Workflow Optimization through Business Reengineering for Tele-cardiac System

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Abstract: Today's third largest industry is healthcare sector. This care sector is in trouble in many ways such as "extra-long waiting time, high expenses on medical and delivery error removal cost and insufficient access of client to important information". Business process re-engineering helps manager in health department to discover best ways to produce better results without having any effect on quality. Business process reengineering recovers the procedures of the business process including its improvement. Workflow Reengineering Methodology is a form of Business Process Reengineering which has upgrading capability starting from need identification to execution. It also has ability of maintenance of workflow. It means that much benefit can be attained by consolidating existing task rather than focusing on previous task. It is optimized that how to re-engineer task by using workflow reengineering methodology in order to reduce time and cost for best quality. Here we present a case study of cardiology hospital, which is a tertiary care corporate hospital of Rawalpindi "Armed Forces Institute of Cardiology and National Institute of Heart Diseases" (AFIC-NIHD). We will show how workflow can be optimized through re-engineering methodology in Tele Cardiac system.

1 INTRODUCTION

1.1 BPR towards Healthcare Sector

Today's third largest industry is healthcare sector. This care sector is in trouble in many ways such as "extra-long waiting time, high expenses on medical etc. When there increase in cost for providing healthcare then health managers try to improve greater performance by reducing cost (Romanow, 2002) The reforming and exploration of workflow, for making it more practical is called Business process reengineering. Dramatic growth in the price of delivery of health related services, worth race, changing markets are the important influences that are motivating hospitals to observe their business processes and to modify them by the way that help to keep the prices sensible and provide best quality to patients. BPR is problem-solving methodology that highlights fundamental redesigns of process to attain intense improvements in present-day measures of performance for example quality, cost, speed and service. A Delphi study has been conducted that

shows BPR is ranked at the top in research priorities for health informatics. According to this record electronic patient records and operating systems are put at higher priorities. (Brender, 2000). BPR elements are to be forced by entire provision practice and also focus on whole service to patients across several functional zones in hospital. In the healthcare, the most active change is technology. By every change, the methodology of service delivery changes. Business process reengineering has greater power for improving all parameters like cost, quality, time and efficiency (Soudabeh, 2013).

1.2 Workflow Reengineering Method

Workflow Reengineering Methodology (WRM) is the technique that for Business Process Reengineering in which workflow controlling automation is used as permitting skill. Workflow Reengineering Methodology is created from the BPR and by all other techniques as discussed in the BPR principles of (Linden, 1993), and (Hammer and Champy, 1993). This methodology empowers BPR

by using workflow automation. WRM is which need for change is identified and also improved workflow maintenance and ultimate implementation is covered (Jamaiah H. Yahaya and Syafrani Fithri, 2012).

2 LITERATURE REVIEW

Healthcare especially cardiology department is rising rapidly in developing and also in established countries. Patients' increase in waiting time is identified as the "growth of length of time when patient move in hospitals and when patient leaves hospitals". The time required for registering, appointment, emergency cure, lab testing, procedures, and distribution of the results for tests. (Romanow, 2002). Electronic histories of patient and associated inter-operating systems are also topic of interest according to this study. BPR performs many improvements which are possible by automated patient records, and inter-operating systems.(Juha, 2007)

Many adverse events are triggered because of incorrect resource allocations, and complicated or poorly presented rules and procedures (Blais, 2008). Methods should be developed for decreasing load in all departments focusing in operating rooms. (Cleary, 2004). High amount of saved money and resources are necessary because eighty precent of money are used for patient care (Kumar, 2004). In BPR method, clinical process are mapped and decomposed into activities that are involved in the process. These mapped process is termed "as-is" process. Avoidable steps are identified in this procedure. We also identify all non-value added activities, delays and bottlenecks (Patwardhan, 2008). After that, the new clinical process are named as "to-be" process (Netjes, 12 2010). In some issues, modification of the process is not enough and may needed to be redesigned or even remove wasteful activity completely (Brock ,1997).

3 CASE STUDY

3.1 Cardiology Hospital Profile

The case discussed over here is a cardiology hospital named "Rawalpindi Armed Forces Institute of Cardiology and National Institute of Heart Diseases "(AFIC-NIHD) which is operational from thirty five years. This modern cardiac hospital has two hundred and fifty beds. It is situated in the heart of Rawalpindi. This cardiac hospital provides facility

of being treated to citizens of Rawalpindi Islamabad, Peshawar and Kashmir.

3.2 Current Workflow Description

In cardiology hospital doctor advise the patient for admission and /or cath lab process, Patient or patient's families go to admission counter. Admission officer confirms availability of beds according to availability. Allotting of bed and case observation is done by Admission officer. And in ward, duty medical officer check the case sheet. He checks the patient and asks nurse for treatment. Nurse gives treatment to patient.

Cath lab treatments like balloon angioplasty, closure, stenting and pacemaker are needed for treatment. After examination, patient gets admitted in ward. Blood and urine Samples are transported to laboratory for examination. And result Report is made. Before starting treatment, Patient is kept in special unit for at least six hours. After treatment process, ICCU a bed is prepared for patient. At the time of discharge, discharge summary is prepared by duty medical officer. Then this is transferred to doctor for consultation and confirmation. After this procedure discharge summary is sent for keying. Billing department receive case sheet by transport. Billing department make up bill. Patient relatives pay bill at billing counter. They fill up feedback form if they consider it necessary.

3.3 Operational Analysis of Current Method

First of all complexity appears due to structure of hospitals, because in hospitals there are many primary wards and secondary units away from one another. Patient journey covers almost all the units for getting treatment. Many other complications occur during treatment are discussed here.

- In emergencies situations and also in morning timing an interruption appears in admission procedure when patient enters into the hospital because there is availability of LAN by which obtainability of the beds can be easily checked.

- Transportation process of patient is delayed because of the problems in transport staffs. So there is a need of maximum staff for taking up patient to any section and sub section easily for treatment.

- Research samples are directed to laboratory by workers or by the help of couriers. Due to which handoff delays appear.

- Delay also appears in diagnostic tests passed before cath lab processes as a consequence of shared Echo machines in primary section and sub section:
- Duty Medical Officers are fewer in number as related to Doctors which cause a big problems: Number of Duty Medical Officers should be in ratio with Doctors
- In case of emergency lifesaving medicines like urokinese, streptokinase etc. are in shortage because of expensiveness cause major delay during treatment.
- In case of discharge a separate billing procedure is not present in hospital. That is also a cause of delay.

4 ARCHITECTURE

Bonita soft architecture is presented over here to in figure 1 show overall methodology (Bonita Soft, 2014)
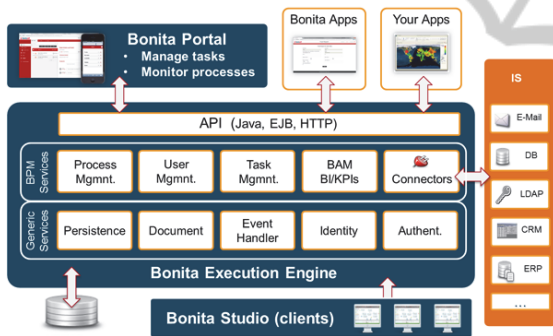

Figure 1: Bonita Soft Architecture.

5 IMPLEMENTATION

For overcoming of previously mentioned problems, there is need to replace old paper based system with paperless and automated system. Bonita Soft is a tool used for implementation. It is workflow optimization tool having capability of communications, and identifying chances for refining the supply of healthcare services by the reduction of costs and maximizing revenue. It provides surety in delivery of information to relevant person in a given time by focusing on 4 important points patient-centered communications, increased throughput, proficiency and complete data.

We consider all 32 steps of workflow reengineering methodology to attain our related goals. First of all an objective is set and then starts changing in existing workflow in order to attain all performance goals in cardiology hospital, For this purpose task are prioritised and we make form according to administration and customer/patient. And operational of business cycle component are prioritised.

After the identification and recording of all the processes of a business, single process is selected for implementation by the team. Team uses *Weighted Selection Approach* to rate each process. The scales from 1 to 5 are used for the factors of changeability, performance, and business and customer impact (Harrington, 1991). For determination of value of every element following questions are important.

5.1 Reengineer Process for Workflow

First of all efficiency of existing system is measured. On the basis of these identification new goals are specified. Reengineering process includes following steps:

- *Transformation and Elimination of Unimportant Tasks:*
Workflow tasks are of three kinds (Harrington, 1991)

- The tasks those are important to the customer.
- The tasks that important for business but not for customer.
- The tasks that are totally unimportant

In cardiology department there are many unimportant tasks that are the major cause of delay like that are shown in following flow charts.

- *Arrangement of Tasks:*
In normal routine, tasks are arranged in serial sequence. This arrangement unreasonably increases the length of cycle of process. The tasks should be performed in parallel sequence because parallel processed task are performed automatically in short timer. For example when patient reached to his bed all of requirement of his treatment should be processed initially. All the tasks in cardiology hospital are arranged in natural order like first of all patient checkups then admission is processed etc.

- *Positioning of Object:*
Transfer of object from one place to another around the department is very much expensive and time consuming. It causes overhead in tracking all the process associated with each other. (Hammer and Champy, 1993). Each and every task in cardiology department has to be observed to understand for

their functional expertise that is already assigned or it can be accomplished with the help of other workflow participant.

- *Combination of Similar Tasks:*

In cardiology hospital all the hand-off in admission, lab procedure, in patient checkup should be removed by the help of tool used in order to increase efficiency, cycle time and cost reduction and improve quality. By using tool like Bonita soft all the paper work is removed and similar tasks are combined.

- *Transfer of Decision Power to Smaller Level*:

In hospital to increase the speed of tasks of processes, decision power should be distributed even at smaller level. Because at every level approval confirmation causes delays which is risk to patient life

- *Reduce Checks and Controls*:

Spontaneous checks and control should be stopped. Because they cause delays in hospital operations and procedures. Bonita soft is very much dynamic tool that can easily provide status information. With the help of this there is no need to stop of procedures running in the hospital.

- *Reduction of Task Completion Time:*

The cost of product is directly affected by the task completion time. If we reduce this time quality and efficiency of product increases. Bonita soft is an automated tool that performs this work efficiently. By using this sub tasks are dynamically created that reduce burden

- *Removal of Blockages and Resource Shortages*:

When workflow processes are slow down at a point, blockages occur. Transfer of object from one place to another also become slowly. Due to which many processes are lined up in queue. Such slow process binds resources needed at other point. Many problems occur because every patient needs full treatment resources. He cannot wait for even a single resource. It is duty of team to identify all blockages and remove them. Number of employees and resources should be according to requirement of hospital.

- *Making Multiple Versions of the Process*:

In backup and recovery many version of processes should be produced. Tool mentioned over here has an ability to store all backup process for future. In hospital it is very mush necessary in case of treatment, billing etc. because record of every patient is essential for future consideration (Hammer and Champy 1993).

6 RESULTS

The proposed framework uses the most recent standards and technologies for modeling and implementing workflow system. It uses BPMN Bonita soft tool to model the as-is and to-be workflow system. The choice of BPMN is due to its capacity and richness to represent different workflow patterns and different business process.

Bonita soft is very much efficient tool where machines movement of patient through hospital can be shown easily. This tool has an efficient graphical user interface. Using that tool following automated workflow is produced that will covers all the problems in cardiology hospital. When we run that workflow task screen appears at every desktop of doctor, admission desk, lab completing available tasks we can attain our officer and billing department. Following figure shows flow overall process. After implementation automated workflow is shown in figure 3.

7 CONCLUSION AND FUTURE WORK

Patient health is very much important in cardiology hospital. Efficiency and high quality are critical missions that every hospital wants to attain. The paper targets at a framework enabling the re-engineering of business processes in order to improve clinical procedures. Thereby, a case study has been conducted to reveal insights on real-world processes in the given context. The presented framework is applied to the investigated processes and results are shown with respect to the improved processes. Moreover, architecture of the framework is presented.

The proposed future work is that we will calculate the performance of all reengineered tasks using four parameters like cost, quality, time and flexibility with the help of devil's quadrangle.
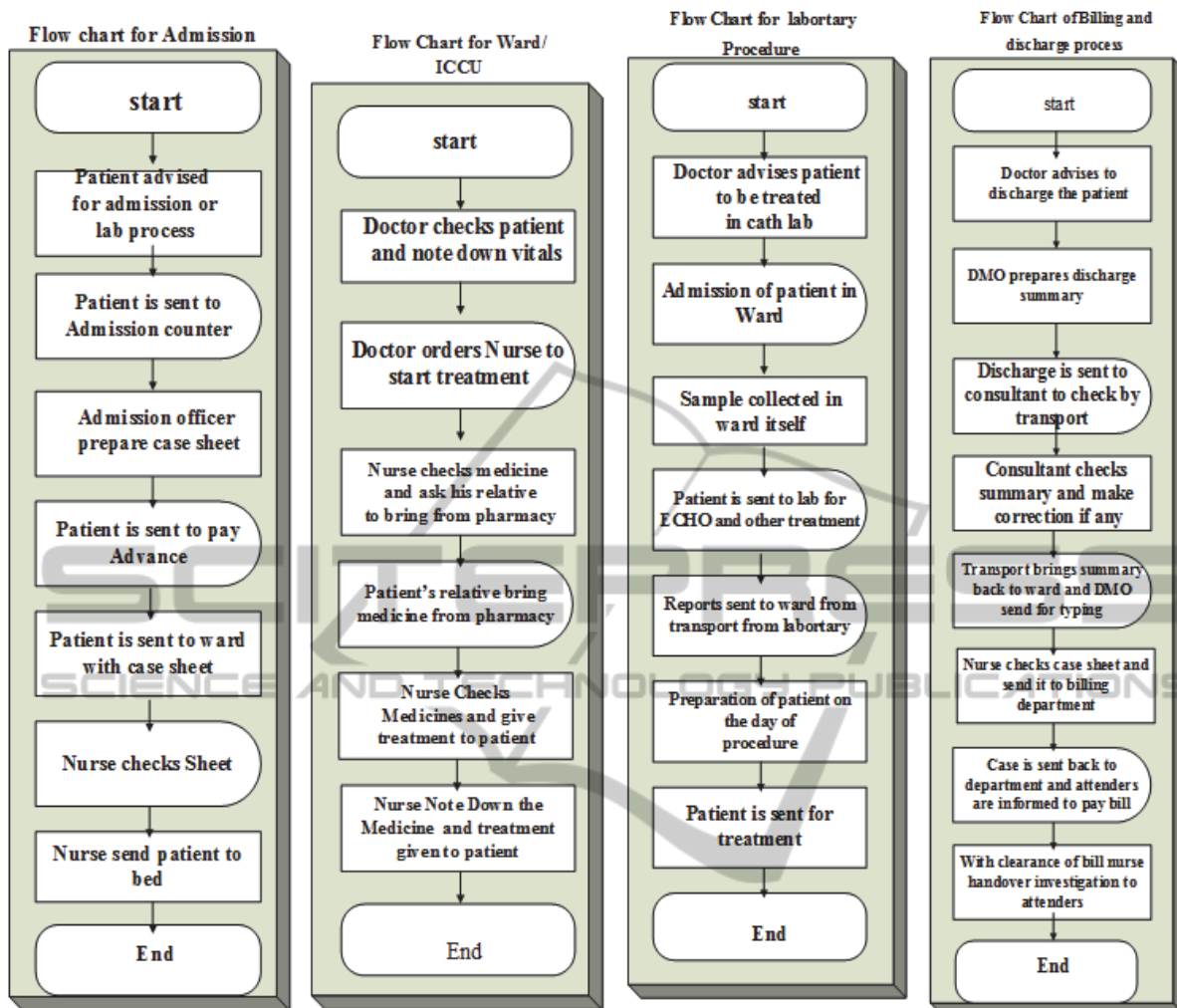
Flow chart for Admission

start

Patient advised for admission or lab process

Patient is sent to Admission counter

Admission officer prepare case sheet

Patient is sent to pay Advance

Patient is sent to ward with case sheet

Nurse checks Sheet

Nurse send patient to bed

End

Flow Chart for Ward/ ICCU

start

Doctor checks patient and note down vitals

Doctor orders Nurse to start treatment

Nurse checks medicine and ask his relative to bring from pharmacy

Patient's relative bring medicine from pharmacy

Nurse Checks Medicines and give treatment to patient

Nurse Note Down the Medicine and treatment given to patient

End

Flow Chart for labortary Procedure

start

Doctor advises patient to be treated in cath lab

Admission of patient in Ward

Sample collected in ward itself

Patient is sent to lab for ECHO and other treatment

Reports sent to ward from transport from labortary

Preparation of patient on the day of procedure

Patient is sent for treatment

End

Flow Chart of Billing and discharge process

start

Doctor advises to discharge the patient

DMO prepares discharge summary

Discharge is sent to consultant to check by transport

Consultant checks summary and make correction if any

Transport brings summary back to ward and DMO send for typing

Nurse checks case sheet and send it to billing department

Case is sent back to department and attenders are informed to pay bill

With clearance of bill nurse handover investigation to attenders

End

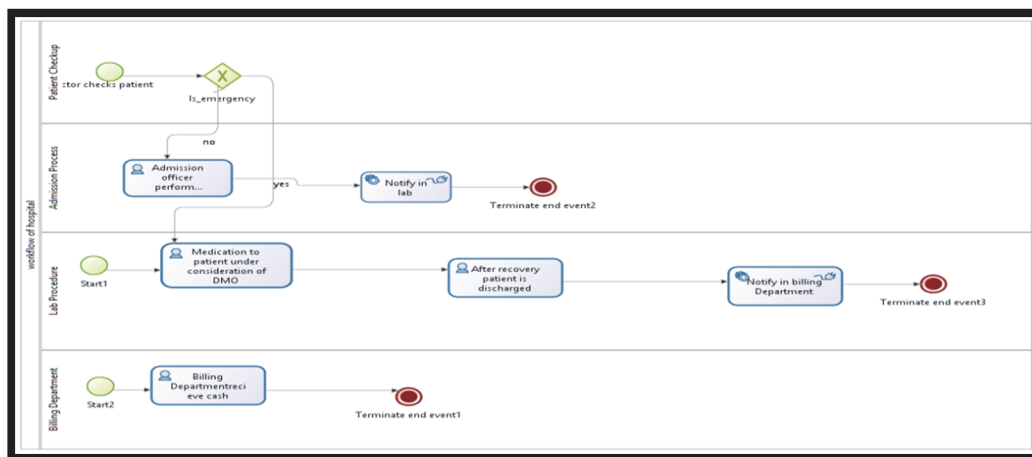Figure 2: Flow Chart of System.

Figure 3: Automated workflow.

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