nursing and Health Care, Ministry of Health and Welfare, 2022; Lin et al., 2021). On October 24, 2000, the Legislative Yuan passed the third amendment to Article 7-1 of the "Nursing Personnel Act", listing "nurse practitioners" as one of the legal names. In 2006, he started to hold the examination of nurse practitioners and became an advanced nurse with a national certificate in Taiwan (Law & Regulations Database of The Republic of China [Taiwan], 2020). Nurse practitioners perform related medical services in accordance with Articles 7 and 24 of the Nursing Personnel Act to ensure the quality of practice and patient safety.

Pre-established Medical Processes

Medical quality and patient safety are the tenets of "Pre-established Medical Processes". According to Article 5 of "Regulations Governing Nurse Practitioners Carrying out Medical Activities under the Supervision of a Physician", contains the following: "(1) Conditions or diagnoses such as symptoms, medical history, physical assessments; (2) Implementation items; (3) Relevant treatments and measures; (4) Written records; (5) The supervising physician and supervision method; (6) Specific training standards or requirements that nurse practitioners and nurse practitioners in training shall meet" (Law & Regulations Database of The Republic of China [Taiwan], 2017). Through "Pre-established Medical Processes", various disease symptoms are integrated into standard specifications according to medical measures and steps, which can help reduce medical negligence due to human errors, maintain medical quality, and ensure patient safety, and can also be guaranteed in clinical practice.

Technology Acceptance Model

Davis developed the Technology Acceptance Model in 1989 based on rational behavior theory, which is used to explain and predict users' acceptance of new information technology and to analyze various factors affecting users' internal beliefs, attitudes, and willingness. In the dimension of TAM, Davis believes that "perceived usefulness" and "perceived ease of use" are the two most important variables affecting users' attitudes towards accepting information technology, which impacts users' behavioral intentions and actual use behavior.

Task-Technology Fit Model

The task-technology fit model was proposed by Goodhue and Thompson (1995) to explore the theory of the relationship among the three dimensions, task characteristics, technological characteristics, and individual characteristics. This theory holds that users must accept and be willing to use information technology. In addition, a good cooperation is needed between information technology and tasks so that the tasks can be performed smoothly and the performance can be improved (Goodhue and Thompson, 1995).

Integration of Technology Acceptance Model and Task-Technology Fit Model

In 1999, Dishaw and Strong found that the TAM is similar to the task-technology adaptation model. They believed that the latter would affect cognitive usefulness and cognitive ease of use and eventually the actual use. The technology acceptance model and task-technology fit model strengthen the model's acceptance and explanation degree for technology, and the integrated explanatory power becomes higher than that of the single model.

Computer Self-Efficacy

According to the perspective of social cognitive theory, self-efficacy refers to an individual's judgment of the ability to complete a task or achieve a goal (Bandura, 1986). Compeau and Higgins (1995) extended self-efficacy to computer self-efficacy. For a specific job or task, whether an individual has the ability to use the information system to complete the task's self-evaluation and cognition, and confirmed that the better the user's computer self-efficacy performance, the better the computer self-efficacy.

Subjective Norm

Subjective norm refers to the behavioral attitude of an individual that is influenced by the external environment or pressure to demonstrate a specific behavior or use (Ajzen & Fishbein, 1980). The research results of Venkatesh and Davis (2000) show that subjective norms can directly or indirectly affect the willingness to use information technology through perceived ease of use. Ursavaş et al. (2019) pointed out that subjective norm is an important variable of medical personnel's adoption of technology, which directly affects actual use, and will be pressured by social opinions or regulations to influence people's behaviors to comply with opinions or regulations.

Performance Measurement of Medical Institutions

The Balanced Scorecard is a multidimensional performance management tool proposed by Kaplan and Norton (1992). It combines financial and nonfinancial indicators to develop a scorecard model, which expands the performance measurement to four dimensions: customer, internal process, learning, and growth. In addition to general enterprises, it also includes the field of health care, and the Balanced Scorecard was considered as an important strategic management tool for the health care industry as early as 1994 (Trotta et al., 2013).

HYPOTHESIS DEVELOPMENT AND FRAMEWORK

Research framework

This study used the “technology acceptance model” and “task-technology fit model” proposed by Dishaw and Strong (1999) as the theoretical bases of the research framework to investigate the use of “pre-established medical processes” by nurse practitioners and whether their fit affects the actual use and the job performance. According to the literature review, computer self-efficacy affects the use of new information systems to complete related tasks; thus, it is included in the research framework. Furthermore, the subjects included in this study were nurse practitioners who were required to use the “pre-established medical processes” in assisting in the issuance of medical orders in accordance with the regulations. Thus, the task characteristics in the task-technology fit will not affect other variables. However, the adoption of the system will be affected by subjective norms within the organization and will have different effects according to the characteristics of the users. Therefore, these two variables are regarded as moderating variables.

Research Hypothesis

Goodhue and Thompson (1995) pointed out that if the information technology can meet and support the needs of work tasks, it will improve users’ willingness to use such a technology. Dishaw and Strong (1999) research shows that task-technology fit affects perceived usefulness and perceived ease of use, which in turn affects usage. Therefore, this study proposes the following hypotheses: H1: The technology features positively affect the perceived usefulness of the “pre-established medical processes” among nurse practitioners "; H2: The technology characteristics positively affect the perceived ease of use of the “pre-established medical processes” among nurse practitioners.

In information management research, computer self-efficacy is mainly used as an external variable of system users' behaviors toward the use of information systems (Compeau & Higgins, 1995). According to Abdulrab (2020), computer self-efficacy is related to an individual's ability, understanding, and belief in performing the tasks. Therefore, this study proposed the following hypotheses: H3: Computer self-efficacy positively affects the perceived usefulness of the "pre-established medical processes" among nurse practitioners; H4: Computer self-efficacy positively affects the perceived ease of use of the "Pre-established Medical Processes" among nurse practitioners.

Dishaw and Strong (1999) believed that task-technological fit model would affect the nurse practitioners’ perceived usefulness, perceived ease of use, and willingness to use. Debajyoti and Syamal (2020) research shows that college students suffer from COVID-19 -The task of using online learning in the 19th period-Technology adaptation has a significant positive correlation with perceived usefulness and perceived ease of use. Therefore, this study proposed the following hypotheses: H5: The task-technology fit positively affects the perceived usefulness of the "pre-established medical processes" among nurse practitioners; H6: The task-technology fit positively affects the Perceived ease of use of the "pre-established medical processes" among nurse practitioners; H7: Perceived ease of use positively affects the perceived usefulness of the "pre-established medical processes" among nurse practitioners.

Davis (1989) demonstrated that the two most important beliefs positively affecting users’ attitudes toward the use of information technology were "perceived usefulness" and "perceived ease of use". Dishaw and Strong (1999) verifies that the adaptation of tasks and technology affects perceived ease of use and perceived usefulness, which in turn affects the actual use. Therefore, this study proposed the following hypotheses: H8: Perceived usefulness positively affects the actual use of "pre-established medical processes" by nurse practitioners; H9: Perceived ease of use positively affects the actual use of "Pre-established Medical Processes" by nurse practitioners.

Goodhue and Thompson (1995) proposed that when the user has the task characteristics endowed by a clear cognitive self, there will be a positive perception and evaluation of the task-technology fit. Dishaw & Strong (1999) believed that the task-technological fit affects perceived ease of use, perceived usefulness, and willingness to use. Karimi et al. (2004) employed the organizational theory to study users’ satisfaction with the use of information systems under environmental uncertainty and task characteristics. The results indicated that the task characteristics had direct and mediating effects on user satisfaction. Therefore, this study proposed the following hypotheses: H10a: Task characteristics have a moderating effect on the relationship between the task-technological fit and perceived usefulness; H10b: The task characteristics have a positive effect on the relationship between the task-technology fit and perceived ease of use adjust the effect.

Venkatesh and Davis (2000) proposed that subjective norms indirectly affect technology adoption through perceived usefulness and perceived ease of use. If majority of the significant people in the group use the system, perceived usefulness will be positively affected, whereas perceived ease of use will be positively affected if used by an increasing number of people in a group (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). Therefore, this study proposes the following hypotheses:

H11a: Subjective norm has a moderating effect on the relationship between perceived usefulness and actual use; H11b: Subjective norm has a moderating effect on the relationship between perceived ease of use and actual use.

Design

The questionnaire followed a structured design. The difference in the degree was expressed as an interval scale, and a five-point Likert scale was used to differentiate its degree as follows: “strongly disagree (1) to strongly agree (5).” To make the content of the questionnaire reliable and valid, after completing the questionnaire design, the academic and medical circles were invited to discuss and revise the content of the questionnaire and the meaning of the questions.

Participants

The recipients are the practicing nurse practitioners in the hospitals in central Taiwan.

Data Collection

Data was collected in April 2022. A total of 300 questionnaires were distributed, and 240 individuals responded. After collecting the questionnaires, they were screened, and invalidated questionnaires were excluded. If the contents of the questionnaires were omitted and the medical information system did not establish a “pre-specified medical procedure,” this study would be considered invalid. After the screening, 212 valid questionnaires were identified, indicating an overall effective questionnaire recovery rate of 88.3%. SPSS 24.0 was used to conduct descriptive statistical analysis on valid samples, and Smart PLS 3.0 was used to verify the research model of the structural equation modeling.

FINDINGS

Basic Information of Nurse Practitioners

In this study, SPSS 24.0 was used to conduct descriptive statistical analysis on the basic data obtained from the 212 valid questionnaires. The analysis results are presented in Table 1.

Table 1: Basic data descriptive statistical analysis

Statistical item	n	%	
Gender	Male	7	3.3
	Female	205	96.7
Education level	Associate degree	3	1.4
	Bachelor's degree	182	85.8
	Master's degree	25	11.8
	Doctorate degree	2	0.9
Certificate Section	Internal Medicine	74	34.9
	Surgical	97	45.8
	Psychiatric	7	3.3
	Pediatrics	20	9.4
	Obstetrics and Gynecology	14	6.6
Clinical experience	Below 5 years	36	17.0
	6~10 years	59	27.8
	11~15 years	54	25.5
	16~20 years	46	21.7
	More than 21 years	17	8.0
Age	Below the age of 29	6	2.8
	30~39 years old	49	23.1
	40~49 years old	140	66.0
	Over 50 years old	17	8.0
Seniority of Individuals Using Medical Information System	Below 5 years	17	8.0
	6~10 years	47	22.2
	11~15 years	65	30.7
	16~20 years	57	26.9
	More than 21 years	26	12.3

Source: This study.

Descriptive Statistical Analysis of Research Items

SPSS 24.0 was used for the descriptive statistical analysis based on 212 valid samples. The analysis results are presented in Table 2.

Reliability and Validity Analysis

Reliability Analysis

SPSS 24.0 was used to analyze the reliability of 212 valid questionnaires. The overall Cronbach's alpha value of the analysis results was 0.952, which is within the acceptable range. In this study, the Cronbach's alpha values ranged from 0.753 to 0.945. Values greater than 0.7 indicate that the research is internally consistent and has a certain degree of reliability.

Validity Analysis

SPSS 24.0 was also used to conduct KMO and Bartlett's spherical test on 212 valid questionnaires. The KMO values in this study ranged from 0.672 to 0.864 and were all greater than 0.6, indicating that there were common factors among the variables of this scale, and the p-values of the spherical test statistics were all a significant level of $0.000 < \alpha = 0.01$ indicates that it is suitable for factor analysis. In this study, the average extracted variance was greater than 0.5, the combined reliability was greater than 0.7, and the factor loading was greater than 0.5 (Hair et al., 2010), indicating that all aspects of this study have good convergent validity, as presented in Table 2. The minimum value of the average variation extraction of the facets in this study was greater than the square of the maximum value of the correlation coefficient between facets, indicating that each facet has good discriminant validity. The results are presented in Table 3.

Table 2: Mean, SD, AVE, CR and factor loadings

Dimension	Question code	Mean	Standard deviation	Average variance extracted	Composite reliability	Factor loadings
Technology Characteristics	EC1	3.15	0.861	0.809	0.944	0.895
	EC2	3.09	0.816			0.859
	EC3	3.29	0.829			0.941
	EC4	3.41	0.850			0.901
Computer self-efficacy	CSE1	3.34	0.888	0.669	0.858	0.758
	CSE2	3.69	0.828			0.858
	CSE3	3.89	0.744			0.833
Task-Technology Fit	TTF1	3.42	0.800	0.741	0.934	0.759
	TTF2	3.11	0.909			0.814
	TTF3	3.28	0.888			0.857
	TTF4	3.28	0.865			0.934
	TTF5	3.32	0.835			0.927
Task Characteristic	TC1	3.20	0.891	0.777	0.932	0.869
	TC2	3.34	0.805			0.956
	TC3	3.33	0.797			0.944
	TC4	3.76	0.832			0.740
Perceived Usefulness	PU1	3.46	0.854	0.859	0.961	0.903
	PU2	3.35	0.932			0.943
	PU3	3.36	0.944			0.935
	PU4	3.33	0.923			0.926
Perceived Ease of Use	PE1	3.77	0.732	0.641	0.877	0.807
	PE2	4.02	0.697			0.848
	PE3	4.10	0.755			0.793
	PE4	4.10	0.723			0.752
Subjective Norm	SN1	3.81	0.766	0.742	0.896	0.793
	SN2	3.50	0.844			0.885
	SN3	3.52	0.866			0.901
Actual Use	AU1	3.68	0.852	0.626	0.921	0.732
	AU2	3.61	0.843			0.756
	AU3	3.54	0.791			0.780

Source: This study.

Table 3: AVE square root correlation matrix

	CSE	PU	PE	EC	AU	TTF	TC	SN
CSE	0.818							
PU	0.259	0.927						
PE	0.444	0.189	0.801					
EC	0.245	0.648	0.151	0.899				
AU	0.367	0.573	0.348	0.531	0.791			
TTF	0.312	0.802	0.244	0.699	0.605	0.861		
TC	0.268	0.770	0.278	0.600	0.594	0.761	0.881	
SN	0.399	0.258	0.358	0.296	0.692	0.288	0.272	0.861

Source: This study.

Structural Model Analysis

In this study, the BootStrap test method was employed to test the path coefficient of 212 valid questionnaires using SmartPLS 3.0, and the path coefficient (β) and t-value were calculated. The test results are presented in Table 5. The least squares method

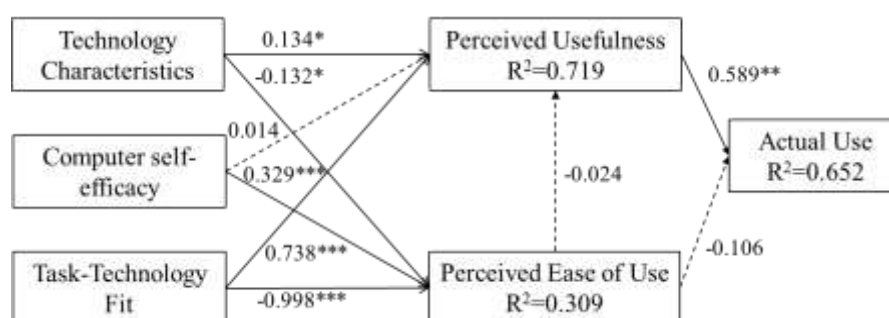
PLS used the coefficient of determination R² to detect the prediction degree of the entire model, which refers to the percentage of variation that can be explained by the exogenous to the endogenous aspects. The R² value of "Perceived Ease of Use" is 0.309; "Perceived Usefulness," 0.719; and "Actual Use," 0.652, all of which have good explanatory power. The path analysis of the overall research structure is presented in Figure 1.

Table 4: Direct path coefficient and hypothesis

Hypothesis	Paths	Beta	t-value	p-value	Decision
H1	Technology Characteristics → Perceived Usefulness	0.134	1.839	0.066*	Accepted
H2	Technology Characteristics → Perceived Ease of Use	-0.132	1.658	0.097*	Accepted
H3	Computer self-efficacy → Perceived Usefulness	0.014	0.290	0.772	Rejected
H4	Computer self-efficacy → Perceived Ease of Use	0.329	4.043	0.000**	Accepted
H5	Task-Technology Fit → Perceived Usefulness	0.738	5.780	0.000**	Accepted
H6	Task-Technology Fit → Perceived Ease of Use	-0.998	3.997	0.000**	Accepted
H7	Perceived Ease of Use → Perceived Usefulness	-0.024	0.598	0.550	Rejected
H8	Perceived Usefulness → Actual Use	0.589	2.036	0.042**	Accepted
H9	Perceived Ease of Use → Actual Use	-0.106	0.444	0.657	Rejected

Note: *p<0.1; **p<0.05; ***p<0.01

Source: This study.



Source: This study.

Figure 1: Path analysis of the overall research structure (*p<0.1; **p<0.05; ***p<0.01)

Adjustment Effect Check

In this study, task characteristics and subjective norm variables were added to the research framework to adjust the effect, and the standardization method was adopted to overcome the multicollinearity problem caused by the calculating interaction variables. The statistical results are presented in Table 5. At present, the "pre-established medical processes" in each medical institution are set up for common diseases, but the clinical diseases are diverse; thus, it is difficult for nurse practitioners to obtain the correct information when using the "pre-established medical processes" in assisting in the issuing of medical orders. Information is required, and it is difficult to effectively use information and achieve task and technology adaptation. However, if a nurse practitioner feels that a colleague or supervisor thinks that the "pre-established medical processes" is easy to operate, and has a strong belief in compliance with the regulations and policies of the Ministry of Health and Welfare, they will perceive that the "pre-established medical processes" is easy to use. It is stipulated in the regulations that "pre-established medical processes" can only be opened after specific training standards or requirements. Therefore, after the nurse practitioners have been educated and trained to open the medical information system, it will be easy to operate in terms of ease of use.

Table 5: Adjustment effect path coefficient test

Hypothesis	Task	Characteristic	Subjective	Norm	Paths	Beta	t-value	p-value
H10a					Task-Technology Fit → Perceived Usefulness	-0.073	2.148	0.032**
H10b					Task-Technology Fit → Perceived Ease of Use	0.192	4.072	0.000***
H11a					Perceived Usefulness → Actual Use	-0.020	0.305	0.760
H11b					Perceived Ease of Use → Actual Use	0.093	1.889	0.059*

Note : *p<0.1; **p<0.05; ***p<0.01

Source: This study.

CONCLUSIONS AND RECOMMENDATIONS

Research Conclusion and Discussion

Based on the "Technology Acceptance Model" and "Task-Technology Fit" integrated model proposed by Dishaw and Strong (1999), this study investigated the behavioral research on the use of "pre-established medical processes" by practicing nurse practitioners. Whether the allocation affects the actual use intention, and thus affects the job performance. Behavior. The results indicated that the technological characteristics and task technological adaptation had a negative impact on cognitive ease of use. More than 50% of the nurse practitioners in this study were aged above 40 years and had at least 11 years of clinical experience and experience in using medical information systems. Their personal work habits have been developed for

a long time and were mainly based on their own working methods. Therefore, despite the "pre-established medical processes" with more detailed data and stronger functions, it will not affect the perceived ease of use. Furthermore, the nurse practitioners were all from the Department of Nursing and mainly focus on learning basic medical scientific knowledge and nursing skills. With the continuous growth of the Internet, learning, and use computer skills may be a little more frustrating in older than in young people. Hackbarth et al. (2003) demonstrated that lack of experience may cause anxiety toward the use of computers, which in turn inhibits users' perceived ease of use. Therefore, the functions provided by the system do not match, are difficult to learn, and lack flexibility, which may negatively affect perceived ease of use. In addition, nurse practitioners may think that the practicality and usefulness of the "pre-established medical processes" in clinical work are not very helpful, so the personal computer self-efficacy is high or low, which cannot affect the relationship between its perceived usefulness. Hu et al., (1999) showed that the applicability of physicians' use of telemedicine in healthcare was explained by the TAM. The result was that perceived ease of use has no positive effect on attitudes, indicating that users have the perceived ease of use of technology varies in importance. This study demonstrated that nurse practitioners place less importance on the perceived ease of use of "pre-established medical processes". Therefore, it is necessary to understand the clinical work characteristics and work content of nurse practitioners to plan for the "pre-established medical processes" and to analyze and evaluate the usefulness and ease of use of the system. As long as the system is easy to use and meets the needs of information, users' willingness to use will increase.

The overall research results indicated that the two dimensions of "technology characteristics" and "task-technology fit" have a significant impact on "perceived usefulness", and the path coefficient of the actual use that affects the "pre-established medical processes" The maximum value is "task-technology fit". From this, it can be seen that the main reason that affects the use of "pre-established medical processes" by nurse practitioners is whether the operation method is consistent with the original work flow, the content of the process needs to be in line with the changes in clinical conditions, and can effectively achieve the inspection-related items required by the patient. Only when the overall system design is easy to use can it help improve the quality of clinical work. If the acceptance of the "pre-established medical processes" can be improved and resistance to it be reduced, the success rate and satisfaction of the process introduction can be increased. This study verifies the task proposed by Goodhue & Thompson (1995). In the technology adaptation model, the user's performance of information technology comes from the task technology adaptation results, the information technology's cognition and experience, and the degree to which the user's needs meet the needs of the users. Therefore, the use of "pre-established medical processes" by nurse practitioners to assist in issuing medical orders can improve the quality of patient safety medical care, improve work efficiency and effectiveness, and thus improve work performance.

Recommendations for Management Practice

The purpose of adopting the "pre-established medical processes" is to make the practice of nurse practitioners more secure and to comply with the policies of the Ministry of Health and Welfare as well as the requirements of the hospital visit assessment project for nurse practitioner training. The management unit of the nurse practitioners When developing related processes or systems, it is necessary to first understand the needs of the users and work processes and to make plans with a focus on the user to enable a smooth implementation of the information system. In the early stage of the process introduction, seeded personnel can be arranged to provide immediate support in solving problems regarding the use. In addition, supervisors can provide care and encouragement to the users so as to reduce the feeling of rejection of the system by nurse practitioners and receive nurse practitioners' feedback on the system at any time. Feedback and assist with processing. The information department stabilizes the information quality during the system design, continuously monitors the system performance and evaluation results, and makes corrections and optimizations at any time according to clinical needs to achieve the maximum benefit of the system introduction. In Taiwan, the overall nurse practitioner's system has been gradually completed. The law clearly defines the scope and content of the practice and regulates the "pre-established medical processes," which enhances the independence of nurse practitioners in medical care. Therefore, in assisting in the issuance of medical orders, relevant laws and regulations should be followed to improve the safety of professional nurse practitioners and the quality of their tasks. It is expected that in the early stage of the system introduction, most people will have inertia, resist changes, or worry that their workload will increase and cause anxiety. These situations can be changed by improving computer-related knowledge, learning computer-related skills, and increasing self-confidence. The usability and usefulness of the system will enable the user to become confident during the transformation of the information system in the future, thereby improving the acceptance and work efficiency of the system.

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REFERENCES

- Abdulrab, M. (2020). Factors Affecting Acceptance and The Use of Technology in Yemeni Telecom Companies. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 11(6), 1-16. <https://doi.org/10.14456/ITJE-MAST.2020.115>
- Azjen, I & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behaviour*. Prentice-Hall.

- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
- Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19(2), 189-211. <http://doi.org/10.2307/249688>
- Dana Alrahbi, Mehmood Khan & Matloub Hussain (2021). Exploring the motivators of technology adoption in healthcare. *International Journal of Healthcare Management*, 14(1), 50-63. DOI:10.1080/20479700.2019.1607451
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Debajyoti Pal & Syamal Patra (2020). University Students' Perception of Video-Based Learning in Times of COVID-19: A TAM/TTF Perspective. *International Journal of Human-Computer Interaction*, 37(10), 903-921. <https://doi.org/10.1080/10447318.2020.1848164>
- Department of Nursing and Health Care, Ministry of Health and Welfare (April 11,2022). A list of the number of qualified nurses from 1995 to 110. <https://www.mohw.gov.tw/dl-77062-d954f045-5b93-4d46-b70b-916e32f31e73.html>
- Dishaw, M. T., & Strong, D. M. (1999). Extending the technology acceptance model with task–technology fit constructs. *Information & Management*, 36(1), 9-21. DOI:10.1016/S0378- 7206(98)00101-3
- Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, 19(2), 213-236. <https://doi.org/10.2307/249689>
- Hackbarth, G., Grover, V., and Yi, M. Y. (2003). Computer Playfulness and Anxiety: Positive and Negative Mediators of the System Experience Effect on Perceived Ease of Use, *Information & Management*. 40(3), 221-232. [https://doi.org/10.1016/S0378-7206\(02\)00006-X](https://doi.org/10.1016/S0378-7206(02)00006-X)
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate data analysis* (7th ed.). Prentice Hall. <https://doi.org/10.1080/10447318.2020.1848164>
- Hu, P. J., Chau, P. Y., Sheng, O. R. L., & Tam, K. Y. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems*, 16(2), 91-112. <https://doi.org/10.1080/07421222.1999.11518247>
- Huang Weimin, Chen Conghua, Su Qingquan, Li Yuxuan (2021). A study on the key factors affecting the introduction of anesthesia information systems in medical institutions. *Aetna Medical Journal*, 27(1), 73-96.
- Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard-measures that drive performance. *Harvard business review*. 70(1), 71-79.
- Karimi, J., Somers, T. M., & Gupta, Y. P. (2004). Impact of Environmental Uncertainty and Task Characteristics on User Satisfaction with Data, *Information Systems Research*, 15(2), 175-193.
- Law & Regulations Database of The Republic of China (Taiwan) (May 8, 2017). Regulations Governing Nurse Practitioners Carrying out Medical Activities under the Supervision of a Physician. Law & Regulations Database of The Republic of China (Taiwan). <https://law.moj.gov.tw/LawClass/LawAll.aspx?pcode=L0020185>
- Law & Regulations Database of The Republic of China (Taiwan) (September 26, 2020). Regulations Governing Specialties and Examination of Nurse Practitioner. Law & Regulations Database of The Republic of China (Taiwan). <https://law.moj.gov.tw/LawClass/LawAll.aspx?pcode=L0020081>
- Lin Menghui, He Lihui, Luo Peiyong, Wang Zhirou, Tong Hengxin, Ke Jiayan, Su Yuhui, Cai Xiuluan (2021). Influence of Taiwanese practice environment on job satisfaction of nurse practitioner: a national survey. *Taiwan Journal of Professional Nursing Physicians*, 8(1), 27-37.
- Qiu Huizhen (2016). Research on the scope of practice and practice mode of professional nurse practitioners - centering on the comparison between Taiwan and the United States. *Tokai University Law Research*, 50, 87-131.
- Trotta, A., Cardamone, E., Cavallaro, G., & Mauro, M. (2013). Applying the Balanced Scorecard approach in teaching hospitals: a literature review and conceptual framework. *The International journal of health planning and management*, 28(2), 181–201. <https://doi.org/10.1002/hpm.2132>
- Ursavaş, Ö. F., Yalçın, Y., & Bakır, E. (2019). The Effect of subjective norms on preservice and in-service teachers' behavioural intentions to use technology: A Multigroup multimodel study. *British Journal of Educational Technology*, 50(5), 2501-2519. <https://doi.org/10.1111/bjet.12834>
- Venkatesh, V. & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273-315. <https://doi.org/10.1111/j.1540-5915.2008.00192.x>
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204. doi:10.1287/mnsc.46.2.186.11926