Key Strategies for Digital Transformation- A Non-medical Center Hospital in Taiwan as An Example

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Abstract

Digital transformation becomes the focus of all industries, governments are actively promoting it to increase the welfare of the people in the technological maturity era. Hospitals are highly relevant to people's lives, and their continuous improvement is necessary. However, the promotion of progress is limited to the hospital culture, management, and health care system, which affects the development of various departments. Through literature review and in-depth interviews with relevant employees who implement electronic medical records and nursing information plans, this study demonstrates that the hospital has experienced many difficulties before reaching the digitization stage. Therefore, the dilemma that the hospital promotes in the digitization stage is all examples of digital transformation. The paper proposes seven digitization strategies: (1) constructing new digital transformation strategies and corresponding system development; (2) re-organize a new hospital culture according to the digital transformation strategy; (3) the hospital management understands and supports the digital transformation; (4) establish a dedicated team for digital transformation; (5) comprehensive process transformation and continuous improvement of user interaction experience; (6) strengthen the ability to use data and drive digital transformation; (7) refrain from regulatory restrictions on medical regulations.

Keywords: Digital transformation, Informatization, Digitalization, Digital empowerment era

1 Introduction

With the progress of science and technology, advanced countries have proposed national information and communication plans. Following the international trend, Asian countries continue to have a robust digital environment, such as Japan's "Society 5.0", Korea's "5G+ innovation growth strategy", and Singapore's "Smart Nation Singapore". Every industry may upgrade its existing services due to digital convergence, which leads its country toward digital transformation.

The ITU definition of digital transformation is a continuous process of multi-modal adoption of digital technologies that fundamentally change the way government and private sector services are ideated, planned, designed, deployed and operated such that they are personalized, paperless, cashless, presenceless, frictionless, and consent-based [1].

Since 2016, Taiwan has promoted the "Digital Nation, Innovative Economic Development Program", "smart Taiwan" and other ICT policies. Our vision is to build up a digital economic environment, encouraging Taiwan's industry toward "digital transformation". Through the above policies, Taiwan ranked 8th in the IMD world competitiveness rankings in 2021. In the report, Taiwan ranks ahead of many countries in infrastructure including telecommunications, which are the cornerstones of digital transformation [2].

Although Taiwan has an excellent digital infrastructure environment, the focus of digital transformation is not only to improve infrastructure but also to strategically adopt digital technologies. To go a step further, Digital transformation is the strategic adoption of digital technologies. It's used to improve processes and productivity, deliver better customer and employee experiences, manage business risk, and control costs. Digital transformation represents myriad tools, solutions, and processes. An effective strategy is one that's customized for each unique organization. Furthermore, Digital transformation is the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers [3]. It's also a cultural change that requires organizations to continually challenge the status quo, experiment, and get comfortable with failure. To put it another way, Digital transformation is fundamental to changing operations and delivering new value to customers, it is also a way of reforming corporate culture and continuously being tested and revised in the environment.

According to the information management association's published report, the average digital transformation maturity of Taiwan's largest enterprises is 6.3 points, which is in the medium-low stage [4]. As stated above, Taiwan has still got a long way to go in terms of getting a mature digital transformation industry. The health care industry is more mature than all industries in Taiwan Thus, Taiwan's healthcare industry has the conditions for digital

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DOI: 10.53106/160792642023032402017

transformation.

After more years of the development process, National Health Insurance Administration has promoted several measures, such as an electronic health records exchange plan, electronic signature on medical records, eHealth and cloud data system, etc. The government is responding to the international medical record standardization and medical digitization trend [5]. The above measures have become the driving force for the digitalization of Taiwan's hospitals.

Digital transformation in hospital is being driven by the need to improve quality, reduce costs, and enhance the patient experience of health care delivery. It does this through both the direct intervention of technology to create new diagnostic and treatment opportunities and also through the improved use of information to create more engaging and efficient care processes [6].

For Taiwan's industries that want to finish digital transformation, the study provides suggestions for hospitals to plan and formulate digital transformation strategies. It is also a case of accelerating the digital transformation of Taiwan's industries. The purpose of this study is: (1) To explore the digital situation of the hospital (2) To explore the possible influencing factors in the process of promoting the digital transformation of hospitals, to accelerate the promotion of the digital transformation of hospitals. (3) Propose the mechanism and promotion strategy of digital empowerment of employees in the hospital's digital transformation. As for hospitals to complete digital transformation, it is the achievable contribution of hospitals to ESG compliance through digital transformation. Furthermore, hospitals can be paperless, improve energy management and reduce carbon dioxide emissions on the environmental side. In terms of social responsibility, hospitals can serve more rural areas through telemedicine. As for governance, hospitals can improve processes through digital transformation, which can reduce staff load, improve the nursing work environment, and create a good working and learning environment.

2 Defining Digital Degree in Hospital

2.1 Definition of Digital Transformation

Many people misunderstand that the completion of digitalization of the industry finishes digital transformation so that the results fail to achieve the expected benefits. Because exiting studies that highlight the structural changes required at different levels in companies, sectors, and industries to be prepared for digital transformation. The extant studies also address the impact and consequences of digital transformation internally, externally, B2B and B2C. However, hospitals are different from general industries [7].

The study review references, it evaluates the definitions of digitization, digitalization, and digital transformation [8-9]. It is used as a standard for assessing the digital degree of a hospital [8].

I. Digitization:

Digitization is the process of converting data into digital information, such as text, pictures, and video so that computers can easily store and transmit information. There are quite a variety of ways to digitize, such as information systematization, scanning with a scanner, taking pictures with a camera, etc.

II. Digitalization:

Digitization is digital information; it is not digitalization. Digitization is the process of using digital technology to optimize existing business processes, operating processes, and operating models. This case has many examples of how digitalization is used such as Email, social media, and API. This also includes a variety of software that integrates internal operational processes into digital.

III. Digital Transformation

For enterprises, the definition of digital transformation includes digitization and digitization. Digital transformation is the general use of digital technologies to integrate all levels of an organization. Enterprises complete digital transformation to improve process efficiency and redefine core values.

As for enterprise finish digital transformation step, the process steps are [10]:

I. Use digital technology:

Enterprise's adoption of new digital technologies is key to digital transformation, such as mobility, cloud computing, IoT, and blockchain. When enterprises adopt high-quality and stable platforms, the digital technology adopted by the enterprise must meet the business and scale needs, and the leaders of the core business units are encouraged to complete the education and training before adopting platforms.

II. On-line implementation

The adoption of a new platform requires support from all sectors, but it usually encounters resistance. Each sector must clearly understand the goals of the new business and the new functions of the platform before the enterprise adopt a new digital platform, to determine whether each department can relate to the new core concept. The above is achieved through a team that educates, plans, and sets up projects.

III. Adjust operations:

The step is the most critical. Each sectors can use the functions of the digital platform, and the enterprise implements new management strategies or business models through the new digital platform. Additionally, it often requires different decision-making processes, different levels of approval, or the involvement of other stakeholders to know who has a new task. The business model affected by digital transformation will redefine each sector in the enterprise. Each sectors complies with the new strategic goals, records data, and can effectively manage the work process and work tasks of employees in the sector.

IV. Training and Support:

The core of the empowerment strategy is that users of the open platform can effectively complete their work. Enterprises improve different skills in many ways, and each method provides different learning methods and skills according to individual needs.

V. Communication strategy:

To ensure that the right message is delivered to recipients as companies adopt new digital platforms, there need to be clear and standardized communication channels within the enterprise. This is because understanding the customer is the key point. Through the effective introduction of the platform,

enterprises can understand the role and status of stakeholders in the new platform. Enterprises can know how the platform affects the personalized messages by the department for different participants. In addition, companies can keep stakeholders informed and involved in the introduction of the platform and maintain ongoing communication.

VI. Calculate ROI:

Enterprises review the target achievement rate and ROI for the promotion of digital transformation. If the ROI is low, it is impossible to continue investing in digital transformation. Enterprises will verify the effectiveness of the strategy and organizational culture changes through analysis of production and sales data, operational indicators, customer loyalty, customer satisfaction, etc. On the other hand, enterprises can also continuously improve and optimize the process. The enterprises continuously execute and enhance their competitiveness, which will widen the gap with their competitors. On the other hand, enterprises can also respond to the ever-changing external environment and take the lead.

2.2 The Dilemma of Digital Transformation of Taiwan's Hospitals

For hospitals to complete the digital transformation, it is not only necessary to complete the above steps, but there are many factors to overcome in Taiwan.

2.2.1 Hospital Culture does not Support

The promotion of e-business in hospitals has three stages in Taiwan. First, the hospital's administration toward the electronic National Health Insurance in 1995. Second, hospitals started pushing for automated medical records and electronic medical records from 2000 to 2010. Third, hospitals began to use artificial intelligence in healthcare, such as clinical decision support systems since 2010 [6].

Taiwan adopts National Health Insurance which has a great impact on the development of hospitals, such as a medical referral system in National Health Insurance, Health Insurance declaration business, construction of a data exchange model within medical databases, and medical resource sharing. It is also the reason for the annual increase in medical expenses in Taiwan, such as the advancement of medical technology. Therefore, the appropriateness of the allocation of medical resources for National Health Insurance is an important issue [11].

National Health Insurance affects the degree of digitalization of hospitals, but the different organizational structures, medical procedures, and in-hospital culture of each hospital make the information system of the hospital unable to be shared and highly customized.

Health Insurance usually was not based on the actual costs of service provision and did not reflect changes in the Medical Price Index. The digitization of hospitals is closely related to National Health Insurance, but the low gross profit of National Health Insurance puts a lot of pressure on hospitals [12-13].

Furthermore, the hospital is the same as other enterprises, profit is the most important purpose. Hospital boards and management understand the importance and benefits of medical equipment, which can be easily purchased or leased such as MRI. However, boards and management sometimes hold off on cost-effectiveness investments over $1 million in equipment, software, or digital services that enhance the quality of the doctor-patient relationship. Hospitals seek to buy new medical equipment and achieve short-term performance, but they don't want to invest heavily in digital technology and service training to improve medical quality or efficiency. Therefore, Hospitals at different levels differ substantially in their levels of smart technology and their demand for it [12]. With National Health Insurance and healthcare policies as the main driving factors, medical centers have endeavored to apply artificial intelligence, whereas non-medical center hospitals have continued to prioritize automated scheduling as their main requirements [14].

The medical industry is still dominated by a doctor, and doctors lead most of the decision-making except for accounting, personnel, general affairs, and directors. Some hospitals are still based on the principle of maintenance and stable operation for information services, and their investment in medical informatization is conservative [13]. It results in medical promotion to becoming a point of informatization [15].

If it wants to promote the digital transformation of hospitals, they must understand the profession of the medical industry and have forward-looking technology professionals. It also need build a more holistic view of the digital transformation in healthcare, there is a great need to conduct research on business model transformation and implications for the management of different interest groups [16].

2.2.2 Focus on Equipment Improvement for Digital Transformation of Hospitals

The direction that Taiwan is currently promoting the digital transformation of hospitals is to improve the functions of medical equipment. For example:

I. Electronic white board system: The system has been digitized and upgraded gradually, and now functions as a dashboard, incorporating sound effects, touch control, image display, face recognition, and other functions that maximize usage efficiency [17].
II. Establishing a systematic framework for promoting shared decision making: the integration of the Healthcare Information System and the Research Electronic Data Capture system, the hospital has constructed an institution-wide promotion structure, SDM developing modules, innovative digital transformation, and effective management mechanism [18].
III. Health Smart Taiwan platform: It is product development by combining industry and clinical expertise [15].
IV. Information Technology related Patient Safety: It build an agile and resilient medical system through information and communications technology [15].
V. AIoT cloud platform: It utilizes the data measured by IoT, conducts data preprocessing cloud, and then provides valuable healthcare analytics through machine learning or deep learning [19].

2.3 Overall Review

At the same time, we review the digital transformation definition and dilemma. We can know that the key to the

success of the hospital's digitalization is the hospital's culture. medical equipment is only to assist in the completion of the digital transformation. However, hospitals usually lack and are less willing to invest in these talents in their departments. However, if the hospital is reluctant to transform digitally, for this reason, it will be more likely to be eliminated in the face of fierce competition from the same industry.

From the above historical context, we need to improve the hospital's culture.

3 Methodology

The method of this research is based on the reference of hospital information to promote two cases of digitalization, to understand the key factors of the lack of digital transformation in the hospital through the case study. This study will make recommendations based on the theory.

3.1 Conceptual Framework

This study mainly discusses the dilemma of the hospital's digitalization, and evaluates the key factors affecting the stage of the hospital's digital transformation. Most hospitals have existing information systems. Hospitals will choose to promote many small information projects to become new systems in the hospital and replace the original system after completion. The premise is that the annual budget will not be increased and the original operation will not be affected. Hospitals will gradually replace outdated medical equipment that cannot support data interface, so as to reduce the risk and impact of digitalization failure. Therefore, the study depth interviewed the key players in the hospital's case for digitalization, and learned about the state of the development process and integrating various factors. To sum up, the study proposes an inductive strategy and recommendations as shown in Figure 1.

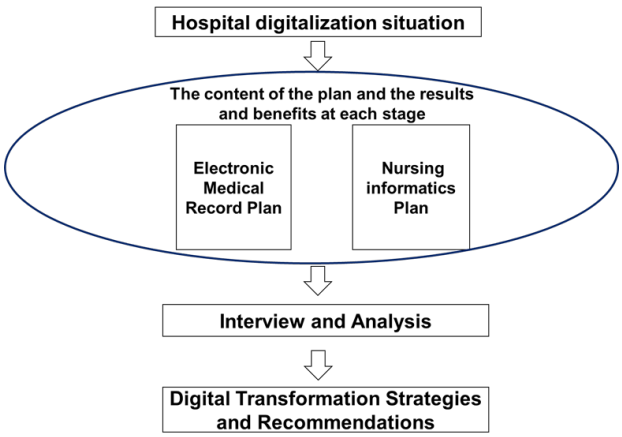

Figure 1. Conceptual framework

3.2 Research Methods

The hospital involves the authority of employees in different units, as well as the division of labor and complex external factors. Case studies and inductive methods are considered to be effective research methods, especially those involving social phenomena related to interpersonal relationships. This approach is to obtain management implications from the collected information [20]. The technique of a case study is an in-depth interview, through the extensive and in-depth collection of data, analysis, and integration of the meaning behind the interview content [21]. From case studies, we explore the strategies that hospitals should formulate for digital transformation through inferences and in-depth interviews. The case study method is a method of scientific research that uses special techniques to gain a deep understanding and identification of a problem. In this way, case studies can find a solution, which is one of the methods often used in the study of social sciences. The advantages of a case study include: (1) It is a qualitative, in-depth, and precise analysis method, through the analysis of the original data with the use of questionnaires and interviews to understand the situation of the research object. (2) It is the use of effective and specific processing methods to analyze large, hierarchical, and in-depth data [22].

There are four reasons why researchers use case studies: (1) The researcher doesn't control whether the event occurs or not; (2) Researchers want to understand the process and reasons for the events at that time; (3) Researchers hope that the results of the study will provide a holistic, insightful interpretation of immediate phenomena because the research object is illuminating;(4) It considers the information of the surrounding life to be very important [23].

A case study has 5 research steps: (1) Establish a research topic; (2) Observe and recording facts; (3) Ask questions (analyzing data); (4) Propose solutions; (5) Establish decision-making [24].

3.3 Information Collection and Analysis Methods

The method of analysis in this study is grounded theory, which uses its encoding of the data. Grounded theory is a qualitative research method suitable for the study of complex social phenomena or undiscussed issues, introduced by Barney Glaser and Anselm Strauss in 1967. Furthermore, grounded theory is to summarize and develop social phenomena and events into a new theory or concept through systematic collection and analysis, rather than having a theory and then verifying it. The grounded theory uses a series of methods to collect and analyze data, while observation and interview are commonly used to collect data [25]. Grounded theory favors theory construction over description, collective patterns over individual narratives, developing fresh concepts over applying received theory, and theorizing processes over assuming stable structure [26].

Although the above coding process is sequential, it can also occur simultaneously and repeatedly, which is beneficial to analyze the hidden content behind the data [27]. The grounded theory uses a series of "methods" to collect and analyze data, among which observation and interview techniques are commonly used to collect data. Strauss and Corbin consider open coding, axial coding, and selective coding as data analysis procedures. The above encoding process is not only sequential but also occurs repeatedly at the same time. This is beneficial to capturing the hidden connotation behind the data. As for grounded theory, there are several characteristics: (1) Researchers need to go into the field and understand what's going on; (2) It is emphasized that theories based on real data are related to academic

development and social phenomena; (3) It is understood the complex and changeful social phenomena and human behavior; (4) It is to understand that there is some meaning behind human actions; (5) It is to know that people play the role of active actors in problem situations: (6) It is to understand that various messages can be defined again and again in the process of interaction: (7) It is sensitive to the course of events; (8) It is the ability to perceive the relevance and importance of the structure, process, and outcome of events [23].

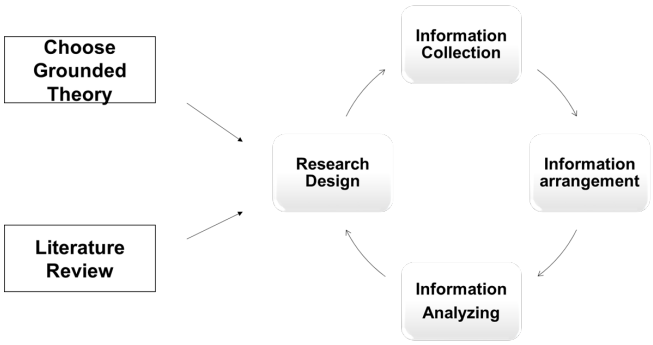

Figure 2. Grounded theory analysis process

The study researches complex social phenomena and the interpersonal stakes, so it adopts qualitative rather than quantitative methods. In research, the study uses information interpretation, induction, and inference to propose a theoretical framework for what key elements of digital transformation should be mastered by hospitals. At the same time, the sources of data for this study are the public website of the private hospital and the Bureau of National Health Insurance, as well as the results of in-depth interviews with researchers as shown in Figure 2.

4 Discussion and Conclusions

4.1 The Situation of Digital Transformation of Hospital Development

A hospital is a large organization and requires precise distribution of work. In the future, hospitals will face the trend of precision medicine and smart healthcare, and it is an existing consensus to promote digital transformation. The hospital will follow the framework of hospital accreditation to complete the transformation of many information plans from digitalization to digital transformation, under the leadership of doctors and the National Health Insurance system. However, the characteristics of hospitals are often strongly related to the expertise of the hospital director and the goals of the hospital. In the process of hospital digital transformation, the information unit often plays an important role or even the main planning unit. Many departments think that digital transformation is a matter of information units, and digital transformation is to complete the informatization and electronics of the hospital system. Therefore, many departments put forward many information requirements, resulting in the itinerary of many information projects and individual planning and implementation. Misunderstandings in many units not only result in insufficient manpower in information units but also lack comprehensive cross-domain, cross-system, and cross-unit planning.

From the second chapter, we know that the definition of digital transformation is not only informationization and digitalization but also the transformation of hospital organizations and the reshaping of culture are more important. In the process of digital transformation, the information unit does play an important role, but the team with the power and independence of the digital transformation is more important in the hospital. After all, if the hospital doesn't have an overall process planning and system architecture unit. The information unit is not high level, it is difficult to make innovative reforms and plans for the overall process and system.

4.2 Case Background

The hospital was established in 1967.It is a private and non-medical center hospital. In the beginning, it received and provided free medical services for children disabled due to polio, including orthopedics, occupational therapy, speech therapy, Psychotherapy, social work, etc. In 1990, the case hospital entrusted the industry to write the information system. At that time, it was a program with the latest three-tier structure, but it was mainly based on the in-hospital billing and ERP system. Many medical records are still written on paper because nursing-related systems don't include information systems. In 1995, the government promoted National Health Insurance and provided NHI cards to citizens. A card has six cells and one cell is filled for each visit. When the six cells are filled, a new card is required. After that, the government turned to promote the chip health insurance card, which indirectly increased the demand for the electron citation of related medical operations in hospitals.

Hospitals are classified into academic medical centers, regional hospitals, district hospitals, and clinics according to the National Health Insurance Administration, with different care tasks and roles in Taiwan. Academic medical centers are responsible for research, teaching, and the treatment of critically ill patients, while hospitals at other levels have other tasks and functions. The Ministry of Health and Welfare promotes the disclosure and transparency of information on the quality of medical services to give patients the right to obtain information. At the same time, it also promotes various plans to improve the quality and efficiency of medical services. One of them is the Electronic Health Records Exchange plan, which not only establishes a standard medical record exchange format but also encourages hospitals to upload electronic medical records and use electronic reporting methods. In this way, the basis for electronic medical records in Taiwan's medical institutions has been gradually established and the development of medical information-related industries has been accelerated.

To sum up, we choose the case study as the Health Records Exchange plan and the nursing information plan.

4.3 Health Records Exchange Plan

4.3.1 Background Information

There are two main reasons why hospitals promote the electronicization of paper medical records. First, the Bureau of National Health Insurance requires medical

records to be fully electronic, so that the medical record form is automatically uploaded to the Bureau of National Health Insurance, which can review the medical record in an electronic format. Second, each unit of the hospital has an increasing demand for informationization of medical operations. Through the electronic medical records, the hospital can integrate different medical records form fields to improve the efficiency of input, the integrity of audit data, and the feasibility of future analysis and application.

For the smooth promotion of electronic medical records, the hospital set up a medical record electronic task force. The vice president of medical care is the convener of the task force, and the medical records department is the main task force responsible unit. At the same time, the task force also includes medical units with paper medical records, such as the surgery department, internal medicine department, and information management office. The task force of each staff and department in the project are as follows:

I. The vice president is responsible for mediating and adjudicating disputed issues and tracking the progress of the work.
II. The medical records department is the authority responsible for the management and preservation of medical records, and the job is to count the number, content, and units of each medical record form. In addition, it is developing various auditing methods for medical record forms.
III. The information management office is responsible for interviewing the needs of the user unit, planning the structure of the system, and writing the system program according to the medical record form. After the program is completed, the information management office the system and schedules the time to the website.

The main facilitator is the task force, which meets regularly to discuss forms and track progress. In the beginning, the task force commissioned the medical records department to count the hospital's medical record forms, establish a list of all medical record forms, and compile the medical record form codes by the department. In this way, the task force determines the scope and unit of implementation of the electronic medical record and then adjusts the meeting time according to the content of the discussion and the time of the work.

Furthermore, the task force meets with the unit to which the medical record form belongs one by one to check whether the unit's medical record form is necessary, or whether different forms can be integrated into one form. The task force also discussed how the existing system used by the unit can cooperate to generate the medical record form, and confirm the person who input the form, including the operation process, the person in charge of the form, and the tester. Finally, the information management office starts to plan the structure of the system according to the results of the meeting. It also preliminarily writes and provides the unit's future user interface (UI) to confirm whether it meets the unit's needs. information management office starts to write the program after completing the unit confirmation and completes the system function step by step. When the unit completes the confirmation function, the system test can be started.

The following three steps are the experience of the hospital to promote the electronic medical record:

I. Planning of electronic medical record form (2016.11-2017.02): The main focus of this stage is to confirm the content and quantity of all medical record forms in the hospital. In addition, it is necessary to re-examine and formulate the electronic medical record, the medical record review mechanism, the workflow and the operation specification, as a preparation for the electronic medical record form.
II. Common and frequently used forms are created electronically (2017.3-2017.12): At this stage, the main focus of work is to select shared and frequently used medical record forms as the primary electronic target. In addition, it is necessary to determine the operation flow of each form, the input personnel, and the checking logic of the fields, so that the information management office can set the schedule of the operation and start writing programs to complete the electronic medical record.
III. The establishment of electronic medical record forms for each unit (2018.01- 2018.12): The main focus of the work is to determine the order of promotion of the forms of each unit, and to determine the operation process of each form, the input personnel and the checking logic of the fields with the unit. In this way, it is time to set up the work schedule with the information management office and start writing the system until the medical record is completed electronically.

4.3.2 Results and Benefits

The hospital has completed the conversion of paper medical record forms and electronic signatures to a total of 165 pieces, and the number of medical records with electronic signatures exceeds 1.2 million per month. The benefits and results achieved are as follows:

I. The hospital saves the storage space and management labor cost of paper medical records. In addition, hospitals do not need to manually transmit documents, and doctors can directly check patient information on the online system.
II. Hospitals can use the system to directly control the permissions for viewing, adding, modifying, and deleting forms, and it can check the correctness of input fields. In this way, hospitals can obtain high-quality medical records.
III. Electronic medical records provide review units to quickly complete the timeliness and stages of reviewing medical records. It is convenient to notify the writer and grasp the completion of the medical record, which is conducive to the subsequent development of the online medical record quality audit and review system.
IV. The digitalization of data facilitates the exchange and sharing of information between different systems of the hospital and avoids repeated input, mutual auditing, and reminders. It is helpful to divide the

maintenance authority of different types of medical record data, which not only improves the efficiency of writing medical records but also makes it easier to analyze the data than paper medical records.

V. Electronic medical records can add prompt messages, restrictions, and functions to the system according to hospital accreditation schemes or teaching evaluations to meet the requirements.

VI. The systematization of the medical record form can be used as the pre-work for the standard specification of external or internal medical records, which is helpful to formulate the standard format of medical records. According to the previous model of electronic medical records, the process will continue until all paper medical records are fully electronic, to achieve the goal of a paperless hospital.

4.3.3 Case Data Analysis

Through interviews, this study explores the current situation of hospitals promoting electronic medical records as shown in Table 1.

Table 1. Data analysis of in-depth interview in electronic medical records

Interviewer background	Phase I	Phase II	Phase III
Write medical records electronic information system	Through the internal screening and training of digital talents by the hospital, it is beneficial to promoting the digital transformation.	The hospital needs to let all classes understand the meaning of digital transformation in the unit. And it wants to create goals and unite everyone to reform the centripetal force.	In addition to the reform of key hospitals in the digital transformation, it is also important for the government to amend the law.
Responsible for the unit interview and planning information system	Digital transformation requires many resources and people are one of them. In addition, the full support of executives is an important factor.	It's building a digital team is a very efficient way to execute digital transformation in a hospital.	In the process of digitalization, hardware and software are equally important. Although the hospital is mainly responsible for medical care, new digital technologies require the introduction of many new digital devices to be effective. (excluding medical devices)
Filler of the medical record form	One of the ways to improve the success of the digital transformation is to cultivate digital talents within the unit to participate in digital transformation.	1. Executives should consider increasing manpower requirements as they drive digital transformation. 2. A hospital reforming its culture is the key point to digital transformation.	It is one of the most efficient ways to digitize with new connected devices and mobile applications in hospitals.
Preservation, management, review, input quality audit, application of medical records	1. The hospital management must have a clear digital strategy and support, which can increase the smoothness of the digital transformation. 2. The National Health Insurance policy is one of the important factors in the digitalization of hospitals.	1. The digitalization of hospital planning also needs to prevent problems. 2. Hospitals' choice of digital technology and the technical capabilities of the practitioners are one of the factors that affect the speed of digitalization.	When the hospital needs to adjust the organizational structure in the promotion of digitalization, the use of new operating platforms and technologies is one of the ways for the hospital to digitize.
Contact person of medical records in the medical records department	1. Some doctors or nurses refuse to accept digitalization because they don't understand the new system. 2. The supervisor and contact person of the unit may not be information experts, but they must have a full understanding of the meaning of digitalization.	The electronic medical record form is designed, but it often lacks the proper functions and permissions. The main reason is that the developers of each system are different and the needs of the units are also different. Furthermore, there is no overall planning and common standards.	Patients often print a lot of paper after seeing a doctor, which is health education. It can be read online by scanning the QR CODE with the hospital's APP.

4.4 Nursing Information Plan

4.4.1 Background Information

To improve the quality of medical care, the hospital has developed many information systems such as registration through the internet homepage system, medical order system, computerized provider order entry, cashier system, PACS, etc. Nursing information is also an important part of the health care system. The development of a nursing information system not only reduces the paperwork in the nursing process but also establishes a patient care database through the information system for transmission and integration, which can achieve the continuity and integrity of medical care. It uses the nursing process to enable patients to obtain individual, holistic, and continuous nursing services.

The nursing department has set up a nursing information system task force. The structure is that the deputy director is the leader, and the nursing information supervisor is the person in charge of coordinating the nursing department. The Information Nursing head is the liaison to the information management office, regular project meetings are held with them to discuss needs and track the progress of the project. The information management office cooperates with the project of starting the nursing information system. The supervisor information management office is the coordination contact person between units, and the system designer is responsible for unit interviews, confirming and evaluating system requirements, planning system architecture, and designing databases.

The department of nursing proposes a functional list of the system and divides the system development into three phases. It also defines the main functions that the system needs to complete in the development stage, and establishes the roadmap for system development.

The following three steps are the experience of the hospital to promote the nursing information plan:

I. Establishing the main and common functions of the nursing information system (2015.02-2016.02) The main work is that the task force leader of the nursing department organizes all nursing forms and assignments, and collects the opinions of all parties in the department. It proposes the functions and corresponding operating procedures of the new system as the basis for the meeting agenda. When it discusses the system development with the information management office, it must discuss the main system function targets and time of each development stage so that the plan can be completed.

II. Establishing nursing information system peripheral functions (2016.03-2017.12): The nursing department holds regular meetings with the information management office to discuss the original related forms, function integration of the existing system, field confirmation, operation process, and data process, authority control, and electronic form format according to the function list. If there is any problem, the two parties can communicate online at any time to improve work efficiency. In the development stage, the information management office provides the first draft of the functional screen to the nursing department for confirmation. Before the information management office starts the programming of the system function, the nursing department confirms that it meets the requirements. Finally, the function development of the information management office is completed, and the nursing department applies submits the test results. The information management office designer is improving the system based on the test results.

III. Nursing information system form build electronic signature function (January 2018.01 – 2018. 06): The nursing department provides the electronic signature format of each form, the operation process of electronic signature, and audit regulations. The nursing department also lists the execution order of each form to facilitate subsequent information management office operations. After completing the hospital procedure, the information management room will make an electronic signature according to the procedure and format of the nursing department. After the hospital completes the electronic signature form, it declares a paperless process.

4.4.2 Results and Benefits

The hospital's results and benefits drive the Nursing Information System as follows:

I. It can instantly record the patient's physical and psychological conditions in the hospital. At the same time, it reduces the cost of paperwork and improves the efficiency of nurses.

II. It provides medical teams to quickly check the conditions of inpatients through the Internet to improve the quality of medical care.

III. It provides all kinds of statistical data to achieve the requirements of evaluation, audit of indicators, and improve the quality of work.

IV. It assists with non-nursing paperwork so that nurses can focus on clinical care and provide quality service.

V. It enhances patient medical safety by increasing the standardization of patient care and the integrity of the records.

4.4.3 Case Data Analysis

Through interviews, this study explores the current situation of nursing information plan as shown in Table 2.

Table 2. Data analysis of in-depth interview in nursing information plan

Interviewer background	Phase I	Phase II	Phase III
Responsible for writing the Nursing Information System	1. Executives are the key point to the hospital's drive to digitize. The main factor is understanding, supporting digitalization, and formulating a clear transformation strategy. 2. It is necessary to develop a new SOP in response to the new system.	It needs to develop a digital platform to allow more real-time accurate information and frequent interaction between units or between doctor-patient relationships.	1. For digital planning, hospitals need overall planning across systems rather than the individual development of each system. It has some common norms and principles, which are helpful for the integration of systems. 2. The future nursing system should be patient-centered, which can fully display the patient's medical history and disease course.
Responsible for interviewing and analyzing unit needs and planning information system architecture	1. Talent is the key to the digitalization of the department. 2. Contact persons or information personnel can communicate and discuss effectively with each other, and it can have perfect system planning and operating procedures.	1. It is very important for the unit supervisor to support digitalization and have its basic concepts. 2. The original process and culture of the hospital will inevitably cause resistance to the reform. The support of the supervisor can reduce the impact of the unit and lead the creation of a new culture to adapt to the future model.	The nursing department uses new technology to change the original process and improve operational efficiency.
Coordination contact person between the Nursing Department and the Information Room	1. If the executive is determined to promote the transformation strategy, employees will have a strong motivation and backing when they facing a lot of ordeals at work. 2. Digitalization requires in-depth work details and talent with professional digitalization capabilities, which can be trained or recruited by the department.	Medical operations affect patient safety. Hospitals must formulate necessary operating specifications and procedures according to various situations to avoid system downtime.	It has the advantages of easy maintenance and convenient traceability in the multi-faceted application of digital data, such as tracing data security and problems.
Integrate nursing needs and workflows in the nursing department	1. A key element of digital transformation is the support of hospital policy and executives. 2. Whether the department has suitable digital talents is also a factor for the success of digitalization.	The use of new technological equipment and innovative thinking is one of the elements of the hospital's digitalization.	Nursing system informatization brings diverse and large amounts of digital data. Hospitals use new data analysis tools in management and operations to achieve real-time digital management, which is an important spirit of digital transformation.

Interviewer background	Phase I	Phase II	Phase III
Analyze nursing needs and review system function interfaces	1. Hospital management must have clear goals and policies for digital transformation, so that departments can implement execution and direction. 2. The task force needs to be familiar with the details of the department's work so that it can organize the most appropriate plans in a multitude of independent and complex systems.	The department uses medical equipment, networking equipment and new automation equipment to promote the digitalization of work procedure, which can bring unprecedented breakthroughs.	Informatization not only brings convenience, reduces operating costs and error rates, but also has negative effects. The task force proposes appropriate countermeasures to improve it.

4.5 An Assessment of Factors Influencing Hospitals' Drive for Digital Transformation

According to the interview, it can be found that the success factor of the department's digitalization is the support and assistance of the hospital management. The reason is that digitalization requires a lot of resources such as manpower, equipment or outsourced manufacturers, which will crowd out the resources of existing businesses. Furthermore, digitalization will change Work Procedure. It requires cross-unit cooperation, the original units or employees will resist the new system and hinder implementation. All of the above are the determinations that need to be implemented by the hospital management.

Similarly, the hospital's task force must accept personnel recommended by different departments, technology companies or external consultants, because different departments have different digital knowledge and degrees. It can not only effectively solve problems at the digital stage, but also provide professional advice for management. In this way, all departments can form a consensus to achieve the goals of each stage smoothly.

Finally, the hospital's digitalization policies and goals will affect the degree and direction of digitalization. The operational performance of a hospital is very important, involving whether it can operate. Therefore, in the face of market competition, hospitals need to invest a lot of resources and implement digitalization in stages. When a hospital is evaluating a digitalization program, it should think about how much benefit it brings from system development, rather than the loss brought about by development in a short period of time. In this way, the hospital can develop a forward-looking development blueprint.

Conclusively, the key factors for hospitals to drive digitalization:

I. The hospital management has a clear policy on digital transformation and supports and assists in its promotion.
II. The hospital sets up a task force.
III. The hospital introduces digital technology.
IV. The department adjusts the original work procedure.
V. The ability to integrate departments is in reports, forms, and system functions.
VI. The speed of hospital informatization and updating of medical equipment.
VII. The horizontal communication between departments is smooth.
VIII. The impact of National Health Insurance policies.

5. Conclusion

A hot topic for companies is accelerating digital transformation, and hospitals are also actively promoting it. However, hospitals not only earn revenue but also treat people. Hospitals tend to be conservative in developing digitalization or adopting emerging technologies. Although hospitals have digital projects and technology applications, there is still a lot of room for improvement compared with other industries. To sum up, government needs to invest in fundamental infrastructure such us spectrum demanding. The private sector evaluates returns on investment[28-29].

The purpose of this study is to:

I. This study analyzes the digitalization stage of hospitals and the direction of promoting digital transformation through literature and review.
II. This study analyzes the factors of the hospital's successful promotion of digitalization through in-depth interviews with individual cases.
III. Combining interviews and theories, this study proposes the digital empowerment mechanism and promotion strategies for employees if the hospital is to transition from the digitalization stage to the digital transformation stage.

Conclusively, the study conducts in-depth interviews with hospital personnel who are mainly involved in the health records exchange plan or nursing information plan and evaluates the factors that affect the digitalization of hospitals. Finally, the strategy for the hospital to promote digital transformation is proposed as follows:

I. Constructing digital transformation strategies and corresponding system development: When the hospital promotes the digital transformation, the management should abandon the thinking of reducing the hospital's operating cost, and develop

the system by thinking about how much the capital investment leverages.

II. Re-organize a new hospital culture according to the digital transformation strategy: With the digital transformation of hospitals, it is important not only to adjust the organizational structure, but also to change the hospital culture, such as risk-taking, innovation, honesty, transparency, sharing, and commitment.

III. The hospital management understands and supports the digital transformation: The management understands the importance and connotation of digital transformation, and fully supports the resources required for digital transformation, such as expanding the digital budget, recruiting and nurturing digital talents, and purchasing digital equipment.

IV. Establish a dedicated team for digital transformation: The hospital establishes a digital task force through departmental screening and training, cooperation with technology companies, or external consultants. It strengthens the hospital's execution and correct decision-making for digital transformation.

V. Comprehensive process transformation and continuous improvement of user interaction experience: The task force integrates work procedure adjustments including cross-domain, cross-system, and cross-unit. And it improve the interactive experience with the user experience.

VI. Strengthen the ability to use data and drive digital transformation: Hospital establishes a holistic data strategy and indicators, which strengthen the collection and analysis of customer data. Data metrics can drive the digital transformation of hospitals.

VII. Refrain from regulatory restrictions on medical regulations: Hospitals should advocate competent authorities to reduce the regulatory barriers such as the physician's act, and medical care act. After all, the transformation of hospitals is related to telemedicine, but the development of telemedicine is limited by regulations. This affects the most beneficial outcomes of a hospital's digital transformation.

Acknowledgement

This research was funded by the Ministry of Science and Technology of the R.O.C., for financially supporting this research under Contract Nos. MOST 110-2221-E-227-001 - and MOST 111-2221-E-227 -002 -MY2. This study was extended from the study of the digital empowerment mechanism and promotion strategy of hospital employees for digital transformation: Take Cheng Hsin General Hospital as an example.

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