의료기관 전문 의료용 CRM 프레임 설계

Medical CRM Frame Design for Medical Institution

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요약

현재 병원에서는 병원관리시스템(HIS), 의료영상시스템(PACS), 처방전달시스템(OCS), 전자의무기록(EMR), 전사적 자원관리(ERP) 등 각 과별・업무별로 독립적인 시스템을 사용하고 있으며, 각 시스템에 종속적인 각각의 DB를 운용하고 있다. 이에 따라 정보의 원내 통합이 불가능하며, 데이터의 투명성과 일관성을 유지하기 어려운 상황이다. 본 연구는 기존의 타 시스템과의 유연한 연계처리를 통한 데이터 통합 환경을 제공하고, 이를 통해 고객이 원하는 최적의 서비스를 최적의 타이밍에 제공할 수 있는 의료 CRM 프레임을 설계하였다. 고객관리 프로세스 표준화에 의해 고객관리, 홍보/마케팅, 서비스관리, 통계/분석의 4가지 의료 CRM 프레임을 설계하였고 개인화된 의료정보 서비스 제공을 위한 모바일 의료 콘텐츠를 확보하여 고객 데이터를 바탕으로 고객의 특성과 건강 상황에 따라 맞춤형 모바일 콘텐츠를 제공할 수 있도록 설계하였다.

■ 중심어 : | 통합 환경 | 의료 CRM | CRM 프레임 | 모바일 콘텐츠 |

Abstract

Hospitals today use independent systems for each department and job such as Hospital Information Sytem(HIS), Picture Archiving Communications System(PACS), Ordering Communication System(OCS), Electronic Medical Record(EMR), Enterprise Resource Planning(ERP), etc and each system employs its own DB. So, it is impossible to integrate information within the institution and difficult to keep transparency and consistency of data. I in this study offered a data integration environment through flexible management linked with other systems, and by doing that, designed a medical CRM frame which offers the optimum service the customer wants at the optimum time. I designed 4 of medical CRM frame: customer relationship management, public relations/marketing, service management, and statistics/analysis by the customer relationship management process standardization and aimed to offer tailored mobile contents according to customer's characters and health situation on the basis of customer's data by securing mobile medical contents for personalized medical information service.

■ keyword : | Integration Environment | Medical CRM | CRM Frame | Mobile Contents |

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Ⅰ. Introduction

Most hospitals cost a lot of money to amass medical records and manage patients′ DBs, however, they only consider an enlargement of customers in quantity, but not there is no systematic analysis on customers and good use. So, it often happens to waste some of customers′ information. An effective medical customer relationship management(CRM) can be constructed when there is an effective management on the system from acquisition, accumulation, and analysis of information to use of it and feedbacks from the results are carried out continuously[1]. However, hospitals today use independent systems for each department and job such as Hospital Information Sytem(HIS), Picture Archiving Communications System(PACS), Ordering Communication System(OCS), Electronic Medical Record(EMR), Enterprise Resource Planning(ERP), etc and each system employs its own DB. So, it is impossible to integrate information within the institution and difficult to keep transparency and consistency of data. It seems the biggest reason why most hospital that introduced CRM has not achieved clear tangible effect. Hence, information inside institution has to be integrated and managed and analysis of information has to be done by the various points of views from each department/station. This study proposes a CRM system data management based on ontology integrated/linked to established OCS, PACS, EMR, and ERP system for effective customers′ information management and analysis of medical CRM. It uses an ontology technique for customer differentiation to offer tailored service to each customer[6]. On average, 1% of customer file have a change of address every month and details of family change more often relatively. This kind of job cannot be done by hand and effective customer management also cannot be done by simple automatic storing and retrieval. That is, after the meaning of information is straightened conceptually and relationships among concepts are defined, it gets the relationship between meaning of information and information through automated agent and then exact information retrieval, generation of new knowledge, and the optimum service have to be served. An ontology should be well-used to describe the connection, which information resources have semantically to each other[8]. On this, this study helps medical institutions use an ontology to manage customers′ information and accumulation of information is not only the simple storing of individual information, but the one made complexly and intelligently to prepare a foundation of Data Warehouse (DW) of CRM system.

It is very important for CRM to use the tools like mobile phones that heighten customer approaches. However, as CRM researches in medical field so far, market segmentation of medical service has been most and the main researches are about to suggest marketing strategies[7]. There were a research on clinic test patient monitoring using a PDA and SMS, but there was no study on mobile service introduced as a way of medical CRM. Moreover, Mobile phones that most economically active population in the country have and PDA that spreads widely to individual and enterprise market can be the optimum channel of CRM for customer management. Hereupon this study integrates/operates established system DB in medical institution to manage every customer′s information by using ontology and implements a tailored mobile service by developing mobile CRM.

Ⅱ. Home and Foreign Research Trend

There are less than 10 of medical information

enterprises in the country which provide medical CRM solution and generally they supply as a package. The main hospitals they supply are pediatrics, dermatology, obstetrics and gynecology, ophthalmology, plastic surgery, and dentistry which give uninsured treatments most and it is supplied to treatments which need customer management continuously. Recently competitions among hospitals is getting higher and introduction of medical CRM is getting more widely spread, so there should be about 500 of small/medium clinics/hospitals to have the system. However, in the case of medical community in domestic, we can say the introduction of CRM system is still in the early stage and there is not much of exact state of CRM management or the result of introduction or a very rare examples that shows the actual effect of CRM system operation. Besides, study on medical CRM system in the field of medical is not much and there is little study on development methodology of medical CRM system frame and effective medical CRM construction methods to be applied to medical spots. Also present medical CRM is just about notice/functions based on SMS mostly and small medical institutions such as pharmacies, clinics, oriental clinics, dentists reconstruct CRM for enterprises and use it or use some SMS functions provided from HIS[2]. SMS service using mobile phone is a typical customer management method that hospitals use and it happened to introduce mobile service to medical CRM owed to diffusion rate of domestic mobile phones.

In the other countries' cases, web based patient service system is common around the US and Europe, it is rather a method that informs commonly adaptable information to anybody than not a service that manages patients intensively, and there are a lot of examples introduced of revenue growth using CRM in large scale of hospitals and effectiveness of patient management[3]. There are coming out a system based on JAVA Platform from Sun and .NET-based product from Microsoft that are connected to HIS belonged to the large scale of medical center[4]. It does not aim to unspecific people different from our country's case and a general practitioner system has been settled down, so it approaches from patient management system linked to existing HIS. Medical CRM methods run in Japan and the US can be referred, but there are some profiles which do not fit to domestic medical environment. For instance, domestic hospitals/clinics do not prefer offering information of diagnosis and treatment and prescription to the customer. Like this, domestic medical environment is so different from foreign medical environments and Korean-styled medical CRM fitted to domestic medical law and process is needed desperately because needs and characters of Korean patients are also different from foreign ones.

Ⅲ. Design of Medical CRM System Frame

3.1 Frame Composition

The purpose of this study is to construct an ontology DB by integrating and connecting to DB of existing OCS, PACS, EMR, ERP, etc., and through this, to design a medical CRM frame which can offer the optimum service at the optimum time. The CRM frame for medical institution proposed divides into 4 parts; customer management, PR/marketing, service management and statistics/analysis and is composed by 8 modules; reservation management, aftercare, promotion and event trigger(automation), customer management, counseling management, service management and report as shown [Figure 1]. he content of each module is as followed.

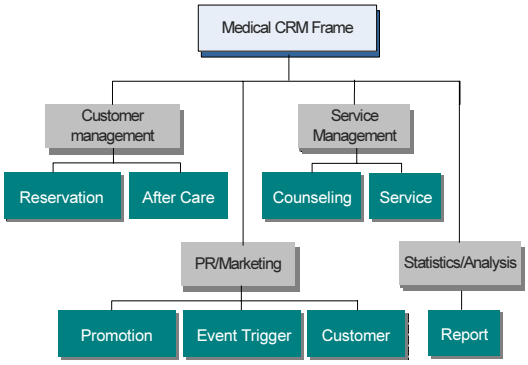

Figure 1. Structure of Medical CRM Frame

- Reservation(Reservation Management) : offers an Alarm Service that transmits text messages which inform the reservation situation to customer before the reserved day of diagnosis and treatment twice systematically.
- After Care(Aftercare Management) : transmits post health recovery information to terminated diagnosis and treatment patient or leaving hospital patient through email, text message, phone, etc.
- Consumer(Customer Information Management) : stores basic information and diagnosis and treatment history information of customer, grasps each customer's character, classifies, establishes customer' level by customer loyalty, and manages.
- Promotion(Promotion/Public Relations) : does marketing by transmitting PR items of special clinic or hospital to customers after targeting customers according to customers' characters
- Event Trigger(Event Automation) : does a marketing by transmitting medical/diagnosis and treatment information needed for certain diseases that have clear prognosis automatically by the schedule established in advance.
- Counseling(Counseling Management) : deals counseling diseases inbound from potential patients around customer through automated answering program for every type rapidly and induces a new diagnosis and treatment.
- Service(request, inquiry management) : manages by dealing customers' requests and inquiries received through email, telephone, and mobile phone or by transmitting to the department or the doctor.
- Report(Statistics, Analysis) : checkups hospital operation by analyzing the practice results of customer management, Promotion and Service, and does feedbacks for effectiveness of hospital operation in the future.

I draw all performances carried out of whole activity of Closed Loop from customer management and promotion of medical institution, and from receiving to diagnosis and treatment from service process, Happy Call, and post-management and construct functions needed for each activity and data. The core process of CRM is shown in [Figure 2].

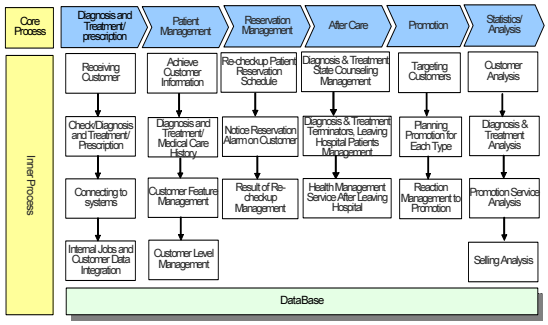

Figure 2. CRM Process

3.2 Database Design

In the existing CRM system we extract data needed from OCS system and retrieve or additional-input extracted data. And it extracts data daily arrangement on the principle rather than connects to online directly[9]. Extraction/ Transformation/Transportation

(ETT) shown in [Figure 3] process has a simple concept, but it needs a lot of efforts and investments to implement an actual ETT. More than 50% of entire integration database construction effort is spent on ETT in general. the way of ETT changes according to cycle of data load, amount of data, degree of data transformation, load speed, cost, type of service close of source system, and so on.

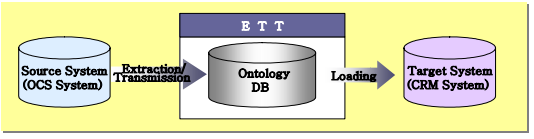

Figure 3. ETT Process

I in this study try to implement ETT process using ontology technique. The reason why I use an ontology technology is to arrange customer's information conceptually and to enable to generate accurate information retrieval and new knowledge through automated agent[10]. Construction and retrieval of proposed ontology DB are considerably composed of 3 modules; Ontology DataBase Creater, Query Processor, and Customer Retrieval Module.

First, Ontology DataBase Creater is the process that transmits existing relational database into ontology relational database based on OWL schema. It creates ontology database based on OWL documents and data input by users and stores. It parses input OWL document to extract ontology information and stores extracted information in the structure according to its kind. It also matches the structure and data provided and stores it in new relational ontology database. Query Processor is the process that puts transmitted ontology database into DataSet to make ontology inference possible and deals with queries. Not find the result by inquirying ontology data directly to relational database, but it gets it from DataSet, memory DB, and deals. By using non-connected DB connection which is one of advantages of DataSet, when inquiring next, it improves the performance by minimizing load. It also finds customer's feature information, matches to query pattern, and retrieve through OntologyDataSet. Query pattern is made based on customer's basic information. Finally, Customer Retrieval Module is the process that recommends potential customers corresponded to inquiry controls the weighted value on chosen customers and unchosen customers. The retrieved result by Query Processor shows potential customers on the user's screen by customer weighted value. When a user chooses a customer, the customer weighted value increases, otherwise, it decreases.

Ⅳ. Web based Integration Interface Environment

4.1 Integration Interface Environment

Systems for medical institution computerization are generally divided into OCS, PACS, CRM, ERP, etc. This study proposes an integration interface environment which integrates and connects in order to operate all of systems more effectively by transmitting and sharing data managed and dealt by each system at present. [Figure 4] shows how to link data and to share with CRM system. customer information is achieved through OCS, CRM, Home-page, etc., according to customer information type. customer information achieved from several systems is systematically collected to 0CRM DB or Base DB and integrated/managed by ontology DB.

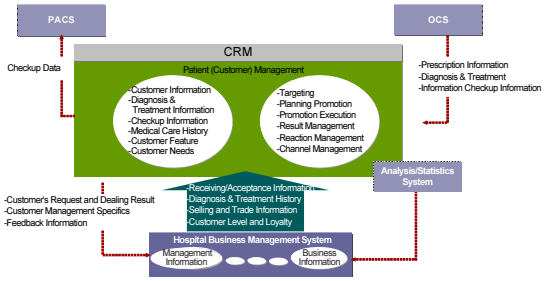

Figure 4. Data Linked to System

Medical CRM is heavy and complex, so it is impossible to input data and manage by hand. Thus, if it registers a promotion, the entire process from target customer extraction and running to result management should be operated automatically. CRM solution in this study that enables to interface with existing system lets One Stop Service which refers customers and manages jobs on CRM screen possible. Automation of process is possible because it integrates and manages activities for customers and campaign based on Workflow of CRM.

It connects and extracts every CRM information organically with single application system developing environment and a point of data contact and uses OLAP, Mining, and analysis elements freely in every CRM application system. It can be an advantage to construct effective data system because information of further DW and Data Mart can be analyzed at the same time. The results of OLAP and Mining constructed in the future, and statistics could be analyzed in one application system. Report, analysis, application system are implemented in one system, so it is very easy to develop and manage and effective. It can implement customer marketing effectively because it enables to run all processes rapidly and repeatedly like plan, design, monitoring, analysis, feedback of campaign[5]. It is easy to connect to channel systems; CRM, Call center, Internet, Mobile, etc., and possible to monitor every process realtime.

4.2 Mobile Contents of Medical CRM

SMS of mobile phones has the highest rate of customer confirmation and regards to be the optimum means to make communication easy with customers[2]. Recent SMS makes interactive communication with customer possible, so it can be applied to the most effective contact channel to customers. Information from customers is managed in DB and the running results can be checked and analyzed. Recent long message function is supported as well and it helps operate the functions of PR, marketing, contents transmission. SMS as a main means of reservation management operates the function that prevents breakaway customers by alarming the reservation to reserved customer before the day. [Figure 5] is an example screen that provides PR contents of hospital to customer by using mobile phone message support service.

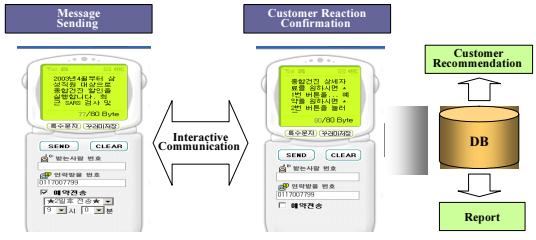

Figure 5. Instance of Mobile Hospital PR Service

There should be not only SMS, but a variety of mobile contents that CRM system should offer[11]. Proposed CRM system is a content managing system that manages medical contents which will be provided to customers and it will be constructed to offer personalized medical contents based on data; hospital use rate, the time of hospital visit, history of having been to other clinics, person who recommended, family history of disease as well, reaction analysis of campaign by hospital, understanding of disease, whether accommodate to pay for care or not, etc.,

according to feature and health condition of customer. Mobile contents that system offers are as followed.

- According to customer's symptoms, it connects to location information based service and recommends the closest medical institution.
- When the customer is in another area, it retrieves a hospital that has a partnership with customer's local hospital.
- For the customers who continue to go to hospital like pediatrics, dermatology, etc, the concepts of mobile coupons or loyalty system can be introduced or free charge of checkup service can be provided.
- It happens for customers to take a counseling for diagnosis and treatment through the screen with counseling clerk of hospital or doctor. In fact, to show actual affected part or symptoms makes more accurate counseling possible and it could be settled as a realtime medical service which leads interactive communication with customers over simple counseling or guide on the phone. Also if it is connected to chatting service, it will be very useful medical contents for customers who have a difficulty of talking and hearing.

If U-health including remote diagnosis and treatment is settled down to start, a need for mobile medical service will be desperate. As professional medical service is available regardless of time and place, security of mobile medical contents will separate success or failure of medical institution CRM.

V. Conclusions

This study constructed an ontology DB by integrating/connecting DB of existing OCS, PACS, EMR, ERP, etc, and through this, designed a medical CRM frame for medical institution that enables to provide the optimum service that a customer wants at the optimum time. In order to do this, it provided a data integration environment through flexible connection handling to established other systems such as OCS, EMR, PACS, etc., and constructed an ontology DB according to customer information. It also designed 4 of medical CRM frame; Customer Management, PR/Marketing, Service Management, and Statistics/Analysis by standardization of customer managing process through introduction of medical-specialized system. It designed to secure mobile medical contents to offer personalized medical information service and to provide tailored mobile contents according to customers' features and health conditions based on customers' data.

I expect that the medical CRM system proposed in this study will bring effects like as followed. Hospitals will meet a profit growth as they secure regular customers and customers will be able to trust the doctors who know them best and be offered a good quality of service. As it developed a common frame of medical CRM accommodated to domestic medical law and process, it can be used all of existing medical institutions and connected to various mobile service. That is how to secure personalized tailored medical contents.

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