THE MODULES ADVENCEMENT TO DEVELOP PMIS INTO FMS IN THE CASES OF MEDICAL FACILITIES

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ABSTRACT: On the construction area, Information Technology (IT) has been a considerably significant part over the all phases; plan, design, procurement, construction and post-construction. For example, CALS, CITIC, PMIS, FMS, BIM and etc, designed and applied for managing construction industry are already valuable to improve on the Construction Management (CM). To develop these management methods, lots of mixed-systems are studied and progressed so far. In this paper, more useful and efficient system modules are proposed through investigating PMIS cases implemented, especially medical projects, to improve into FMS on the post-construction. Because most PMIS on the construction phase is used not to continue as FMS, considerable cost and time is consumed to rebuild the system, even both systems have common modules. As these wastes are faced to design systems, the important modules on PMIS are derived and analyzed to apply to FMS to save time and cost on CM.

Keywords : PMIS, FMS, Module, Medical Facility

1. INTRODUCTION

Construction industry has been dramatically growth with IT industry all over the phases; plan, design, procurement, construction and post-construction. As the government of S. Korea has driven CALS (Continuous Acquisition & Life-cycle Support) of construction area to manage PM (Project Management), the importance of build and operate the kind of system applied to construction area is more increased to improve construction qualities. For example, CITIS, PMIS, FMS, BIM and etc. are investigated and improved as new or mixed in the lots of projects. Especially PMIS has became a significant system in the CM(Construction Management) to make more efficient construction atmosphere and save time and cost over the construction phase. Otherwise, FMS is more efficient system on the phase of post-construction to maintain buildings or facilities as useful as possible. Especially, Medical projects like as hospitals or medical center need the system more significantly. Medical project is probably more important how to manage and operate the building or facilities than how to build it. Thus modules designed in FMS of Medical project are studied and analyzed to apply the system to use more practical and useful. Some modules are based on the design and build elements like as drawings, specifications, details, information of accessories of facilities and etc. As this reason, PMIS modules involved the elements like as drawings and any information on the construction have to be considerate to link to FMS modules.

Lots of PMIS has became just a database, not be linked as FMS to maintain a building. Thus numerous time and cost are wasted as constructing both system on a project even they have lots of commons.

In this paper, the cases of Medical projects' PMIS are introduced, and then as analyzing the modules of the system, significant modules are selected to apply FMS to maintain the medical project more efficiently. Especially, the PMISs of Pusan National University Yangsan Hospital and Pusan National University Children Hospital are investigated and studied which modules are appropriate to apply FMS when it is constructed.

First of all, the construction strategies and owners needs of both of Projects' PMIS are analyzed. The functions of the modules on the system are grasped, and then the function's applications are studied.

On the base of the results of preceding study, each hospitals needs to operate and manage the building or any facilities' system are caught to provide comport services to patients or any employees in the hospitals. Especially, even laying pipes or wires are made by databases to use as elements of FMS because wards or pavilions are operate by IT system from Lighting on and off to allocating surgeries

Finally, the modules involved database elements selected from PMIS are proposed to build FMS to apply more efficient and valuable system without consuming time and cost. Moreover when PMIS is constructed on new project, the modules is considerate to extent to FMS, or PMIS and FMS is linked of mixed to use to maintain entire project to post construction.

2. CASE STUDIES OF PMIS

2.1 Pusan National University Yangsan Hospital

The PMIS is constructed to manage this CM project of Pusan National University Yangsan Hospital systematically and integrally. The system supports the communication network and collaboration work to establish the project and high medical technology facilities are supported when they are installed on the construction phase. The one of the purpose of system is to provide data at post-construction phase, to maintain facility efficiently. This PMIS is not expected to reduce cost and time, but to save the work process; generally document work 20% reduction, picture/drawings workforce 90% reduction, drawing modification 30% reduction referred Korea Construction CALS Association information.

Firstly, this hospital is already opened with some of medical center in November, 2008. Secondly, Dental Hospital, Oriental Hospital, Nurse Center and Rehabilitation Hospital will be opened at 2011. Finally, The Pusan National University Yangsan Hospital will be known as a biggest integral medical town in S. Korea and become an axis of development for medical industry as maintaining study and investigation.

Especially, the high technology of IT and digital technique is connected with this hospital project, and natural environment provides and maintain the condition of the best medical cure and healing.

Table 1. Summary of Pusan National University Yangsan Hospital

ITEM	CONTENTS
Owner	Pusan National University Hospital
Place	1 block, 3rd Phase Zone, Yangsan New town, Gyeongsangnam-do
Use	Medical Facility
Plottage	165,000m^2
Building Area	21,398 m^2
Gross Floor Area	209,055 m^2
Structure	Pre-stressed Concrete & Steel
Facility	University Hospital : 792 sickbed Dental Hospital : 203 treatment table Nurse Center : 178 sickbed Rehabilitation Hospital: 150 sickbed Funeral Service : 12 ceremonial hall

2.2 Pusan National University Children Hospital

The System is almost similar with the PMIS of Pusan National University Yangsan Hospital. Lots of modules in the system are overlapped, but Pusan National University Children Hospital has lots of differences to Pusan National University Yangsan Hospital in many parts like as scale or use. Due to specialization the purpose of building for children, some modules are characterized in considerable parts. In fact, Children hospital established by private has risk about profits. Those kinds of hospital have to service with inexpensive and good quality.

Table 2. Summary of Pusan National University Children Hospital

ITEM	CONTENTS
Owner	Pusan National University Hospital
Place	1 block, 3rd Phase Zone, Yangsan New town, Gyeongsangnam-do
Use	Medical Facility
Plottage	165,000m^2
Building Area	2,283 m^2
Gross Floor Area	18,997 m^2
Structure	Pre-stressed Concrete & Steel
Facility	General sickbed : 126 Special sickbed : 116

This Children hospital is equipped with high technology convenience. Especially, special PET and MRI are optimized to treat any serious illness for children.

3. FUNCTINS OF MOULES ON PMIS

3.1 Purpose and strategy to establish PMIS

The system on both project are very similar because two project's owner is the same, and locate in close place. Moreover equipments furnished in the projects are almost same like as PET, MRI or Surgery Instrument, except any characterized tools or instrument in the children hospital or the Yangsan Hospital. As they have similar and differences, the purpose has common to build the systems on both projects. It is that the systems are optimized for user, constructed just in time, minimized to maintain and repair.

In these systems, as lots of specialists on diverse parts are involved to design of each PMIS, optimized functions and customized modules are derived for user. First of all, advanced establishment methodology selected efficiently is applied to the system, and then templates and data divided by construction classification is applied to stack up data and make customizing quickly. All of these strategies are the base to operate system optimized and build.

The system is classified as three part; public relations, report of person or visitor concerned project and staffs in charge. In the level for public relations, the information concerned construction is provided to citizen at Yangsan. It includes outlines of construction, Status of progress of construction, public service notice, participation of citizen and etc. The level of report of person or visitor concerned project involves the systems which be able to grasp the status of construction progress based on time management; rate of finishing, recovery measure, images of construction conditions and etc. It's possible to encourage employee of any workers as easy order about operations. For staffs in charge, construction data like as drawings, specification, images or any information to construct projects are provided easily as make communication structure and network.

Table 3. Summary of Modules of both PMIS (Main Menu : 9, Sub Menu : 63)

3.2 Major Functions by Modules

3.2.1 Document/Data Management

- Hangul software(HWP) tool supply
- Function of record Specification
- Electronic Approval system
- Document Arrangement
- Charge Function by department of organization
- Enquiry of Approval Information by Phases

3.2.2 Time Management

- Status of Master Schedule
- Providing Bar-chart of Master Schedule
- Service of Enquiry Management Standard of Progress Schedule
- Showing Statue of Main Schedule of Building Structure UI

3.2.3 Searching Engine

- Searching all over the document, data, drawings or Members
- Service Searching Function by Authorization

3.2.4 Authorization Management

- User Management
  (Request for register user -> approval of manager of system to use -> OBS register)
- Log in ID Management Function
- ID Store Function
- Function of Connection Authorization Management
- Setting Function by OBS Personnel User

3.2.5 Drawing Management

- Upload of Download files
- My Drawing Module
- Viewing Tool of Drawings(Brava Viewing)

(ETC. Function ; Messages: Check System personally,
Send or Receive function by User)

4. Background and Strategy to advance into FMS

4.1. Summary of FMS of Medical Project

It is a tool to support operation of Facility efficient, and provides analysis indicator and various trends to be necessary for managing building system and integral database. Especially, FMS of medical project supports conveniences, satisfaction and safety than other project system if the system is optimized to requirement of owner of users. In the side of patients, this system is able to service the best treatment environment more comfortable and clean. For medical operator like as doctor or nurse, digital medical information infra is supplied to them speedy, and comfortable work place based on IT is provided employees. In the face of facility of a medical building, the system gives economical advantages on the side of maintenance and safety consideration of hospital facility. Moreover the system is able to support saving activities through effective operation, and services to manage facilities efficiently and scientifically.

Gradually, as medical project is becoming a large scale or high-technology, more efficient FMS is necessary. To apply the change, FMS has to adopt the change of environment, technology, system of countermeasure and communities. Especially, integral management method is needed as increasing hospital building numbers. Moreover as intelligent building is getting more brilliant, the method to link to new IT technique is essential. Also, customer of patients requirement has became more various and numerous so that quick corresponds are need to deal with any accident of customers of patients. All of these situations are based on computerization and scientific management; recording data of facilities and operation work, establishing environment of standardization, automation, quantity and accumulation of diverse analysis and indicator data all over the facilities.

4.2. Work Computerization of Hospital Facility [8]

4.2.1 Major Check Index for Build System

New index for space planning is essential. Under the condition changed speedy and rapidly of environment facility, Scale decision is needed to predicate of activation and conduct the purpose on the dramatic indicator

Information accumulation and establishment of FMS is significant to correspond to change, on the Management direction, organization and system.

4.2.2 Analysis of Work for Modules of Building Management System

4.2.2.1 Health care system characteristics
- Heavily regulated
- Funding dynamics
- Healthcare Alliances
- Critical Infrastructure
- Unique Organization, Culture, Terminology

4.2.2.2 Function
- HVAC(Heating, Ventilating and Air-Conditioning)
- Temperature / Humidity Control

4.2.2.3 Related Solutions
- Comfort monitoring (IAQ)
- Intensive care room / Clean Room Control
- Medical Gases Monitoring
- Drug Fridge Monitoring
- Toxic gas Monitoring

4.2.2.4 Value & Benefits
- Comfort
- Optimized operation
- Reports for better decision making
- Reliable smoke control in case of fire
- JCAHO compliance (Joint Commission on Accreditation of Healthcare Organization)

4.2.2.5 System Components
- XL800/200/100/50/10
- Local Devices/ sensors / detectors
- Integrates with Fire / Video / Access control / Parking / FMS. Also integrates with 3rd party IT systems

4.2.3 Analysis of Work for Modules of Fire & Life Safety

4.2.3.1 Function
- Fire Detection and alarming
- Evaluation management

4.2.3.2 Related Solutions
- Detect &alarm for smoke, gas, flame, temperature status
- Emergency procedures & evacuation control ; Electronic mustering/ Voice alarm & guide

4.2.3.3 Values & Benefits
- Safer environment for all people
- Minimized false alarm
- JCAHO / Regulatory compliance
- Faster & efficient safety management

4.2.3.4 System Components
- Detectors : Smoke. Gas, Temperature, Flame
- Integrates with PA/PV system
- Integrates with HVAC / Video system

4.2.4 Analysis of Work for Modules of Object tracking

4.2.4.1 Functions
- Patient & Staff Locating
- Asset Locating

4.2.4.2 Related Solution
- Patients tracking : wandering, lock-up, behavior analysis
- Baby matching & tracking
- Equipment tracking : wheel chairs / Laptops / Beds / Orderlies / Dialysis

4.2.4.3 Values & Benefits
- Improve productivity of staff and assets across hospital (time and labor)
- Reduce theft. Loss and hoarding
- Reduce capital outlay

4.2.4.4 Technologies
- Active / passive RFID transceivers / Tags
- Wireless network : TCP/IP/Bluetooth/Mesh/Wifi

4.2.5 Analysis of Work for Modules of Security-Digital Video Surveillance

4.2.5.1 Function
- Real time security monitoring & alarm
- Digital video recording

4.2.5.2 Related solution
- Perimeter / parking lot monitoring
- Ward / Lockdown / Pharmacy monitoring
- Patient monitoring
- Intrusion detecting

4.2.5.3 Values & Benefits
- Identifies security breaches / false alarms
- Video analytics : productivity / efficiency
- Recording for security & Litigation
- Scalable over time and distance

4.2.5.4 Technologies
- Digital video processing
- HD/IR/zoon cameras
- Integrates with Access control / HVAC / Lighting / Door strikes / Fire alarm

5. Proposed Advance FMS from PMIS

The Results of integration of systems, PMIS and FMS is like as followings, and expected to utilize to establish in real medical projects

Table 4. Example Modules of FMS advanced from PMIS Modules

Main Modules	Sub Modules	Contents
Building Management	Building Information	Building Code, Use, Address, Floors, Plottage, Gross Area, Structure, Parking, Finish of exterior or interior, Images, Height of building and floors or Date of embarkation of the construction work etc.
Equipment Management	Classification of Equipment Information of Equipment Record of Equipment Inquiry of Equipment by Placement Inquiry of Operation Time	Equipment Code ; Air conditioning / Refrigeration / Ventilation / Heating / Medical Gas / City Gas / Sanitation / Water Supply Tank / Drainage Pump / Vacuum Cleaning / Power / Week Current / Consumer Electronics / Automatic Door system / Elevation / Fire-Fighting / Funeral Hall / Environment/ etc. Equipment (Model, Vendor, Manufacture, Capacity, Related Document Service etc.)
Work Management	Classification of Work Standardization of Work A/S Receipt Work Management Schedule of Worker Urgent Communication n Net Daily Record of Business Print of legal Record	List of Standardization Work Schedule Management by month or year Schedule Management by each Equipment Order to each department in charge List of Order Process regularly Register and Conduct of Requirement by Personnel or Department
Drawing Management	List of Drawings Basic Drawings Plan Finishing Table of Materials Plan of Ceiling Details of Toilet Details of Doors Details of Curtain wall Gondola of Helicopter Detail of Lamp Detail of Furniture Section of Structure Reinforcement Placing Drawings	Each floors Drawings Drawing Code Viewer Program Revision management of Modification Detail Information Registered
Energy Management	Classification of Energy Gas meter Waterguage Energy Examination Energy Plan Energy Use Analysis Tax Notice	Daily Peak / Load Quantity by Feeder Results of Daily Use of Electronic Annual Use Result Water Daily Use Result Gas Daily Use Result
Estimate Management	Classification of Estimate Plan of Estimate Result of Estimate Analysis of Estimate Comparison	Repair / Material / Energy / Environment Arrangement / Wire / Service / Training / etc. Expenses and Graph

6. CONCLUSIONS

PMIS has been gradually grown up to success on the construction management since PMIS was entered. As most of clients have lots of information of PMIS, It is necessary to design and advance PMIS differentiated to take CM project under the keen competition.

The estimation and analysis of original system has to be acted to build a growth PMIS, One of significant methods to get a great PMIS need that cases of PMIS operated in real are studied and advanced with another concerned System So Utilization of the mixed system PMIS-FMS.

The expectation of FMS concerned and linked with PMIS is advanced with Modules and additional Functions development. Construction Outlines and Facilities Area Management, Drawings and Cost Management, Contract and Repair Record Management, Maintain Materials, Specification Management, Wire, Duct and Cable details and etc are studied and investigated to apply to both PMIS and FMS.

REFERENCES

[1] Mirostaw J. Skibniewski, "Success vs. Failure in Application of Web-based Project Management Sstem in Construction", 2003.

[2] Hyun Soo Lee, "Development Strategy of Construction PMIS", *Architectural Institute of Korea*, Vol. 1(52), pp. 729, 2008.

[3] Young Il Moon, "The study of Project Management Information System Establishment for Construction", *Korea Institute of Construction Engineering and Management*, Vol. 3(4), pp. 132, 2002.

[4] Joon Ho Jeong, "Application of BIM-based PMIS Considering Construction Life-Cycle", *Korea Institute of Construction Engineering and Management*, 2008

[5] Min Hyeon Ri, "A case study of Construction Management for Pusan National University Children Hospital", *Korea Institute of Construction Engineering and Management*, 2008

[6] Chul Ho Lim, " Medical Facility Management Work Reform based on CAD", *Korea Facility Management Association*, 2008

[7] Bu An Lee, "FMS Application plan of Short-term General Hospital Facility", *Korea Facility Management Association*, 2008

[8] JoonHa Na, "Healthcare Solutions", Honeywell, *Korea Facility Management Association*, 2008

Table 5. System Composition of PMIS