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Performance Evaluation of Innovatively Reengineered Process in Cardiology Hospital using Devil's Quadrangle

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ABSTRACT

Medical industry is of vital importance as it deals with the health affairs of humanity, an effort to contribute the assistance with respect to saving of health, wealth and time of the individual and the system (community). In cardiology hospital patients and attendants normally face many troubles (problems) while seeking the treatment for their disease, like access to proper place, excess of waiting time, lack of information in admin and control etc. It is necessary to reengineer tasks hierarchy and sequence in cardiology sector for solving patient's problems and saving the financial cost. Business process reengineering recovers the procedures of the business process including its improvement. In this paper we present a case study of cardiology hospital named Armed Forces Institute of Cardiology and National Institute of Heart Diseases" (AFIC-NIHD). First of all we reengineer tasks and present them with the help of workflow optimization tool called Bonita Soft. And then calculate the performance of all reengineered tasks using four parameters like cost, quality, time and flexibility with the help of devil's quadrangle. We have explored how workflow reengineering steps effect on these four parameters and how this reengineering methodology implementation is fruitful.

Keywords: *Medical Re-engineering, Devil's Quadrangle, Workflow Optimization*

1. INTRODUCTION

Business process reengineering (BPR) is an important factor for each and every factory and firm because they want to reduce production cost, increase production quality at proper time and speed. All this is possible with the help of BPR [1]. Cardiology sector is very much important and rapidly progressing sector in all over the world. Many problems like higher cost, increasing waiting time etc are appearing in sector. When cost grows up then it has to be maintained by the managers for improving quality [2].

This sector can be improved by using business process reengineering. In this procedure first of all we introduce clinical "as-is" process. These processes are mapped process. From these processes unwanted steps and activities are identified then new processes are produced named as "to-be" processes. [3, 4, 5]. In many cases reengineering becomes essential because adjustment of the process does not do useful work [6]. Business process reengineering can produce brainstorming results, if they are properly applied. By [7] comparing of performance of to-be process can help to locate the area where more changes are needed. Expenses and error can be reduced by performing simulation of to-be process. [8]. In order to achieve cost reduction, they can eliminate some extra costs such as simplifying the process and eliminating some steps or roles [9, 10, and 11]. Business process reengineering is very much important in organizations because it can easily utilize information technology features 12]. It can be easily used as tool because it has greater power of variation and flexibility. Each organization want to adopt because of its improving power in efficiency [13]

On the other hand workflow analysis and design is done it in all relevant industries [14]. It has greater scope because it is important due to 3 aspects1) cost reduction, 2) time reduction [17], 3) improvement in quality, productivity and flexibility [15, 16, 17]. Business process reengineering is most widely used in hospitals because in 1997 USA presented a report according to which Business process reengineering (BPR) performs vital role in cost reduction [18, 19]. For attaining that purpose some extra cost is removed in hospital process by simplifying and eliminating some extra steps [19, 20, and 21]. Business process reengineering (BPR) is also meant for improving clinical performance, empowerment and satisfaction of employees [20].Here first of all we have performed reengineering of processes of cardiology hospital then we evaluate performance of that processes. How each step of reengineering affects overall quality, cost, time and flexibility? For evaluation following framework is used.

1.1 Evaluation Framework

Devil's quadrangle is an evaluation framework especially for workflows. There are 4 dimensions that are affected during reengineering cost, time, flexibility and quality. [22]. in ideal behavior time needed for process handling decreases. Execution cost of process decreases, quality and flexibility for process variation increases. This model has an interesting behavior of tradeoff where the surge for a particular key aspect may negatively affect other dimensions of a particular system.

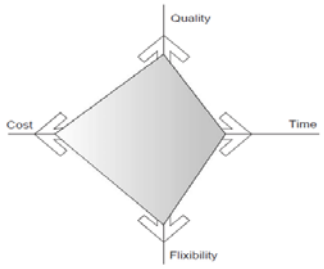

Figure 1: Devil's Quadrangle

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1. Drawbacks in Cardiology Hospital Workflow

Patient flows in hospital in horizontal manner. Many complexities appear during this movement. First of all this difficulty appears due to structure of hospitals, because many medical units are away from one another. For treatment purpose patient have to cover almost all the units. This patient journey faces many types of threats. 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 no central system available by which obtainability of the beds can be easily checked.
- Transportation process of patient is delayed because of the problems in transport staffs.
- 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. is 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.

2.2 Workflow Reengineering Steps

- Elimination of unimportant Tasks
- Arrangement of tasks
- Positioning of object
- Combination of similar tasks
- Transfer of decision power to smaller level
- Reduce Checks and Controls
- Reduction of Task completion Time
- Removal of Blockages and Resource Shortages
- Make Multiple Versions of the Process

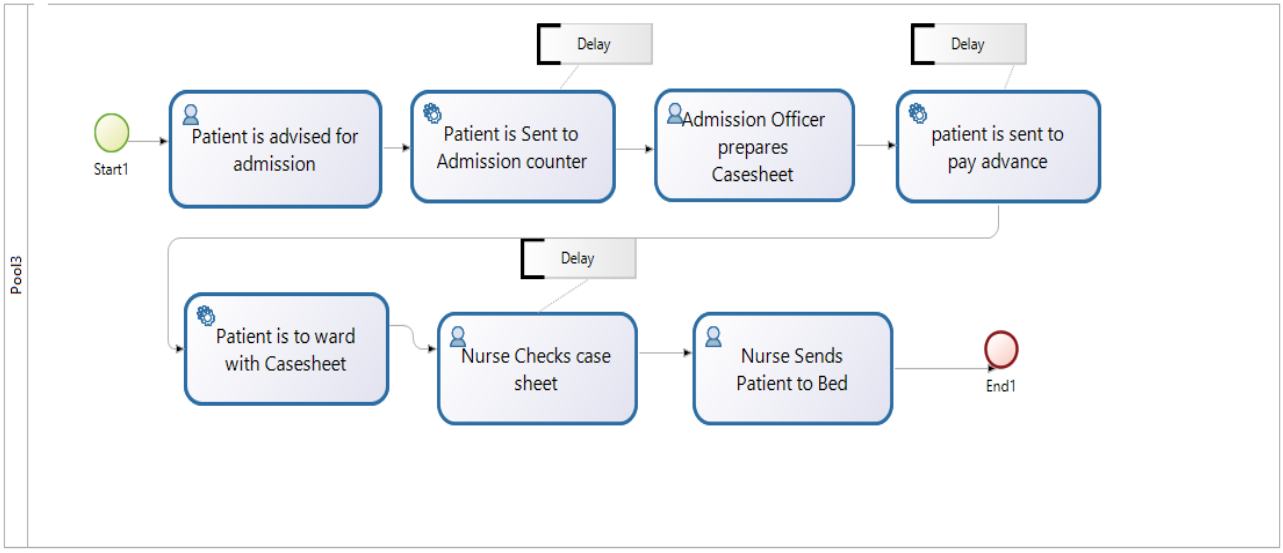

Figure 2: Workflow of Patient in Admission Process

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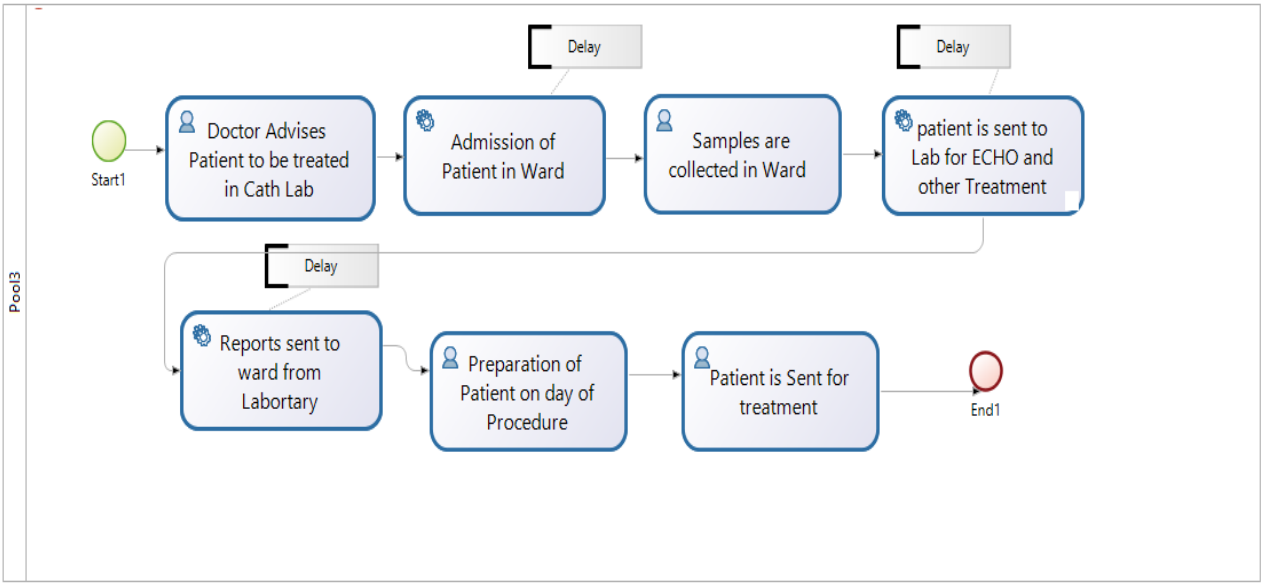

Figure 3: Workflow of Patient in Ward

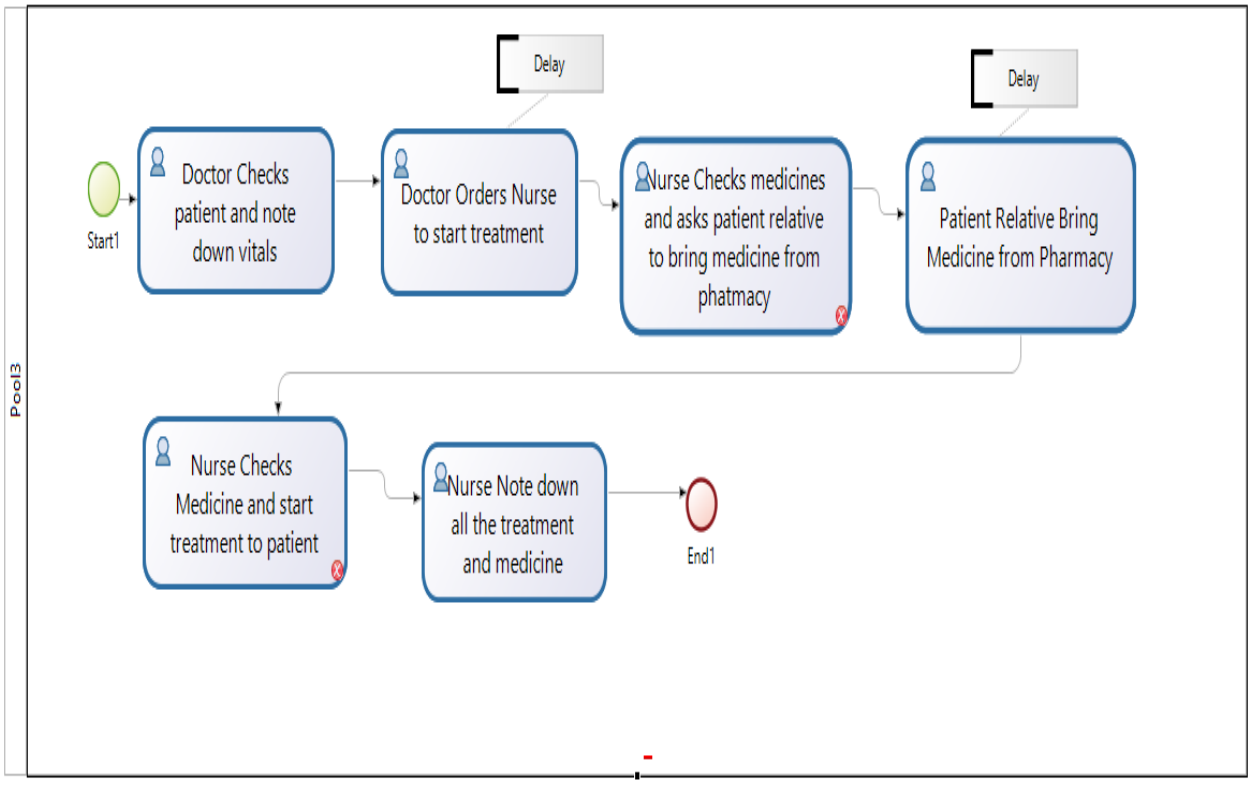

Figure 4: Workflow of Patient in Lab

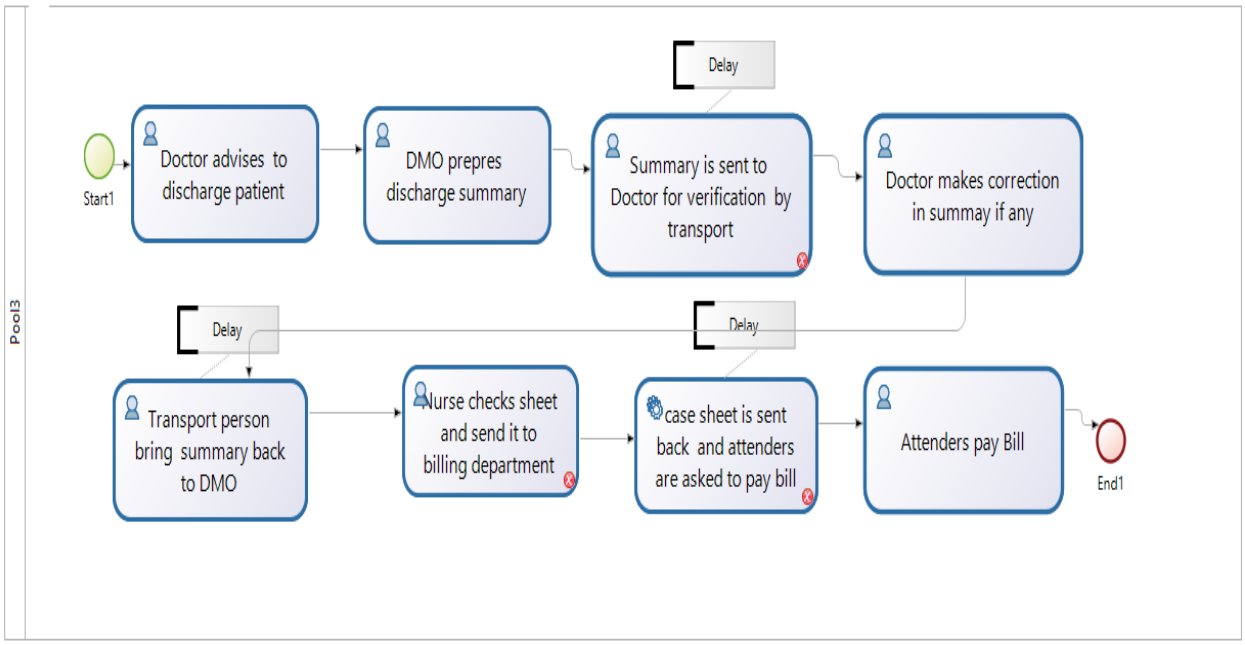

Figure 5: Workflow of Patient in During Discharge

Workflows of patients in different sections are shown in figure 2, 3, 4 and 5. After applying above steps of workflow reengineering with the help of Bonita soft patient problems are solved and following workflows are produced.

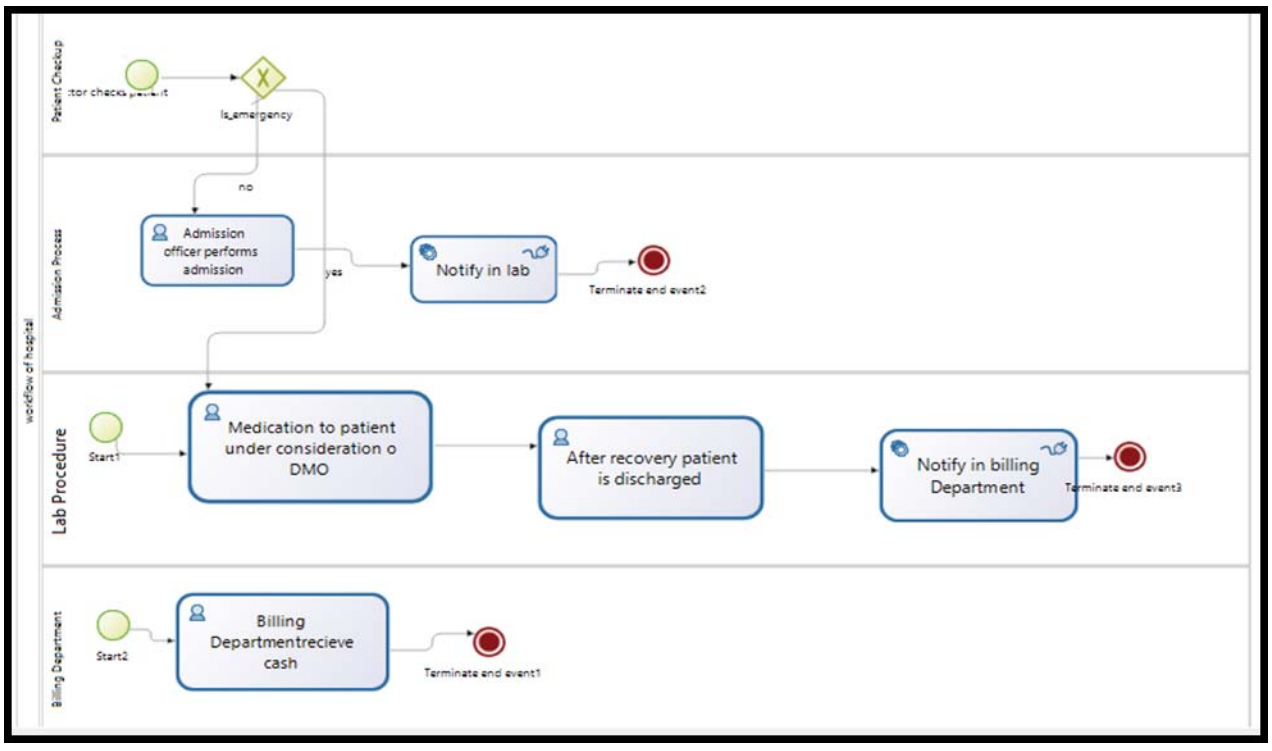

Figure 6: Automated Workflow after Reengineering Application

2. PERFORMANCE EVALUATION

For performance evaluation Devil's Quadrangle is used, through which we will check how introduction of each step will effect time, cost, quality and flexibility. In diagram grey color part represent neutral behavior.

Transformation and elimination of unimportant Tasks

Unimportant tasks are those which don't provide any benefit to customer. In cardiology hospital unnecessary tasks are like patient wait at admission counter for cash payment, patient relative brings medicine from pharmacy, patient wait time at billing department etc. All these are unnecessary task and are eliminated. Elimination of unnecessary task reduces time, cost and flexibility and quality increases [24], [23]. The aims of this best practice are to increase the speed of processing and to reduce the cost of handling an order. An important drawback may be that the quality of the service deteriorates.

Arrangement of tasks

Serial processing of task increase 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 checkup should be performed then admission if necessary, otherwise patient should be sent to lab for treatment. If patient recover the discharge of patient should be performed. Then billing department performs billing activity. In existing business processes, actual tasks orderings do not reveal the necessary dependencies between tasks. Arrangement of task increases time, cost and flexibility and quality increases.

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. Each and every task in cardiology department has to be observed to understand that it has functional expertise 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. After doctor checkup patient data is automatically sent to the admission desk for admission and if emergency patient data is directly sent to lab for lab treatment. After discharge patient is sent to billing department for clearance whose data is already sent. When similar tasks are combined then a larger task is created quality is increased because many smaller tasks are executed as one.

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. Due to this quality and flexibility increases and time decreases.

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. In cardiology each and every patient is at risk such type of delays cause severe effect on patient health and life. When we don't stop procedure then cost, quality and flexibility of work increases, less time is needed to complete the process.

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 which is major cause of delay and increase in cost and quality production.

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 requires 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 should be according to requirement if one is facing overburden then other will take responsibility of performing all these removals. Number of resources should be according to requirement of hospital. In this case time needed for process decreases but flexibility and cost increases [24].

Make 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. In this case quality and flexibility increases but time decreases to complete task.

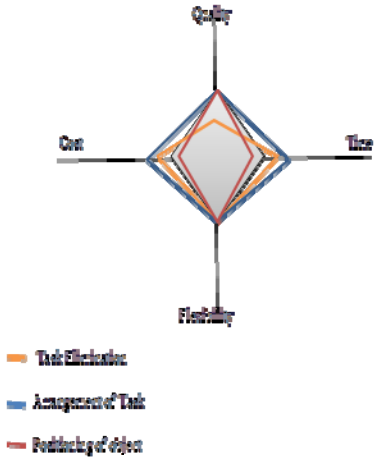

Figure 7

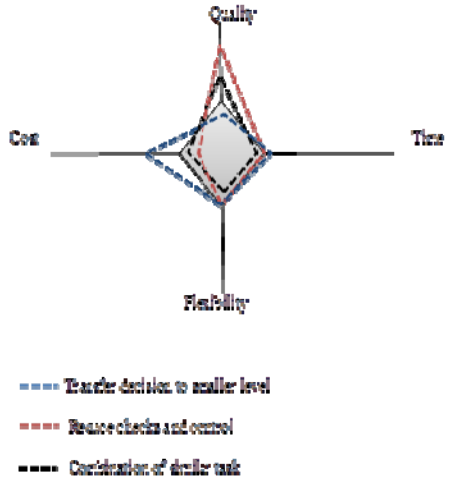

Figure 8

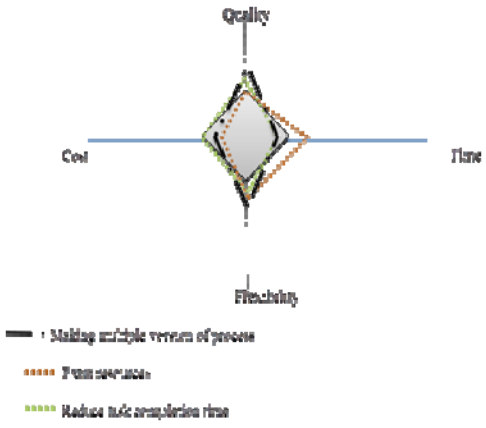

Figure 9

3. CONCLUSION

The movement of patient is very much important in cardiology hospital. Efficiency and high quality are critical missions that every hospital wants to attain. It is very much necessary to bring staff together through an automatic tool. Training should be given to each person for providing high quality health. Bonita soft is very much efficient tool where machines movement of patient through hospital can be shown easily. This tool efficient graphical user interface. By the application of reengineering principles hand off delays are removed. When we apply Bonita soft tool for reengineering purpose and check all the reengineering step using Devil's quadrangle then following results are produced.

- Overall cost decreases
- Performance increases
- Overall time decreases
- Customer services increases

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