보건의료 조직의 협업적 의료 커뮤니케이션 시스템에 대한 연구 - 환자교육을 중심으로

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요 약

의료조직 내에서의 커뮤니케이션 오류와 지연은 의료고객의 서비스 질 하락과 의료분쟁 등 심각한 문제를 야기 시키고 있다. 따라서, 최근 협업적 의료 커뮤니케이션 체계의 중요성이 크게 부각되고 있다. 의사, 환자/보호자, 간호사, 실험실들 간의 커뮤니케이션이 원활하게 이뤄질 때 고효율 저비용 서비스는 물론 궁극적으로 병원의 경영성과에도 도움이 된다. 이러한 동기에서 중소 및 대형병원에서 이 시스템 도입이 급증하는 추세이다. 본 논문에서는 유무선 기반의 협업적 의료커뮤니케이션(Clinical Collaborative Communication)시스템의 구현방법과 모델링을 통한 구현 연구 및 시스템 평가를 위해 S 병원을 대상으로 계량적 평가를 수행하였다.

주제어 : 환자교육, 커뮤니케이션, 협업, 모델링, 구현, 평가

Study on a Clinical Collaborative Communication System in Healthcare Organizations -Focused on Patient Education

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ABSTRACT

Communication errors have severe consequences clinical quality and disputes in medical organizations. Thus, clinical communication has become a major practice recently, since clinical and managerial effectiveness can also be enhanced by improving the quality of the physician, medical staff, and laboratories interactions. Both medium and large-sized hospitals are increasingly adopting the philosophy to shorten clinical service time while enhancing higher medical service quality and lower healthcare service costs. From this motivation, this paper studies on the clinical collaborative communication concept and investigates approaches to the philosophy for implementation. The system has been theorized to improve communication and enhancing medical outcome qualities. In addition, to validate the system, the author analyzes the efficiency and effectiveness in S hospital, using statistical survey works.

Keyword : Patient Education, Communication, Collaboration, Modeling, Implementation, Validation

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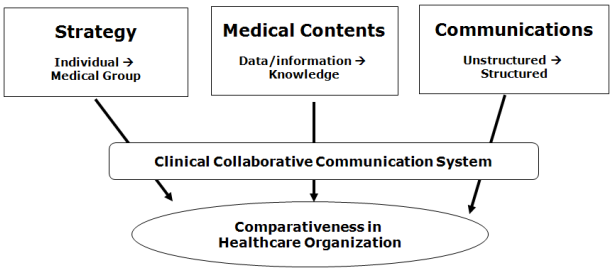
1. Introduction

Clinical communication error has critical consequences in health care process. Just-in-time collaborative communication[1] promotes mutual clinical value creations and emphasize medical qualities[6]. The purpose of the study is to explore the implementation of the clinical collaborative communication system (CCC), and investigates the potential impact of the CCC system on the daily experiences in medical organizations.

The communication mechanisms should be based on well-defined roles for each healthcare stakeholder, and its interactions. The healthcare roles should be determined by focusing the core competencies of the stakeholders on maximizing the competitive medical quality advantage of the CCC domain.

Another feature of clinical collaborative communication is that although healthcare stakeholders have their own local strategies, a hospital community-oriented strategy is more important. A consensus is essential. In CCC, the stakeholders should adhere to the rules of engagement on the basis of communication strategy. To produce the synergy of communication, stakeholders need to understand and share more healthcare contents such as knowledge and expertise; a collaborative communication system to exchange knowledge on services is important.

Collaborative communication initiatives arising from the Internet explosion are too various[17]. Currently, many hospitals are creating their own infrastructures for modernizing their collaborative communication systems by taking advantage of the advances in network based telecommunication implementations[8][16].



<Fig. 1> Perspective on CCC System

Stressing on the domain of communication in knowledge and expertise sharing implementation, this paper is organized as follows. In the second section, the approaches of the CCC are reviewed. The third section presents a case to implement the CCC practice with proposed architecture. Finally, this paper is concluded by the last section.

2. Previous Researches and Approaches

To implement the practices of clinical collaborative communication in the real world healthcare, a variety of approaches have been developed and adopted by advanced healthcare organizations depending upon their medical communication strategies and goals. If we classify a number of implementing approaches into two major parts, the first part is organizational improvement by building clinical collaborative communication teams and the second is computer-based approaches supported by information technologies[2][4]. This section is to investigate various approaches to the clinical collaborative communication. Each group is individually described below in detail.

2.1 Core Competency-driven Mission

Core competencies are the sources of sustainable competitive advantage and are valuable capabilities. They are collective, unique, non-imitable, and strategically

flexible[14]. These core competences have to be aligned with the strategy. This approach is a logical extension because core competency-driven mission (CCM) oriented nurses, clinicians, and other healthcare team find themselves in situations requiring rapid but accurate communication while under heavy stress, as might be found in surgical, obstetric, and neonatal units[6][10].

The following structured procedures[13] can be employed to identify the core competence. First, based on balanced scorecard[12], user can identify key capabilities from each functional domain, using financial and non-financial performance measures. In general, financial performance measures include revenue growth, investment profitability, asset utilization, and unit cost. Second, on the basis of business goal, strategy, technology vulnerability, and potential partners, these key capabilities are prioritized on a five-point scale. Third, core competence is chosen based on rareness, inimitability, and non-substitutability. The non-core competences are strategically partnered with external medical stakeholders. Every non-core competence will be allocated to external stakeholders[14]. This concept modeling is implemented as a CCC system seamlessly.

2.2 Communication Process Re-engineering

The initial process to adopt communication process reengineering includes construction of a healthcare cross-functional team led by a strong hospital manager[3][6]. The primary objective of this organizational change is to provide a parallel and concurrent communication support required at each phase of collaborative communication practice. The required communications are gathered by the cross-functional healthcare team members from variety of disciplines such as prognosis, pathogenesis, symptom analysis, therapy, marketing, purchase and administrative-support[4][11]. For this purpose, cross-functional teaming and team leader appointment are important elements. The principles of teamwork are summarized as follows[2].

Select cohesive teams based on mutual linking and each other's expertise, bring specialists from all major functional areas, ensure the common vision of the communication process, organize controlled convergence to communication solutions that everyone accepts, use both formal and informal communication, and provide partner-principled relationship for implementing a CCC system.

2.3 Healthcare Stakeholder Satisfactions

The clinical communication involves various phases of activities. The service conception phase requires more detailed efforts to define, analyze, and consider external and internal communication requirements in the early design stage. One of the most popular approaches in this category is quality function deployment[15]. It involves construction and evaluation of a matrix form which is known as the house of quality at each phase of decision. The matrix chart forms a visual map containing the communication needs of the consumers in the input row and the healthcare service decisions to meet the communication desires in the output column. Starting from the voice of healthcare consumer as an initial input element, the house of quality generates the output of healthcare team decision, which afterward becomes the input of new house of quality to eventually make the final phase decision[4][8].

2.4 Communication by Information Network

The clinical communication in healthcare environment needs a communication infrastructure which facilitates transfer and sharing of information, knowledge as well as expertise since the relevant information should be available when healthcare team members require it[7]. Current rapid evolution of information technologies accelerates healthcare organizations to communicate on-line medical information under the CCC practices.

To deal with the concept of CCC, various types of contents including medical text, numeric, graphics files, images, and sound can be handled during healthcare service processes[16][19]. It also focused on the functions of access control, structure management, communication process workflow management, and data classification management[13]. The following table illustrates the implication for CCC concepts.

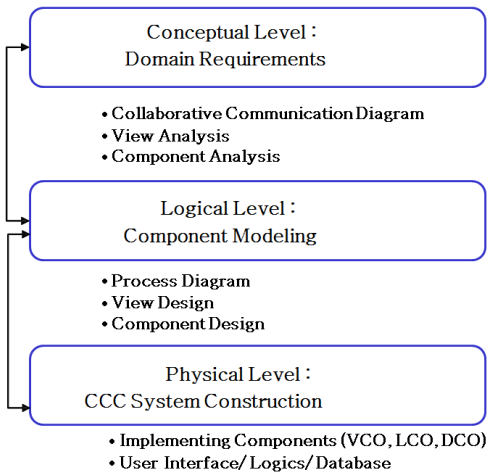
<Table 1> Collaborative Communication in Healthcare

Implications	Reference
Communication is fundamental to healthcare; to achieve positive health outcomes, healthcare professionals and other stakeholders must be able to communicate collaboratively.	[9][10]
Collaborative communication as an essential element of public health and a core component of the health care system.	[16][17]
Importance is a communication as both a practice for improving patient safety as well as a national priority for health care quality measurement and reporting.	[1][6][8]
Collaborative communication skills during health care encounters improves satisfaction, compliance and adherence to treatment regimes, provision of preventive services, and clinical outcomes.	[2][10]
Collaboration emphasize on electronically supporting information exchange to foster collaborative business activities with tightly coupled relationship.	[12][13]

3. System and Case

3.1 Architecture

The proposed approach is clinical core competency-driven, and it has three levels, as depicted in Fig. 2: conceptual, logical, and physical. In the conceptual level, a domain requirement is identified according to collaborative diagram, view analysis, and component analysis, using core competencies of each medicine sector in the collaborative assessment[9, 13]. Core competence has already been addressed as a critical factor in defining the tasks or missios[12] of each team.



<Fig. 2> Three Level Architecture

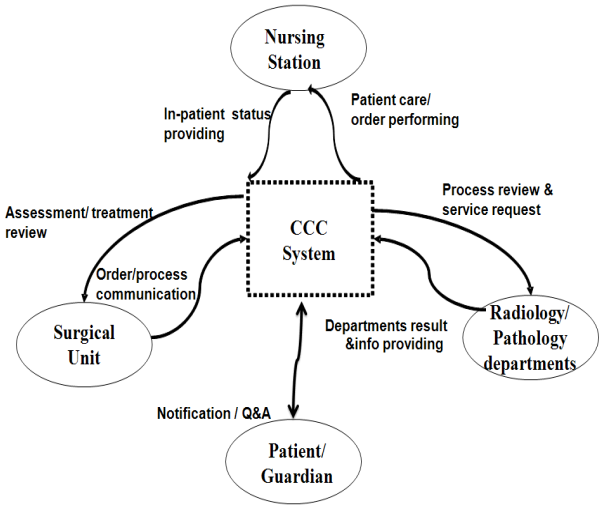
At the logical level, the collaborative communication diagram is specified using it own detail mission. The analyzed views and components are cleared into components such as data schema, logical program, and user interface specifications. Consequently, at the logical level, a view can be transformed into a complete component set. Physically running application can be implemented based on the components at the physical level. Each component represents a unit of independent element. The detailed descriptions of proposed architecture are shown in Table 2.

<Table 2> Architecture Description

Level	Steps	Description of Steps
Domain Requirement (Conceptual Level)	**Collaborative Communication Diagram**	Grasps CCC domain of participants called task domain and clarify relationship among the targeted task domains by investigating communication requirements in the area. Each relationships of task domain can be explored on the basis of the domains' communication relationship.
	View Analysis	On the basis of this collaborative communication diagram, further specifications are modeled including role and events required in the target CCC environment.
	Component Analysis	Identify event scenario in users' views and extract required components in the application area -Event Scenario Analysis: Identify users' informational, behavioral, and collaborative requirements -Component Interaction Analysis: Represent interactive relationships among components
Component Modeling (Logical Level)	**Process Diagram**	Identify users' informational, behavioral, and collaborative communication requirements
	View Design	Represent interactive relationships among components based on view. Each view includes indexes of component artifacts: Component Type, User Interface, Logic, Database, Navigation, Logic Code, and Physical Database Schema.
	Component Design	Design component specification based on type characteristics and model navigation link, logic, and database schema -Component Type Design: Represent information contents of domain classes in class structure diagram and navigational units. -User Interface Design: User Interface specifications are enhanced to incorporate data location, interface components choice, and component properties -Logic Design: Represent the relationship between source and target node. Source and target node may be OO view or Access Structure Node -Database Design: Transform object model to logical database schema for target DBMS -Navigation Design: Provide users the access structure which users can use to navigate to different part of hypermedia application.
CCC system Construction (Physical Level)	**Implementing Components (VCO, LCO, DCO)** for User interface, Logics & Database	Drive the model down to a low level of detail preparing it for implementation; constructs a physically running CCC application system in target environments. The value of the view components lies in the independent reusable artifacts that can be used effectively in the process of maintenance and development. Consequently, it consistently uses these components of the view up to the system construction phase.

3.2 A Case and Modeling

Currently, S hospital organization is looking forward to a new direction based on clinical collaborative communication to enhance medical quality by better communications. The investigation took place in surgical units spread over four floors in S hospital. The location is a 623-bed acute care hospital. It is a part of a larger regional health care system. The hospital was selected as a test bed in the early stages of implementing the CCC system. All the medical staff's cemented relationships and focused on new communication processes across the each own medical service chains through CCC system. Nurses had received basic training in CCC system for use primarily in communication with physicians as well as other stakeholders. The CCC system was being implemented, mostly for surgical unit, nursing station, patient/guardian, departments of radiology and pathology. However, the hospital has not fully implemented the enabling system yet, but the case may be used to help understand CCC approach as an example.



<Fig. 3> Conceptual Level: Collaborative Communication Diagram for Domain Requirements

Fig. 3 illustrates knowledge sharing collaborative communication diagram for CCC domain requirement definition. In this step, major diagram is introduced for the proposed

methodology architecture; collaborative diagram.

The purpose of the diagram is to identify participating stakeholders and their collaborative communication relationships in terms of the core competence-driven mission. Core competence missions in each stakehholder are the sources of sustainable clinical competitive advantage and are valuable medical mission capabilities[12][14]. They are collective, unique, non-imitable, and strategically flexible[13]. These core competences have to be aligned with the medical CCC strategy.

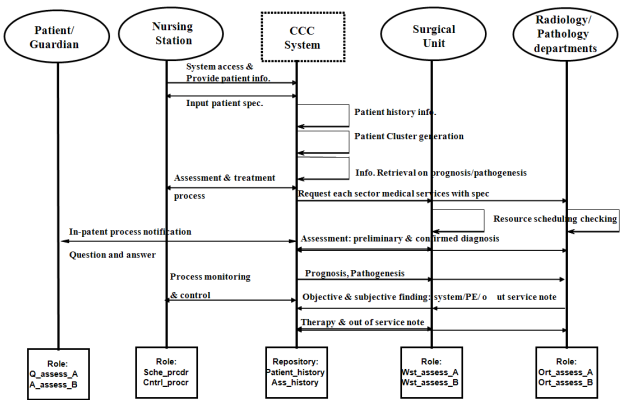
For networked CCC healthcare community, collaborative communication relationships among stakeholders can offer competitive benefits. CCC system communicate collaboratively overall medical schedules and resource utilization strategy for therapy, diagnosis, prognosis, pathogenesis, assessment in preliminary and confirmed diagnosis, objective finding of symptom, subjective finding in physical examination and outcome data management for out service notes. In addition, it is in charge of scheduling arrangement and medical assessment process coordination for patients. Therefore each stakeholder can perform and contribute effective communications.

If a clinician on surgical unit requires biopsy result of a patient, assessment and result are notified to the monitor in surgical unit with protocol. Nursing station can check doctor's order for in-patients and generates a possible detailed plan along with complete medical specifications. If required, on-line visual communication function can be used among the three sectors for notification or being consulted with the other medicine stakeholder side. The staff also can check alternative plan and notice for a target patient type. This process is performed by the use of patient cluster codes[12][16]. Each medical party can enhance patient record access, and each medical party can provide each superior talent in medical assessment.

Depending on the clinical staff's role, access area in the system can be restricted. Role-based access control is to specify and enforce stakeholder-specific security policies in a way that maps naturally to the collaborative system's structure[16]. With the control, authority is managed at a level that corresponds closely to the system's structure.

The next diagram drills down from the collaborative communication diagram to specifications. The purpose of the diagram is to sharpen specific missions and their relationships to Process Diagram.

This detailed specification is depicted as a process, as shown in Fig. 3. Two specifications are important. First, it identifies roles that can achieve the core competence missions. Second, it captures the CCC relationships among the roles. Each relationship is defined as an action on the basis of an object-oriented theory[9][16]. Each role will be analyzed more specifically in the next phase to capture the requirements for collaboration.



<Fig. 4> Logical Level: Process Diagram for Logical Modeling

The major purpose of the diagram for component modeling is to capture, at the conceptual level, component views that will be

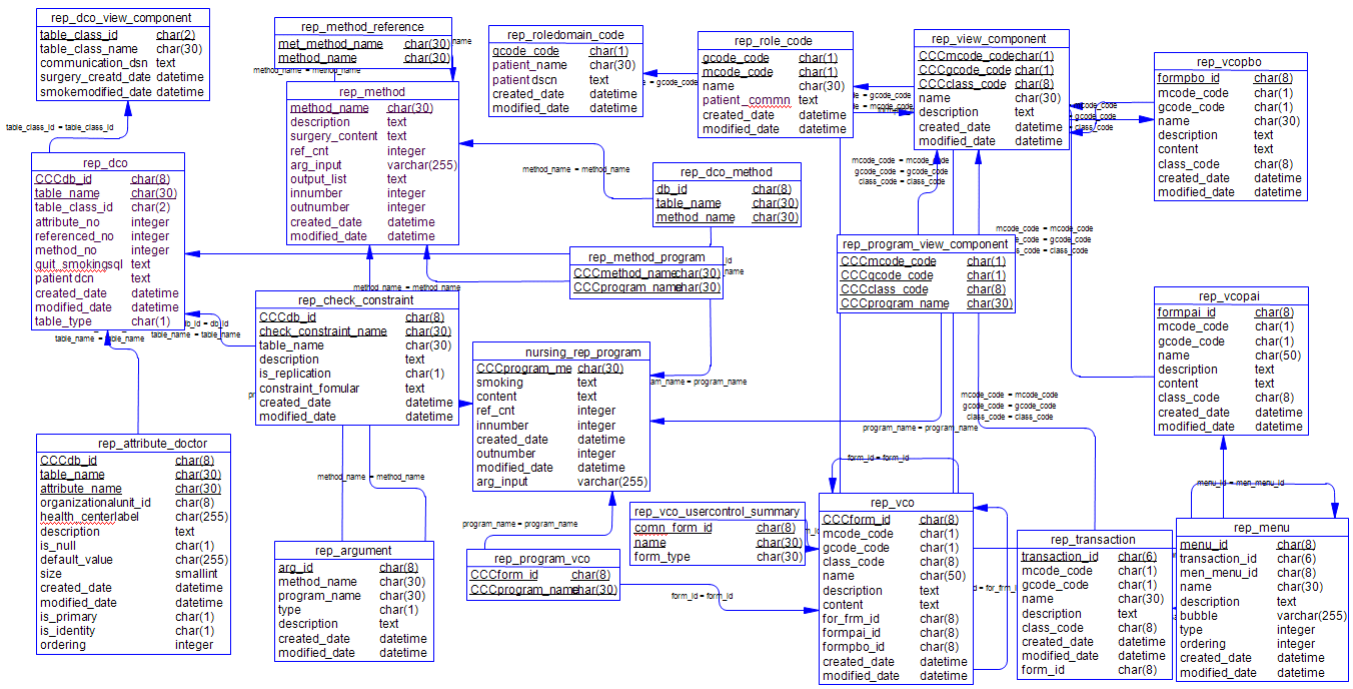
designed as technical components for implementation. Component modeling comprises three major tasks: to analyze scenarios for each action, to capture component views from the scenarios and to establish relationships among the component views. Scenarios help understand the required collaborative works among the multiple stakeholders[16]. To understand the behavior of the medical stakeholders is essential for developing a collaborative medicine system that can enhance the value of roles and reap much greater loyalty in return[10][11].

The component design phase provides the implementation design specifications for DCOs, VCOs and LCOs. The next illustrate a DCO. The purpose of the DCO design is to build a physical database schema. The schema is completed by identifying DCOs on the basis of conceptual attributes as depicted in Fig. 5.

To access the CCC system, user needs to provide information on customer identification, password, site address. Depending on the user's role, access area in the system can be restricted.

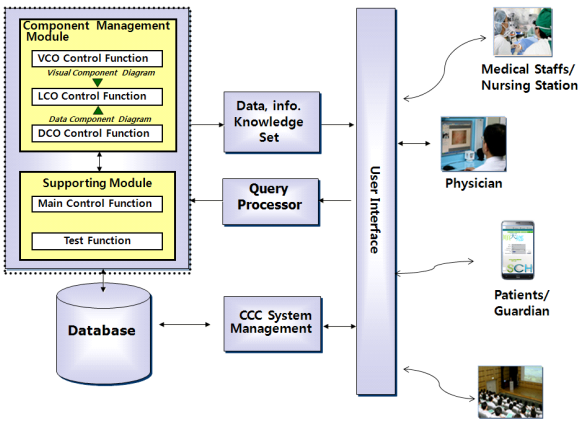
The effective storage of medical knowledges such as lab. results and clinical pathway are critical for the medical process. The flexible platform for the storage of knowledge is needed just in time basis. Thus, this emphasizes on clinical pathways. CCC system was built so as to support effectively maintaining the quality and control the cost of medicine by formulating database model for knowledge storage. The implementation effectively on the basis of the meta-schema. This tool may affect economic success for CCC system implementations. Medical ontology was employed for the construction of a flexible system. Using task and domain ontologies[7], clinical information as well as knowledge are efficiently accessible between medical staff and patients.

CCC system consists of two main modules: component management module and supporting module. Each module consists of a number of functions. The component management module is responsible for implementing CCC systems by creating, editing, or modifying components such as VCO, LCO, and DCO. The module consists of



<Fig. 5> Physical Level: A Partial DCO for Implementing Data Component

three types of functions - VCO control, LCO control, and DCO control functions. The supporting module serves the supportance of the component management module. The module consists of two types of functions - main control and test functions. These data, information as well as knowledge sharing query processings are performed on the basis of a repository meta-schema in database. The overall architecture of CCC system is depicted in Fig 6. Role-based access control is to specify and enforce stakeholder-specific security policies in a way that maps naturally to the CCC system's structure. With the control, authority is managed at a level that corresponds closely to the system's structure.



<Fig. 6> CCC System Structure

CCC system consists of two main modules: component management module and supporting module. Each module consists of a number of functions. The component management module is responsible for implementing CCC systems by creating, editing, or modifying components such as VCO, LCO, and DCO. The module consists of three types of functions - VCO control, LCO control, and DCO control functions. The supporting module serves the supportance of the component management module. The module consists of two types of functions - main control and test functions. These data, information as well as knowledge sharing query processings are performed on the basis of a repository meta-schema in database. The overall architecture of CCC system is depicted in Fig 6. Role-based access control is to specify and enforce stakeholder-specific security policies in a way that maps naturally to the CCC system's structure. With the control, authority is managed at a level that corresponds closely to the system's structure.

<Fig. 7> Physical Level: Mobile VCO user interface for CCC System Construction

Each user is assigned one or more roles, where roles are based on the user's job responsibilities and competencies in the healthcare organization. Each role is assigned one or more authorities. It is a user's membership into roles that determine the privileges the user is permitted to perform. Security consists of determining the operations that must be executed by user in particular jobs, and assigning stakeholders to the proper roles.

Fig. 7 and Fig. 8 show main VCO user interfaces; mobile and web version respectively[18]. If the staff notifies vital sign and personal history data on the patient[18], a doctor in charge can be notified by mobile phone and access the data or in-patient status along with visual specifications. If required, on-line visual communication function can be

used between the two stakeholder sides. This process is performed by the use of patient code.

<Fig. 8> Physical Level: Web VCO user interface for CCC System Construction

The representation of patient abnormal status, including the patient's medical history attached is considered for first aid order.

For the validation and effectiveness for the system, interviews took place during work time and were conducted on site. It generally lasted about an hour and were used to gain an understanding of how CCC system was used and its broad effects on nurses' communication and other activities. By adopting the CCC system, S Hospital's stakeholders can share information from a variety of sources for better collaborative communication.

4. Methodology Comparison

This compares proposed approach with the others. The conceptual design prior to physical implementation is essential in CCC systems analysis and design. For the comparison of these methodologies, several criteria are of interest: formalization, medical staffs analysis, system requirement analysis, data model, source of navigation design, development supporting system, and methodology phases. This comparison is summarized in Table 3.

The informal methodologies do not specify detailed activities for each phase; the linkages of outputs are not proposed. For formal methodologies like ours, not only development activities, but also linkages of their inputs and outputs are described. Typically, developers tend to add formal structures to the development process[19]. Medical staffs analysis is a starting point for a CCC system development. Proposed CCC approach strikes a balance between bottom-up and top-down modeling. For the CCC analysis, proposed approach relies on a top-down approach to derive mission-oriented view; on the other hand, it adopts a bottom-up approach in analyzing and specifying components from the event scenarios for the missions. This hybrid approach can complement the modeling complexity.

It adopts scenarios that can describe collaborative communication processes. The use of scenarios is likely to enhance the understandability of the system requirements by effectively reflecting the behavior of the missions.

It is important to consider an analysis and design method that can offer flexible possibilities by hiding the complex structures and the location of the physically distributed information required to support inter-medical organizational business. In particular, the success of mobile Web-based CCC systems is significantly associated with navigation[13]. proposed CCC approach uses a navigational structure diagram to enhance the usability of the CCC system by effectively reflecting the navigational requirements of users, while the other methodologies do not consider the navigation.

<Table 3> Methodology Comparison

Method-ology / Criteria	WSDM [4][19]	HDM-Lite [12]	ACEM [13]	WHDM [7][13]	This Methodology
Formalization	Formal	Formal	Informal	Formal	Formal
Medical Staffs Analysis	Audience Class Hierarchy	N/A	User Involvement	N/A	Core Competence
CCC System Requirement Analysis	Audience Class Hierarchy	N/A	Use Case	Workflow	View
Data Model	O-O	E-R	N/A	E-R	Component Set
Source of Navigation Design	Navigation Track	E-R Relationship	N/A	Document-Relationship	Component Relationship (VCO)
Methodology Phases	1.Mission Statement Specification 2.User Classification 3.User Class Description 4.Object Modeling 5.Navigational Design 6.Implementation Design 7.Implementation	1.Conceptualize 2.Generate Database 3.Implement and Deploy	1.Basic System Analysis and Design 2.Architecture Decision 3.Build Basic Functionality 4.Deployments	1.Workflow Analysis 2.Document Analysis 3.Hypermedia Design 4.Implementation	1.Domain Requirement 2. Component Modeling 3. CCC System Construction

5. Validation

This survey is conducted in collaboration with S hospital managements for the validation in the potential adoption of the CCC, and performed on 1st and 2nd weeks on September, 2012. The efficacy of the system was assessed using five major parts: CCC experience, system evaluation, CCC usefulness, treatment process/medical service, and general information on questionnaire respondents. The detail constitutions are shown in the below table.

Experienced medical customers (10 male and 11 female) volunteers aged 18 - 71 years (mean ± s.d., 42.3 ± 6.5) participated in the survey. Subjects gave written informed consent, and the CCC using experiments were compared to the before and after patient communication systems.

For the patients, CCC was administrated for the communication regarding their own medical condition, service processes, and medical background. Patients who participated in network-driven communication experienced significant changes in the desired results. This assessment study supports the positive impact that the proposed CCC network-driven patient communication has on knowledge acquisition and the communication that occurs between patient and provider.

<Table 4> Survey Questionnaire Contents Structure

Part	Questions	Descriptions	Etc.
CCC Experience	5	·information quality ·usage time and frequency ·intention use constantly ·understanding personal situation ·related medical contents and service easiness	
System Evaluation	11	·authority ·conformability ·quality ·correctness ·up-to-date ·design ·Q&A ·completeness ·access ·CS ·interoperability speed	5 point scale
CCC Usefulness	3	·security on personal situation ·decision making on future medical service alternative	
Treatment process/ Medical service	4	·treatment process understand-ability ·medical service understand-ability ·network-Internet ·network-Mobile	
General information on involver	7	·gender ·age ·education degree ·job/carrier ·family income ·motivation in hospitalization ·personal information	

For instance, information quality (mean ± s.e. before, 2.48±0.237; after, 4.04±0.678; $p < 0.0$, paired t-test), customer satisfactions (mean ± s.e. before, 2.12±0.341; after, 4.11±0.434; $p < 0.0$, paired t-test), Access speed (mean ± s.e. before CCC, 2.22±0.452; after CCC, 3.95±0.541; $p < 0.0$, paired t-test)in agreement with adopting CCC justifications. In the case of "design" could not be measured and ruled out due to the offline and online characteristic. One of the findings is that it demonstrated the value of patient and guardian communication systems by providing timely information and data.

The results are consistent, and result reports indicating that CCC does affect patient attention, communication function, as well as related personalized communication contents. The present findings are remarkably similar to

previous literature survey findings. The active involvement of the medical stockholder is essential key for successful working of CCC that can enhance the value of roles and reap much greater patient loyalty in return[10, 11].

Collected data were analysed using statistical software, SPSS 12, for the variables, descriptive, cross-tabulation, and multiple response analysis were performed.

<Table 5> Response Average by Questionnaire

Question No.	N	Before Adopting CCC Mean±S.D.	After Adopting CCC Mean±S.D.	t	p
Authority	21/21	3.13±0.788	4.14±0.456	1.76	0.00*
Correctness	20/21	2.43±0.566	4.00±0.345	1.77	0.15*
Curiosity	21/21	3.65±0.565	4.47±0456	1.76	0.00*
Easiness	21/21	3.86±0.245	3.39±0.787	1.77	0.00*
Up-to-datedness	21/21	3.21±0.234	4.43±0.567	1.76	0.00*
Completeness	21/21	2.43±0.564	4.23±0.454	1.77	0.00*
Information Quality	21/20	2.48±0.237	4.04±0.678	1.68	0.00*
Design	21/21	N/A	3.60±0.565	N/A	N/A
Access Speed	21/19	2.22±0.452	3.95±0.541	1.79	0.00*
Customer Satisfactions	21/20	2.12±0.341	4.11±0.434	1.69	0.00*
Interoperability	21/21	2.34±0.764	3.64±0.852	1.79	0.00*

*$p<0.05$

These findings indicate that CCC are the another sources of sustainable competitive advantage of S hospital and are valuable capabilities in the light of comparing the before and after CCC installation. None of the question analyzed less significant in the light of mean and p values. Most of response analyzed superior to previous offline system especially such as correctness, completeness, information quality, access speed, and patient satisfactions.

6. Conclusion

Communication errors have grave consequences in health care. The data, information and knowledge storage and sharing for clinical communication pathways are an important issue in modern medicine. In this paper, the asset sharing for clinical collaborative communications which uses a flexible tool to integrate the abilities of physician, medical staffs, patients/guardians was introduced and constructed.

One feature of this study is data, information and knowledge sharing over the Web on a real-time basis. This study also explores the modeling and implementation approaches of the clinical collaboration communicative system, and investigate the potential impact of CCC on the day-to-day experiences in hospitals. This proposed system is used across the health care field, and has an impact on how health care professionals operate beyond the creation of a common language with patients.

The results indicate that CCC may function as more than a system to standardize communication among in-patients, nurses and physicians. Rather, the findings indicate that CCC may aid in schema development that allows rapid decision making by nurses, and reinforce a move toward standardization for better medical qualities.

One of the findings in statistical survey investigation is that patients' perception of their quality of cure is also improved significantly under 95% confidence level when they are empowered by well-designed communication systems. Empowered patients tend to feel more personally capable of positively impacting their results. For patients with chronic conditions, health-related communication quality of life can improve significantly when they are trained in self-management techniques and empowered with education. The CCC can be suitable for other hospital settings when modified.

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