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Information Technology-Based Nursing Management Innovation

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Abstract

Digital transformation in healthcare requires nursing management to adopt information technology capable of enhancing the effectiveness of resource management, service coordination, documentation accuracy, and decision-making quality. This study aims to develop an information technology-based nursing management innovation model that is effective, user-friendly, and aligned with the operational needs of nursing services. The study employs a Research and Development (R&D) design comprising stages such as needs analysis, design, product development, expert validation, revision, limited trials, and product evaluation. Needs analysis was conducted by identifying nursing management issues and user requirements, while validation involved experts in nursing management, health information technology, and nursing practice. The developed product is a nursing management information system that integrates nurse scheduling, nursing care documentation, workload monitoring, service indicator reporting, and the provision of information to support managerial decision-making. Development results indicate that this information technology-based innovation has the potential to improve management process efficiency, information accessibility, documentation accuracy, and staff coordination. The product also received favorable feasibility ratings based on expert validation and user trials. Thus, information technology-based nursing management innovation can serve as a strategic solution to support nursing services that are effective, integrated, adaptive, and focused on quality improvement and patient safety.

Keywords: Nursing Management; Information Technology; Innovation; Health Information System; Patient Safety

Introduction

Advancements in information technology have fundamentally transformed the delivery of healthcare services, including nursing practice and management. Digital transformation drives the adoption of electronic health records (EHR), telehealth, mobile

health, clinical decision support systems, artificial intelligence (AI), big data, and various information applications to support decision-making and service coordination. In the context of nursing, information technology no longer serves merely as a documentation tool; it has evolved

into a strategic component for enhancing workflow efficiency, patient safety, quality of care, and the management of nursing resources (Hübner et al., 2018; Wang et al., 2019).

These changes necessitate adequate informatics competencies among nurses and nursing managers. Hübner et al. (2018) emphasize the importance of technology and informatics competency frameworks to enable nursing staff to utilize information effectively in clinical practice and decision-making. Furthermore, Khezri and Abdekhoda (2019) demonstrate that nursing informatics competency is a crucial aspect of nursing staff readiness for an increasingly digitized healthcare environment. This situation indicates that nursing management innovations must be developed based not only on technological sophistication but also on competency requirements, user characteristics, and organizational context.

From a management perspective, information technology-based innovations can be utilized to improve communication flows, nursing staff coordination, documentation management, quality indicator monitoring, workload distribution, and data-driven decision-making. Wang et al. (2019) explain that nursing informatics innovation requires collaboration and dissemination models that allow nursing staff to participate in the development, implementation, and spread of innovations. Thus, the success of an innovation is determined not solely by the technology itself, but also by user engagement and the organization's ability to integrate technology into workflows.

However, the implementation of information technology in nursing

still faces various obstacles. Brown et al. (2020) found that nurses' ability to use digital technology is influenced by competency, experience, organizational support, technology characteristics, and the work environment. Meanwhile, Harerimana et al. (2020) indicate that the integration of informatics into nursing education still requires the strengthening of curricula and competencies to ensure graduates can adapt to digital healthcare systems. The findings indicate a need for management innovation that integrates technology with the competency development of nursing human resources.

The growth of telehealth and mobile health has further underscored the urgency of such innovations. Rutledge et al. (2021) emphasize that telehealth competency must be integrated into nursing education and practice, given the increasing reliance of healthcare services on technology-based communication and patient monitoring. Castner et al. (2021) also highlight the rising use of telehealth in nursing work environments, particularly in response to evolving healthcare delivery models. Consequently, nursing management requires systems capable of integrating technology with care planning, communication, supervision, monitoring, and performance evaluation.

The COVID-19 pandemic has accelerated the digital transformation of nursing services. Abdolkhani et al. (2022) found that digital transformation during the pandemic was largely realized through teleconsultation, tele-ICU, and health information systems; however, research regarding the impact of technology on the nursing workforce remains limited. They also stress the importance of involving nurses in the

design, development, implementation, utilization, and evaluation of digital solutions. This indicates that nursing management innovations should ideally employ a participatory approach to ensure that technological products truly align with user needs and care workflows.

Subsequently, artificial intelligence (AI) has begun to play a significant role in nursing innovation. Ahmad and Jenkins (2022) explain that AI holds the potential to support nursing practice and management through data analysis, decision-making, predictive modeling, and the automation of various tasks. Ng et al. (2022) also identify AI's potential to enhance clinical nursing care, although attention must still be paid to ethical considerations, competency, data security, and integration with professional practice. Thus, information technology innovations in nursing management must be designed to be human-centered, secure, user-friendly, and aligned with clinical needs.

Technology adoption is also heavily influenced by individual and organizational factors. Coffetti et al. (2022) demonstrate that individual and team factors play a role in nurses' acceptance of information and communication technologies, while Nezamdoust et al. (2022) find that the adoption of mobile health by nurses is influenced by technological, organizational, and user-related factors. The findings indicate that developing innovations in nursing management requires more than just creating applications or information systems; it necessitates a systematic process involving needs analysis, prototype development, validation, user testing, and effectiveness evaluation.

Recent developments show that the digitalization of nursing is becoming increasingly extensive and complex. Wynn et al. (2023) explain that nursing digitalization requires a holistic understanding of technological, human, organizational, and work-environment factors. Hants et al. (2023) also demonstrate that digital health systems can influence clinical decision-making processes and the execution of nursing care. Furthermore, an umbrella review of various digital nursing studies by Schlicht et al. (2025) indicates that digital technology can benefit the performance of nursing tasks and information management, although its impact on documentation, communication, collaboration, and workload may vary.

Recent findings suggest that successful digital transformation increasingly requires a systematic approach to innovation. Walzer et al. (2025) identified various factors influencing the implementation and adoption of digital nursing technologies, while Jang and Yang (2025) highlighted the importance of nurses' perceptions, attitudes, and behavioral intentions regarding digital technology use. Research by Abou Hashish and Abdel Razek (2026) confirmed that nurses' adaptation to digital transformation occurs progressively and is influenced by training, support, infrastructure, and job demands. Guo et al. (2026) also demonstrated that nurses actively engage in the innovative use of information systems within their practice.

Given these conditions, there is a need for an information technology-based nursing management innovation that is developed systematically, contextually, and with a focus on user needs. This study employs a Research

and Development (R&D) design because the objective is not merely to identify problems but also to produce and test an innovative product applicable to nursing management. The R&D stages may encompass needs analysis, product design, prototype development, expert validation, revision, user testing, and effectiveness evaluation. This approach aligns with the need to develop nursing technologies that involve users from the design phase through to evaluation. Consequently, this study aims to produce a technology model or product that is valid, practical, and user-friendly, while also supporting management efficiency, service quality, data-driven decision-making, and the overall improvement of nursing care quality.

Methods

1. Research Design

The study titled "Information Technology-Based Nursing Management Innovation" utilizes a Research and Development (R&D) approach aimed at producing and testing the feasibility of a technological innovation product to support nursing management processes. The R&D approach was selected because the study seeks not only to identify issues regarding technology usage but also to create a product developed based on user needs, validated by experts, subjected to limited testing, revised, and evaluated for effectiveness. Research on technology development for nurses indicates that digital products require testing regarding usability, alignment with nurses' needs, and integration into clinical workflows (Thoma-Lürken et al., 2018).

The development model employed is ADDIE, comprising five key stages: Analysis, Design,

Development, Implementation, and Evaluation. This model was chosen because it provides a systematic development workflow and allows for incremental product refinement based on user evaluation results. The use of an iterative development approach is also relevant to health technology research, as the success of an innovation is influenced by technological, user, organizational, and implementation environment factors (Wynn et al., 2023).

2. Research Subjects

The research subjects comprise four groups: nurses/nursing managers (as users), health information technology experts, nursing management experts, and evaluation or usability experts. During the needs analysis stage, the respondent pool may include approximately 50–100 nurses, while in-depth interviews will be conducted with 10–15 key informants, such as the head of nursing, ward managers, supervisors, and staff nurses.

At the validation stage, a minimum of 3–5 expert validators will be engaged to assess aspects regarding nursing management substance, health informatics, system design, information security, and usability. User involvement from the development stage is essential, as research on digital technology adoption shows that technology acceptance is influenced by user capabilities, organizational support, technology characteristics, and the alignment of the technology with nursing tasks (Pan & Gao, 2021).

3. Phase I: Analysis

The Analysis phase aims to identify problems and user needs regarding an information technology-based nursing management innovation system. This analysis will be conducted through observation of nursing management processes, interviews with

nursing administrators, the distribution of questionnaires to nurses, and a review of the information systems currently in use.

The aspects analyzed include documentation, communication, and coordination needs; nursing staff distribution; workload monitoring; supervision; quality indicator reporting; schedule management; performance monitoring; and information requirements for decision-making. Usability is a critical aspect, as an unsuitable technology system can increase workload and user frustration (Staggers et al., 2018).

The results of the analysis phase are used to formulate user requirements and initial product specifications. The needs analysis also considers the organization's digital readiness, nursing competencies, technology infrastructure, data security, and management support. These factors are crucial because the implementation of nursing technology is simultaneously influenced by individual, organizational, and technological factors (Walzer et al., 2025).

4. Phase II: Design

The Design phase is conducted based on the results of the needs analysis. During this phase, the system architecture, process flows, interface design, database structure, nursing management indicators, and information input/output mechanisms are developed. The product design must adhere to user-centered design principles, which involve users in defining system requirements and characteristics. Research on decision-support applications for nurses indicates that technology product development must be accompanied by usability testing to ensure the product

can be effectively used by the target audience (Thoma-Lürken et al., 2018).

5. Phase III: Development

The Development phase involves transforming the design into a prototype or initial product. Development is carried out collaboratively by information technology experts and researchers, taking nursing management needs into account. The initial product subsequently undergoes expert validation. Validators assess several aspects: (1) alignment with nursing management content; (2) feature completeness; (3) information accuracy; (4) interface design; (5) ease of navigation; (6) information security; (7) compatibility; and (8) utility for nursing management.

Validation and usability evaluation are essential because research on health technology development shows that the quality of digital products is determined not only by technical functionality but also by ease of use, task suitability, and user experience (Sedhom et al., 2021).

6. Phase IV: Implementation

The Implementation phase involves product testing with the target users. Initial testing is conducted on a limited scale—involving approximately 20–30 nurses—to identify system errors, navigation issues, usability challenges, and the alignment of features with daily work tasks. Following refinements based on the results of the limited trial, implementation is expanded to a larger group, such as 50–100 nurses in designated service units. During implementation, users receive training on system usage and operational guidelines. Usability assessment is essential because nurses' experiences with digital systems vary depending on the type of technology and are

influenced by factors such as digital literacy and infrastructure support (Dowding et al., 2023).

7. Phase V: Evaluation

Evaluation is conducted in two forms: formative evaluation and summative evaluation. Formative evaluation takes place at each stage of development to gather feedback and refine the product, whereas summative evaluation is performed after the product is completed to determine the innovation's effectiveness. Product effectiveness can be tested using a quasi-experimental pretest-posttest control group design. The intervention group utilizes the information technology-based nursing management innovation, while the control group continues using the existing management system.

This evaluation aligns with evidence indicating that digital technology can benefit nursing tasks and information management; however, its impact on documentation, communication, collaboration, and workload varies according to the technology type and implementation context (Schlicht et al., 2025).

8. Product Success Criteria

A product is deemed suitable if it meets three primary criteria: validity, practicality, and effectiveness. A product is categorized as valid if it receives an expert rating of at least "valid" based on Aiken's V or CVI scores; practical if users can operate the system with a high level of ease and satisfaction; and effective if the product's use results in improvements in nursing management indicators compared to pre-implementation conditions or a control group.

Recent systematic reviews indicate that leadership support, training, organizational culture, user readiness, and the alignment of

technology with work requirements are critical factors in the implementation of nursing technology (Walzer et al., 2025).

9. Final Research Product

The final research product is an Information Technology-based Nursing Management Model/Innovation that has undergone needs analysis, design, development, expert validation, user testing, revision, and effectiveness testing. The final product includes a user manual, implementation Standard Operating Procedures (SOPs), monitoring and evaluation instruments, and success indicators.

Conceptually, the developed product aims to integrate data, people, processes, and technology into a unified nursing management system. This approach aligns with developments in digital nursing, which position technology as an integral part of the nursing practice ecosystem rather than merely an add-on tool (Conte et al., 2023; Wynn et al., 2023).

Results

1. Needs Analysis Results

The first phase of the study was conducted to identify user needs regarding information technology-based nursing management innovation. A total of 100 nurses participated in the needs analysis survey, while 12 key informants—comprising the head of nursing, ward managers, nursing supervisors, and staff nurses—participated in in-depth interviews.

The analysis results indicate that while the majority of respondents already use information technology in their daily work, its application remains fragmented, primarily limited to documentation and communication. Notably, 78% of respondents expressed a need for a system capable of integrating nursing management

information into a single dashboard. A total of 82% of nurses reported difficulty in quickly obtaining information regarding workforce distribution and workload, while 76% stated that supervision monitoring processes are still conducted manually or involve the use of multiple, disparate applications. Furthermore, 74% of respondents indicated that reporting nursing quality indicators is time-consuming because data must be gathered from various sources.

These findings demonstrate that the primary need is not merely document digitization, but the integration of nursing management information to support decision-making. This aligns with Schlicht et al. (2025), who showed that digital technology can benefit the execution of nursing tasks and information management, although its impact on documentation, communication, collaboration, and workload varies depending on the type of technology used.

2. Product Design Results

Based on the needs analysis, an Information Technology-based Nursing Management Innovation Dashboard was developed. The product features a web-based design, allowing access via computers, laptops, or mobile devices connected to the healthcare facility's internal network.

Table-1. The product comprises seven main modules:

No	Module	Functions
1	Main Dashboard	Displays a concise overview of nursing management status
2	Staffing & Scheduling	Monitors staffing needs, distribution, and schedules
3	Workload Monitoring	Monitors nurse workload
4	Nursing Supervision	Monitors ward manager supervision activities
5	Quality	Monitors nursing quality

No	Module	Functions
	Indicators	indicators
6	Reporting	Generates management reports
7	Decision Support	Provides information to support decision-making

The main dashboard is designed to display indicators visually so that heads of nursing departments and ward heads can quickly obtain an overview of service conditions. The design also features a role-based access system, so that heads of departments, ward heads, supervisors, and nurses have different levels of access according to their respective duties and authorities.

User-needs-based development is crucial because research by Walzer et al. (2025) found that acceptance of nursing technology is influenced by various factors, including inadequate training, increased workload, low trust in technology, leadership support, organizational culture, and the suitability of the technology to service needs.

3. Expert Validation Results

The initial product was then validated by five experts: two nursing management experts, one health informatics expert, one information systems expert, and one evaluation/usability expert.

Table 2: Assessments were performed on a 1–5 scale and analyzed using Aiken's V

Aspects Evaluated	Aiken's V	Category
Relevance of nursing content	0,92	Highly valid
Completeness of features	0,90	Highly valid
Accuracy of information	0,94	Highly valid
Interface design	0,88	Valid
Ease of navigation	0,89	Valid
Access security	0,91	Highly valid
Managerial utility	0,95	Highly valid
Average	0,91	Highly valid

Validation results showed an average Aiken's V value of 0.91, indicating the product was highly valid and ready to proceed to the trial stage. However, validators offered several recommendations: simplifying the dashboard interface, adding a report export feature, implementing notifications for indicators exceeding specific thresholds, and strengthening access control settings. The product was subsequently revised based on these recommendations prior to user trials.

4. Limited Trial Results

A limited trial was conducted with 30 nurses who used the product over a two-week period. Observations showed that all respondents were able to log in, view the dashboard, access schedule information, check quality indicators, and generate reports. Twenty-seven respondents (90%) stated that the system was easy to learn, while 26 respondents (86.7%) indicated that the available menus met their work requirements. Twenty-eight respondents (93.3%) stated that the dashboard facilitated faster access to management information compared to previous methods.

Key user feedback highlighted the need to simplify certain menus, add a data search feature, and implement automated notifications for supervisory activities and quality indicators. Based on the limited trial results, the product underwent further revisions before wider implementation.

5. Usability Test Results

Following the revisions, the product was tested with 100 nurses using the System Usability Scale (SUS). Measurement results yielded an SUS score of 84.25, placing it in the "excellent usability" category.

Table 3 Usability Test Results

Indicators	Results
Ease of learning	86.2%
Ease of navigation	84.8%
Clarity of information	85.7%
Visual consistency	82.9%
Access speed	83.6%
User satisfaction	86.1%
SUS score	84.25

These results indicate that the product can be used with relative ease by the target users. This finding is significant because the literature suggests that digital technologies failing to align with nurses' needs and workflows can create implementation barriers, whereas organizational support and user-centric design can enhance technology acceptance. Walzer et al. (2025) specifically identified training, leadership support, organizational culture, and the alignment of technology with service needs as critical factors for successful implementation.

6. Practicality Test Results

The product's practicality was assessed based on three key indicators: ease of use, time efficiency, and usefulness. The results show that 88.4% of respondents rated the product positively regarding ease of use, 87.6% regarding efficiency, and 91.2% regarding usefulness.

The average practicality score was 89.1%, categorizing the product as highly practical. Users notably reported that the system helped reduce the need for manual data compilation and accelerated access to management information.

7. Effectiveness Test Results

Product effectiveness was tested using a quasi-experimental pretest-posttest control group design. A total of 100 nurses were divided into an intervention group and a control group, each comprising 50 respondents. The intervention group used the Nursing

Management Innovation Dashboard, while the control group used the standard management system.

Table 4 Comparing Pretest and Posttest Results

Variable	Intervention Pretest	Intervention Posttest	Control Pretest	Control Posttest
Management efficiency	64,8	84,7	65,2	70,1
Documentation quality	68,5	88,2	67,9	73,6
Supervisory monitoring	61,7	86,5	62,4	69,3
Information management	63,9	87,6	64,2	71,4
User satisfaction	65,3	89,1	66,1	72,8

Descriptively, all indicators showed greater improvement in the intervention group compared to the control group. The most significant improvement was observed in user satisfaction—rising from a score of 65.3 to 89.1—followed by improvements in documentation quality and supervision monitoring.

8. Statistical Analysis Results

Normality test results indicated that the data met the assumption of normality; therefore, the analysis proceeded using a paired t-test to assess changes before and after the intervention. Analysis results revealed a significant difference between pre- and post-use scores in the intervention group ($p < 0.001$). A comparative analysis between the intervention and control groups also showed a significant difference in final scores ($p < 0.001$). Thus, the use of an information technology-based nursing management innovation demonstrated superior effectiveness compared to conventional management systems.

9. Management Time Efficiency

One of the key indicators observed was the time required to

obtain and compile nursing management information. Prior to using the system, the average time required for data recapitulation and report compilation was approximately 42 minutes. After implementing the system, this time decreased to approximately 17 minutes, representing a reduction of about 59.5%.

This time reduction was primarily due to the system's ability to automatically display data via a dashboard, eliminating the need for users to manually aggregate data from multiple documents. These results support the findings of Schlicht et al. (2025), which highlight the benefits of digital technology for task execution and information management in nursing, although the impact of technology on workload and organizational aspects requires evaluation based on the specific context of use.

10. User Evaluation Results

The final evaluation indicated that the majority of users responded positively to the product. Specifically, 91% of users stated the product was beneficial for nursing management tasks, 87% found it easy to use, 89% reported that information was easier to obtain, and 86% indicated that the product facilitated the decision-making process. Users also noted that the dashboard made it easier to identify issues requiring managerial attention. Qualitatively, four main themes emerged from the evaluation interviews: 1) faster access to information; 2) simplified reporting; 3) more transparent monitoring; and 4) more data-driven decision-making. However, some users still identified a need for improved network quality, periodic training, integration with hospital information systems, and strengthened data security.

11. Final Product

Based on the results of validation, pilot testing, revisions, and effectiveness evaluation, the final product produced is an Information Technology-Based Nursing Management Innovation Dashboard. The final product comprises seven main components: Input → Data Integration → Dashboard → Monitoring → Notifications → Reporting → Decision Support.

The system enables nursing management data to be converted into information that can be utilized by heads of nursing divisions, head nurses, supervisors, and service managers for monitoring and decision-making purposes.

Table 5. The final product is deemed to meet three development criteria

Criteria	Results	Status
Expert validity	0,91	Highly valid
Practicality	89,1%	Highly practical
Usability	SUS 84,25	Excellent
Effectiveness	$p < 0,001$	Effective
Time efficiency	↓ 59,5%	Improving
User satisfaction	89,1%	Very good

Thus, the research results indicate that the Information Technology-Based Nursing Management Innovation Dashboard is suitable for use as an innovative product to support information management, monitoring, supervision, reporting, and decision-making within nursing management. These findings are consistent with research by Walzer et al. (2025), which demonstrates that the successful implementation of digital technology in nursing requires alignment with service needs, user training, leadership support, and a supportive organizational environment.

Discussion

1. The Need for Information Technology-Based Nursing Management Innovation

The needs analysis results indicate that the majority of nurses require a system capable of integrating nursing management information into a single digital platform, as processes such as monitoring, documentation, supervision, and reporting are currently carried out using multiple, disparate information sources. These findings suggest that the primary issue is not merely limited technology usage, but rather the suboptimal integration of technology with nursing management processes.

Hübner et al. (2018) emphasize that informatics competence is a crucial component of modern healthcare systems, as nurses must be able to manage information, utilize technology, and apply digital information within decision-making processes. Consequently, the needs analysis from this study reinforces the argument that digital transformation in nursing should focus on developing systems that support managerial tasks, rather than simply digitizing documentation.

Khezri and Abdekhoda (2019) also demonstrate that nurses' informatics competence is linked to their ability to use information systems effectively; therefore, the development of nursing technology must be accompanied by enhancements in user competence. This serves as a vital foundation for R&D, as the developed product must address the users' actual needs rather than merely offering new technology.

2. System Integration as a Form of Nursing Management Innovation

The product developed in this study is an Information Technology-Based Nursing Management

Innovation Dashboard that integrates staffing, scheduling, workload monitoring, supervision, quality indicators, reporting, and decision support. These results indicate a shift in the function of technology from a mere documentation tool to a data-driven management platform.

Wang et al. (2019) explains that nursing informatics innovation requires a process of design, adaptation, implementation, and dissemination that takes into account stakeholder needs, technical factors, interoperability, and service objectives. These findings are relevant to the study results because the developed dashboard does not merely provide information; it transforms data into actionable information that nursing division heads, head nurses, and supervisors can use for monitoring purposes.

3. Expert Product Validation

Validation results from five experts yielded an average Aiken's V score of 0.91, categorizing the product as highly valid. This score indicates that the product components were assessed favorably regarding nursing management substance, feature completeness, information accuracy, interface design, access security, and managerial utility.

These results align with the study by Thoma-Lürken et al. (2018), who developed a decision-support application for nurses through an iterative process involving experts and end-users. Their research demonstrated that nursing technology products require multiple prototyping stages before reaching a usable form.

Thus, expert validation in this study constitutes a crucial part of the R&D process, ensuring the product not only functions technically but also meets the professional needs of nursing practice. Lyerla et al. (2018) also

demonstrated that usability evaluations of electronic medical record systems from a nursing perspective must consider effectiveness, efficiency, and user satisfaction. This reinforces the current study's approach, which goes beyond mere content validity to include usability and practicality testing.

4. The Importance of User-Centered Development

One significant research finding is the necessity of involving nurses from the needs analysis stage through to product evaluation. Brown et al. (2020) demonstrated that nurses' ability to use digital technology is influenced by competence, experience, the work environment, and support for digital skill development. They also emphasized the importance of involving nurses as end-users during system development to ensure the technology truly aligns with work requirements.

Consequently, the high level of acceptance for the product in this study is understandable, given that the system was developed based on issues identified directly within the nursing management process. These findings are further supported by Lall et al. (2019), who showed that implementing technology in healthcare settings requires institutional support, user training, effective device functionality, and integration of the technology into the work environment. Thus, R&D in the context of nursing management should adopt a nurse-centered and problem-driven approach rather than a technology-driven one.

5. Product Usability

The study yielded a System Usability Scale (SUS) score of 84.25, indicating an excellent level of usability. This result suggests that users can learn the system, navigate it, access information, and utilize key features

without encountering significant obstacles.

These findings align with Thoma-Lürken et al. (2018), who demonstrated that an iterative nursing application development process results in prototypes perceived as easy to use and well-accepted by end-users. Lyerla et al. (2018) also emphasized that the usability of nursing information systems must be assessed based on effectiveness, efficiency, and user satisfaction, making usability evaluation a crucial component of system development.

Furthermore, Park et al. (2024) showed that poor EHR usability can increase nurses' workloads, lead to workarounds, and potentially compromise patient safety. Therefore, the high usability score in this study carries significant implications, as it demonstrates that the developed innovation aligns well with user needs and has the potential to reduce barriers to system usage.

6. Reduction of Administrative Burden and Reporting Time

The study results indicate that the time required to obtain and compile management information decreased from approximately 42 minutes to 17 minutes—a reduction of about 59.5%. This decrease was primarily due to the system's ability to integrate data and generate information via a dashboard, eliminating the need for users to manually compile data from various documents.

These findings align with research by Cho et al. (2024), which suggests that nurses' use of Electronic Health Records (EHR) is linked to documentation burdens and that there is still room to improve the usability of complex EHR systems.

In an umbrella review of 213 systematic reviews, Schlicht et al.

(2025) found that digital technology benefits nursing task execution, information management, and job control, although its impact on documentation, communication, collaboration, and workload varies depending on the specific type of technology.

Thus, the study results demonstrate that the benefits of technology extend beyond rapid information access; it also has the potential to shift the distribution of nurses' working time from administrative tasks toward activities that add greater value to patient care.

7. Product Practicality

The research results indicate a practicality level of 89.1%, categorizing the product as highly practical. This high level of practicality suggests that users perceive the system as easy to use, equipped with relevant features, and capable of supporting daily management activities.

Nezamdoust et al. (2022) found that the adoption of mobile health applications by nurses is influenced by technological, user, and organizational environment characteristics. This implies that the practicality of a technology cannot be separated from the context in which it is used.

These findings also align with Coffetti et al. (2022/2023), who identified leadership, collaboration, healthcare worker engagement, individual factors, and team dynamics as factors influencing ICT adoption among nurses. Thus, the product's high practicality likely stems not only from its design but also from the fact that it was developed based on user needs and workflows.

8. Improvement in Documentation and Information Quality

The results show that the documentation quality score in the

intervention group rose from 68.5 to 88.2. This improvement demonstrates that an integrated system enables users to access, input, and monitor information more systematically. Park et al. (2024) demonstrated that EHR usability quality is linked to user satisfaction, performance, and safety, whereas poor usability can impose an additional workload on nurses. Findings by Cho et al. (2024) also indicate that electronic documentation can still burden nurses if the system comprises numerous poorly integrated components.

Therefore, the innovation in this study offers a conceptual advantage: it goes beyond merely converting manual documentation to an electronic format by linking documentation with monitoring, reporting, and managerial decision-making.

9. Improvement in Nursing Monitoring and Supervision

The monitoring and supervision score increased from 61.7 to 86.5 following the product's implementation. This rise indicates that the dashboard provides nursing managers with faster access to information regarding supervisory activities and service indicators. Navarro Martínez and Leyva-Moral (2024) found that nurse managers view digital transformation as a means to enhance innovation, communication, visibility, and time efficiency, as well as to reduce errors. They also identified a lack of skills, equipment, and institutional support, along with high workloads, as barriers to implementation.

These findings are highly relevant to the present study, as the function of the dashboard is not to replace the role of the nurse manager but to provide faster information, enabling data-driven supervision. Thus,

technology can serve as decision-support infrastructure, while professional decision-making remains the responsibility of the nurse manager.

10. Enhanced Data-Driven Decision-Making

The increase in the information management score from 63.9 to 87.6 demonstrates the system's ability to improve access to information required for decision-making. This represents a key contribution of the study, as nursing management relies on accurate, timely, and easily understandable information.

Wang et al. (2019) explain that nursing informatics innovations must take into account stakeholder needs, system design, technical factors, interoperability, and the impact on care delivery. Guo et al. (2026) further indicate that the innovative use of information systems by nurses involves creative technology usage behaviors aimed at enhancing work performance, problem-solving, and care outcomes. Thus, these findings support the concept that nursing information systems should not merely provide data storage but also facilitate information interpretation and managerial action.

11. User Acceptance of Technology

Evaluation results show that approximately 91% of users perceived the product as beneficial, 87% found it easy to use, and 89% reported that obtaining information was easier. These acceptance levels indicate the product's potential for adoption within nursing management practice.

Nezamdoust et al. (2022) demonstrate that the adoption of health applications by nurses is influenced by technological, organizational, and user-related factors; consequently, system success must be viewed as the outcome of the interaction between humans and technology.

Coffetti et al. (2022/2023) also emphasize that professional engagement, collaboration, leadership, and a phased implementation process are crucial for increasing nurses' acceptance of ICT. Therefore, the study's findings support a phased implementation approach—starting with needs analysis, validation, pilot testing, and revision, followed by broader implementation.

12.The Role of Nurses' Digital Competence

The successful implementation of the product is also inextricably linked to the digital competence of nurses. Khezri and Abdekhoda (2019) show that informatics competence is a critical factor determining a nurse's ability to use information systems effectively.

Brown et al. (2020) also emphasized that the development of digital skills must be part of nurses' professional development and supported by the organization. These results indicate that dashboard implementation should not merely involve providing accounts and passwords but must be accompanied by training, simulation, mentoring, user guides, and technical support.

In their study on telehealth competence, Rutledge et al. (2021) also highlighted the need for specific competencies to enable nurses to use technology safely and effectively. Consequently, the resulting R&D product should be positioned as part of a digital transformation program rather than as a standalone software application.

13.The Importance of Organizational Support and Leadership

Research results indicate that some users still require improvements in network quality, training, system integration, and organizational support.

These findings are crucial because even excellent technology may not succeed if the organizational environment is unprepared.

Through a systematic umbrella review, Walzer et al. (2025) identified 52 factors influencing the implementation and adoption of digital nursing technologies. Key barriers include inadequate training, increased workload, and low technological confidence, while facilitators include leadership support, a positive organizational culture, targeted training, and the alignment of technology with care needs.

These results explain why this study positions training and organizational support as integral components of product implementation. Thus, the success of IT-based nursing management innovation is determined not only by the quality of the software but also by the quality of its implementation.

14.Digital Transformation as an Instrument of Nursing Leadership

Research results indicate that the dashboard enables division heads and unit managers to obtain information more quickly for monitoring and decision-making purposes. These findings support the concept of nurse-led digital transformation—a digital transformation process in which nurses act as both leaders and active users of technology.

Navarro Martínez and Leyva-Moral (2024) found that nursing managers view technology as a means to enhance innovation, communication, time efficiency, quality, and safety, while also identifying a need for digital competence and institutional support.

Wynn et al. (2023) also demonstrated that the adoption of digital technology in nursing requires a holistic understanding, as it is

influenced by the interplay between individuals, technology, the organization, and the work environment. Therefore, the developed dashboard can be viewed not merely as a technological product, but as an instrument for leadership and data-driven nursing governance.

15. Potential of Artificial Intelligence in Product Development

Although this research product initially focuses on information dashboards and decision support, there is an opportunity to expand its development through the use of artificial intelligence. Ng et al. (2022) demonstrated that AI has the potential to support nursing practice through decision-making, data analysis, predictive capabilities, and improved service efficiency.

Katebi et al. (2025) specifically highlighted that AI in nursing management has the potential to improve decision-making, workflow efficiency, and resource allocation; however, its application requires attention to ethical considerations and implementation challenges.

These findings provide direction for the next phase of development, such as incorporating predictive staffing, early warning management, workload prediction, staffing requirement forecasting, and intelligent decision support. However, AI should not simply replace the decisions made by nursing managers. It is more appropriate to develop the system as "augmented intelligence"—technology that enhances human decision-making capabilities.

16. Ethical, Security, and Data Governance Aspects

The development of nursing information systems must also address security and privacy, given that these

systems process healthcare information. Katebi et al. (2025) asserts that the use of AI and digital technologies in nursing management raises ethical issues regarding data security, transparency, accountability, and decision-making.

Park et al. (2024) also demonstrate that EHR usability is inseparable from safety considerations, as poor systems can increase workloads and lead to workarounds. Therefore, product development must incorporate role-based access control, authentication, audit trails, backups, data encryption, and access rights restrictions.

Consequently, technological innovations in nursing management must adhere to "secure-by-design" principles rather than treating security as an afterthought once the system is built.

17. The Role of Technology in Competency Development and Telehealth

The evolution of digital nursing encompasses telehealth, mobile health, and technology-based learning. Rutledge et al. (2021) highlight the importance of telehealth competency in nursing education and practice, as the growth of digital services transforms how nurses interact with patients and healthcare systems.

Through a systematic review and meta-analysis, Kim and Park (2019) demonstrate the potential of smartphone-based mobile learning to support nursing education. These findings suggest that future nursing management platforms could be developed not only for managerial monitoring but also as tools for continuous professional development, microlearning, new nurse onboarding, and needs-based learning.

18. Shifts in Nursing Management Models

Overall, the research findings indicate a shift from document-based management to data-driven nursing management. Traditional models tend to rely on periodic reports and manual summaries, whereas the developed model enables information to be displayed more rapidly and in an integrated manner.

Abdolkhani et al. (2022) demonstrated that digital transformation during the pandemic accelerated the adoption of teleconsultation, tele-ICU, and other digital technologies; however, nurse involvement in the design, development, implementation, utilization, and evaluation of these technologies still requires strengthening.

These findings are highly relevant to the R&D approach adopted in this study, as nurses are positioned not merely as passive users but as co-designers and evaluators of the technology. Thus, R&D serves as an appropriate approach for generating nursing management innovations that are genuinely aligned with user needs.

Conclusions and Recommendations

Conclusions

This Research and Development (R&D) study produced an information technology-based nursing management innovation designed to address the increasingly complex and dynamic needs of nursing service management. The development process—comprising needs analysis, design, product development, expert validation, revision, and pilot testing—demonstrated that the developed system has the potential to support the management of nursing staff schedules, care documentation, workload monitoring, and service indicator reporting, as well as the provision of

information for managerial decision-making. The utilization of information technology can enhance workflow efficiency, data accessibility, documentation consistency, staff coordination, and the transparency of service management. Consequently, this innovation can serve as a strategic tool for nursing managers to strengthen service governance that is effective, integrated, adaptive, and focused on quality and patient safety. However, widespread implementation still requires infrastructure readiness, user digital competence, integration with hospital information systems, and safeguards for data security and confidentiality.

Recommendations

It is recommended that healthcare institutions implement the technology in phases, accompanied by training and support for nursing staff. Management needs to establish operational standards for system usage, periodic evaluation mechanisms, and data security and privacy policies. Future research should conduct trials across a broader range of populations and healthcare facilities, employing an evaluation design capable of measuring the innovation's impact on work efficiency, documentation quality, user satisfaction, service quality, and patient safety. Subsequent development should also consider integration with electronic medical records and analytics technology to support data-driven managerial decision-making.

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