

Application of Total Quality Management in Utility Sector A Case Study

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Abstract— After the great successes of TQM in manufacturing sector it is now largely used in service sector. In our study we have made an attempt to apply tools and methodologies of TQM in a power distribution company in New Delhi. The main focus of our study is time taken in Attribute change process. The top issue faced by this organization is that the attribute change requests are not being resolved in desired time due to which company has to face various consequences like unsatisfied consumer, a dent in the brand image and on top of all penal charges from regulatory body. In our case study we took this problem as an opportunity and applied our knowledge to find the issues in process and tried to improve it. We used PDCA methodology for solving the issues and evolving recommendations to improve the process. At the end request which goes beyond 7 days has been decreased from 59% to 7% in Name change process and 55% to 11% in category change process. These results are confirmed through Hypothesis testing in Mini Tab.

Keywords— Attribute change, PDCA (Plan, Do, Check, Act), Hypothesis Testing

I. INTRODUCTION

Total Quality Management is a system approach for managing quality. It is the set of activities perform to improve the product and service of the system. The three words has different meanings:

Total: Involving everyone in all functional areas at all levels.

Quality: Degree of excellence a product or service provide to meet the customer requirements.

Management: Act, art, or manner of handling, controlling, directing etc.,

Effective utilization of resources.

During past few years' service sector is evolving very fast and has become very important part of global economy. Service sectors account for more than 75% of the GDP in developed countries and currently, the same trend is being observed in most of the developing countries [1]. In India also, it evolving at very fast rate e.g. online shopping, call centers, online food delivery, banking etc. Digital India, one of the initiate taken by government has given boost to the growth of service sector. There is different sector which come under service sector and one of them is utility sector. Utility sector contain those companies which provide gas, water and electricity to its consumers and society of the nation

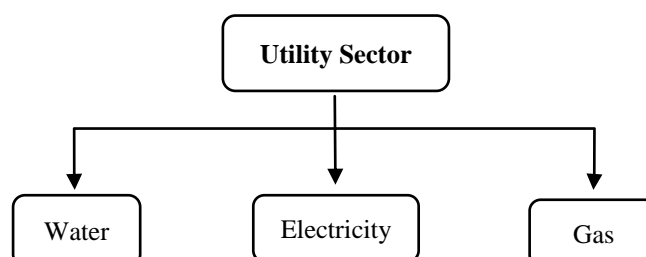


Fig. 1: Classification of utility sector

Our study focuses on power distribution organization which buy electricity by different sources in India (NTPC, NHPC etc.) and distributes among its consumers. They also take care of infrastructure and maintenance and the same. we have worked on attribute change process which contain Name change (change the name of the connection) and category change (change the category of connection for electric load supplied) process for consumers. The company is somehow not able to complete the process in desired time that is 7 days and therefore face the consequences. So, our main target is to identify the cause and non-value-added activities in process, eliminate them and give recommendations to further improvement in the process. As this project is run on pilot bases for 3 months in a particular district area and results are analysed and validate through hypothesis testing.

II. LITERATURE REVIEW

TQM is both a philosophy and a set of guiding principles that comprise the foundation of a continuously improving organization [2]. It improves performance by lowering costs, increasing revenues, delighting customers, and empowering employees [3]. TQM can only be implemented successfully if certain critical dimensions are addressed, i.e. management commitment and support towards TQM, motivating and training of employees, and monitoring of customers' requirement through feedback [4]. In it empowered employees who are properly and adequately guided and trained, take decisions that help to achieve the vision of the Organization [5].

Customer is most important factor and many decisions in TQM are taken according to customer needs. TQM also focus on activities which result in customer delight e.g. better service, gifts coupons, after service care etc. TQM focuses strongly on the importance of the relationship between customers and as well as employee [6]. Hence, it is one of the success factors of TQM

So, in this literature review some of the important factors and dimensions of TQM are learned which help in further study

III. CASE STUDY

The project begins with collecting of evidence for the unstable process. We enquire the process with concerned department and collect the data of previous month. From here our PDCA methodology for process start.

❖ Plan

We start with analysing the given data and plot run chart. To get greater understanding of the process we also plot process flow diagram of the process with the help of concerned department persons which is shown in Fig 3.

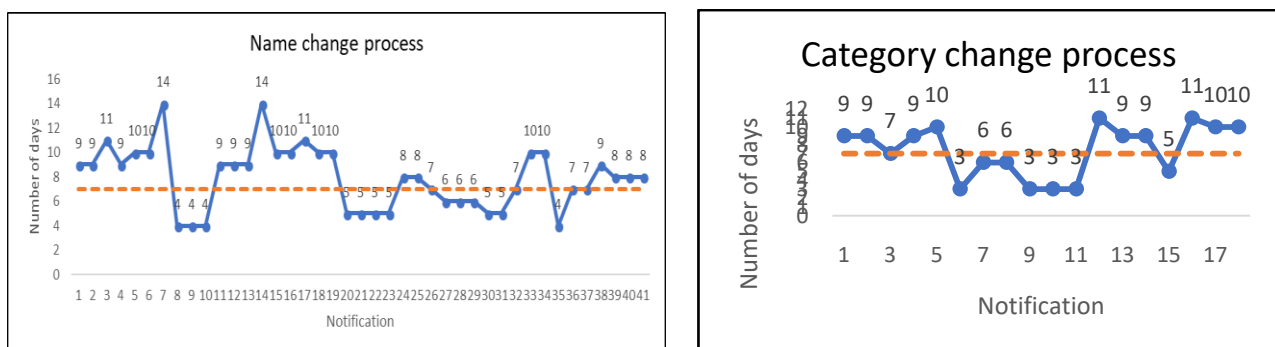


Fig.2: Run Chart for Attribute change processes Jan 2018

- From the above run charts (Figure 2), we analyse that:
 1. Out of 41 requests 24 goes beyond control limit i.e. 59% requests.
 2. Out of 18 requests 10 goes beyond control limit i.e. 55% requests.
- To understand the workflow of the process we prepare process map of the process under the guidance of CMG (consumer management group).

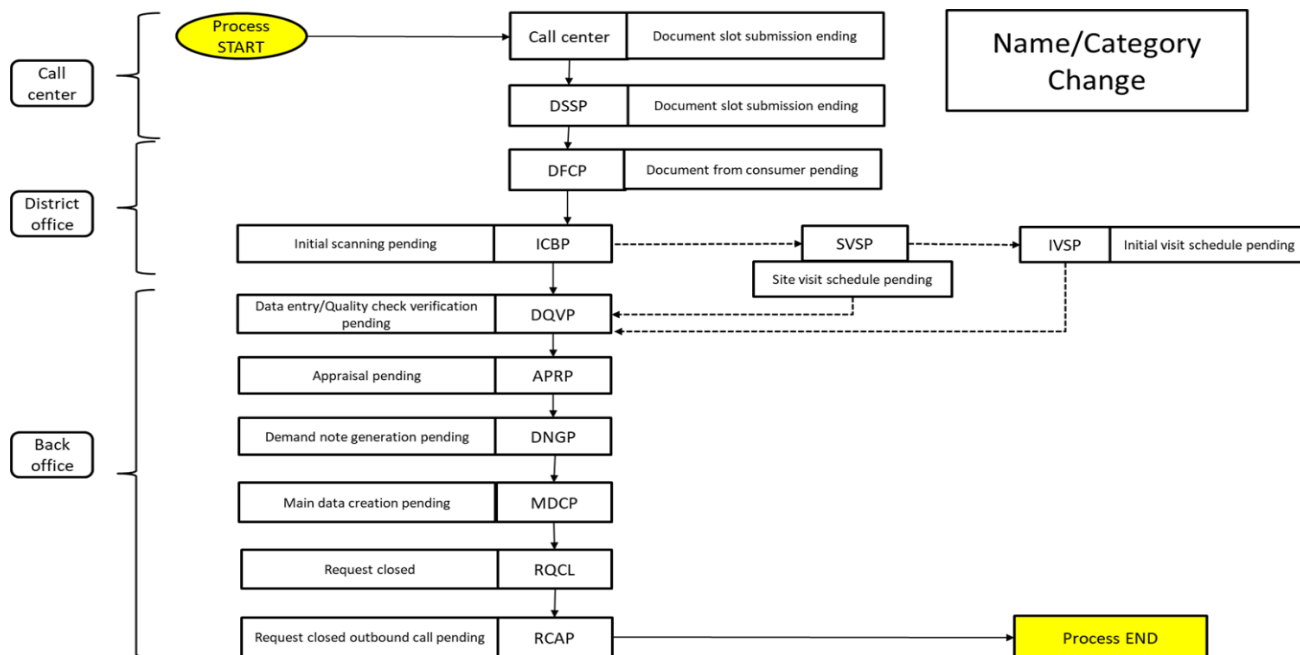


Fig. 3 Process Map

- From the run chart we come to the conclusion that there is problem in process as many points goes beyond the control limit i.e. 7 days, so with these evidences we arrange a brainstorming session with concerned member from the organization. Number of reason comes out for the failure of process. From the output of brainstorming session, we create affinity diagram based on number of possible reasons.

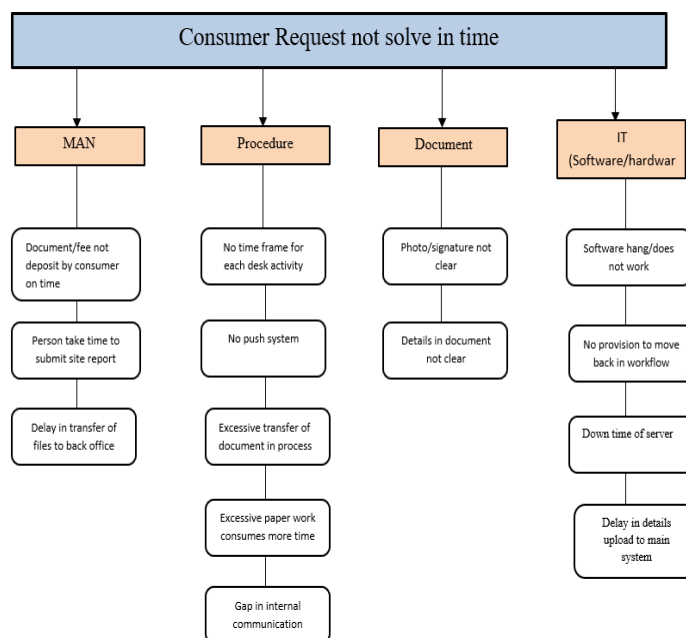


Fig 4: Affinity Diagram

- After finding the potential cause for the delay in process completion we need to find out the valid causes, for that we take the help of Quality impact matrix and short least the causes which have high and median impact on the process.

Impact

	High	Medium	Low
Controlled	1. Delay in transfer of files to back office. 2. No time frame for each desk activity	1. Excessive paper work consumes more time	1. Excessive transfer of documents 2. Gap in internal communication
Uncontrolled	1. Document/fee not deposit by consumer on time 2. Photo/signature not clear 3. Details in document not clear 4. Down Time of server	1. Software hang/does not work 2. No provision to move back in workflow	1. Delay in details upload to main system

Fig 5: Control Impact Matrix

➤ From the above matrix it become easy for us to find out what are the real causes which have impact on the process. From here we divide our project in two parts

1) Working on the real causes

2) Find the Non-value-added activities and suggest recommendations to eliminate them. Working on first part we use why-why analysis tool to find out root cause.

Cause 1	Delay in transfer of files to back office.			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Files not pick from district Office on time	No particular schedule to pick files	Duration of desk activity for the documents in district office is not defined		

Cause 2	No time frame for each desk activity			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Due to new guidelines, activity completion time reduced	New internal desk timeline not created	PA department does not take initiative	Communication gap between Departments	

Cause 3	More paper work consumes more time			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Excessive paper work equal to more number of activities	More activities consume more time			

Cause 4	Document/fee not deposit by consumer in time			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Forget to deposit/busy	No reminder from organization			

Cause 5	Photo/signature not clear			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Documents are not checked on front desk	Duty is not assigned to respected person			
Cause 6	Details in document not clear (Consumer ID & Property)			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Details are not checked on front desk	Duty is not assigned to respected person			
Cause 7	Down Time of server			
1 st Why	2 nd Why	3 rd Why	4 th Why	5 th Why
Internal failure in server	High user traffic/network issue	Use of old devices		

Table 1: Why-Why Analysis

- After identifying the root causes, different counter action is recommended. These actions are discussed with management and concerned department and list of feasible action is formed which can be implemented in the process.
- These all actions are implemented in the DO phase of the project.

Cause	Proposed Action
<input type="checkbox"/> Delay in transfer of files to back office.	1.No document should be older than 2 days in document collection center.
<input type="checkbox"/> No time frame for each desk activity	1. New time lines be formed for each desk activities and communicated to concerned persons
<input type="checkbox"/> More paper work consumes more time	1. Digitally scan and transfer of document, reduce time consumed in activities.
<input type="checkbox"/> Document/fee not deposit by consumer in time	1. Reminder in the form of SMS and email will be send to consumer for document and fee submit request.
<input type="checkbox"/> Photo/signature not clear	1. verification of documents by first desk person with id proofs
<input type="checkbox"/> Details in document not clear (Consumer ID & Property)	1. Verification of documents and check of id proofs and required property papers are of same individual
<input type="checkbox"/> Down Time of server	1. Wi-Fi Routers updated 2. Software updates in systems

Table 2. Cause and proposed actions

Process map: After working on causes we decide to walk through the process and identify the activities which utilize more time. For this we use Process map to understand each activity. Here we use *lean philosophy* of TQM and categories the activities in the form of waste (That does not any value to process).

- Random 20 notifications of each process are analysed and detail process map is formed which also represent the waiting time in each desk activity.
- One-one example for each process is described above.

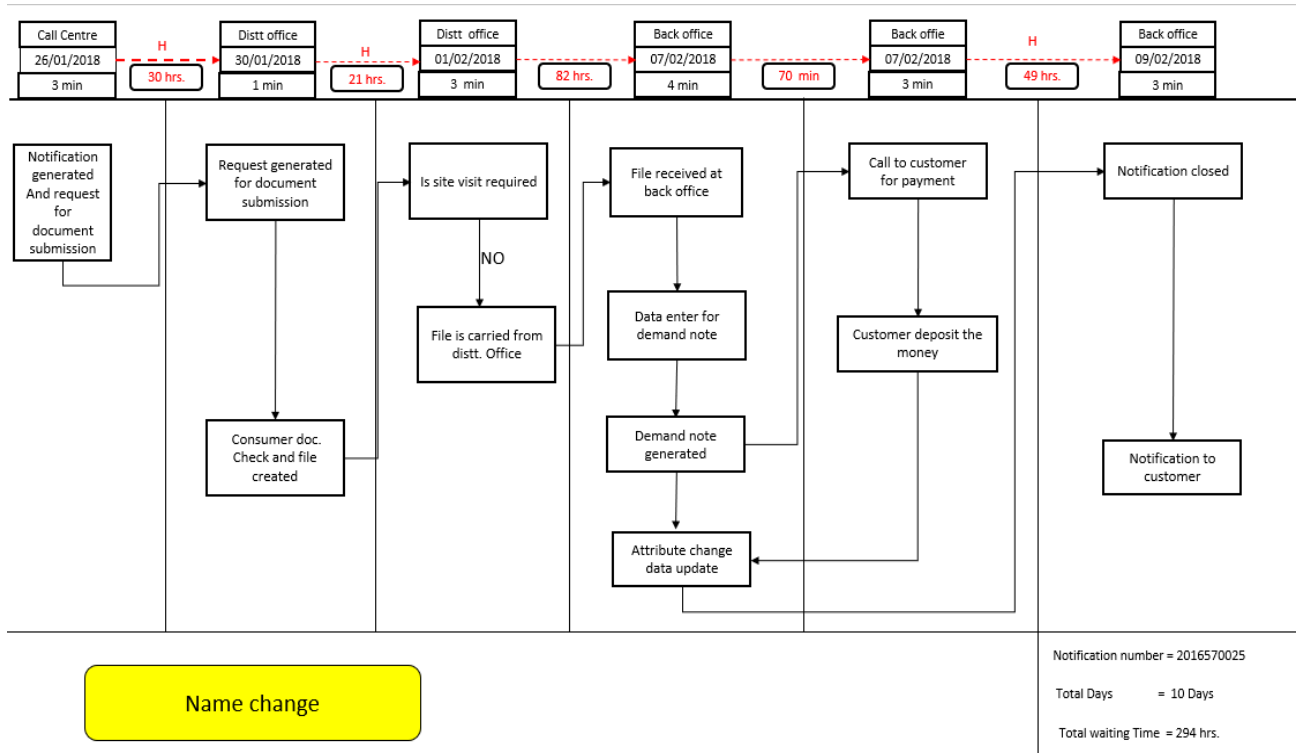


Fig. 6: Process map for Name Change Process

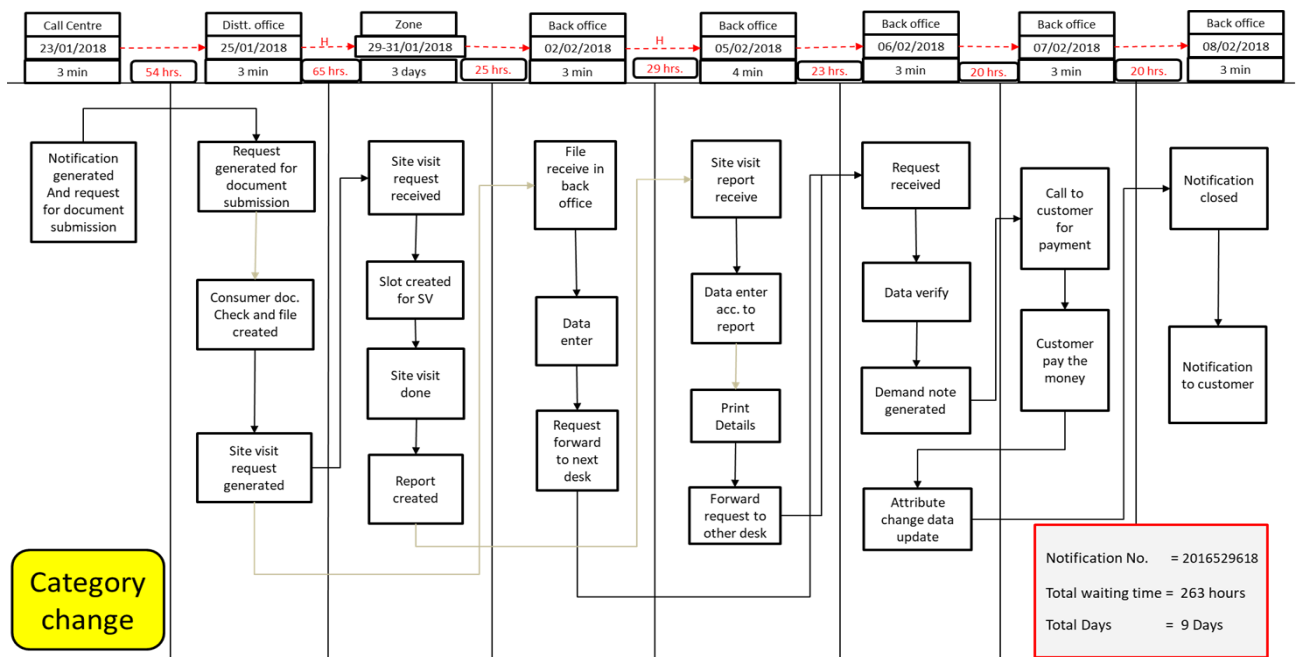


Fig 7: Process map for category change process

- After analysing the process step to step, activities are identified in the process that does not add any value to process or need to be revised and utilize more time, hence lead to waste.
- These activities are now categories in the form of waste and their impacts are described.

Waste	Activity	Impact
<input type="checkbox"/> Motion/ Waiting	Physical transfer of documents from District Office to Back Office	Manpower Cost Extra Time for document transfer
<input type="checkbox"/> Inventory	Storage of ID Proof + Ownership Doc (physical copies) required for Name change Storage of ID Proof + Ownership Doc + Site Visit Report (physical copies) required for Category change	Additional Papers leading to storage problem and subsequent disposal
<input type="checkbox"/> Rework	Re-entering the data as there is no option to “Reject & send Back” in case of deficiency found during the internal processing of request through workflow	Extra Time consume

Table 3: Wastes and their Impact

- After identifying waste, actions are proposed to create check in process and alter the process according to needs.
- All these recommendations help in reducing cycle time of process, monitor and improve it.

Proposed Action	Implementation
Digitally transfer of file from district office to back office	By Using Front Desk person
Provide option to consumer to register and upload details	Through Module In company App
Specify time for each desk activity and monitor them using control charts. Create a warning system in process to alert for notification going above time limit.	Through SAP and Minitab
Add option to go back to previous step or to correct the details enter in system.	Return option in process workflow activities in software

Table 4: Proposed action for waste activities

❖ **Do Phase:**

- In this phase all the recommendations which are suggested in plan phase are implemented practically on pilot bases for three months and data is collected accordingly.
- Regular monitoring and feedback are examined from concerned departments and consumer.

❖ **Check Phase:**

- After implementing these recommendations in process, we observe a favourable change in it.
- To validate these changes, we again collect data from PA department and plot the data using Run chart.

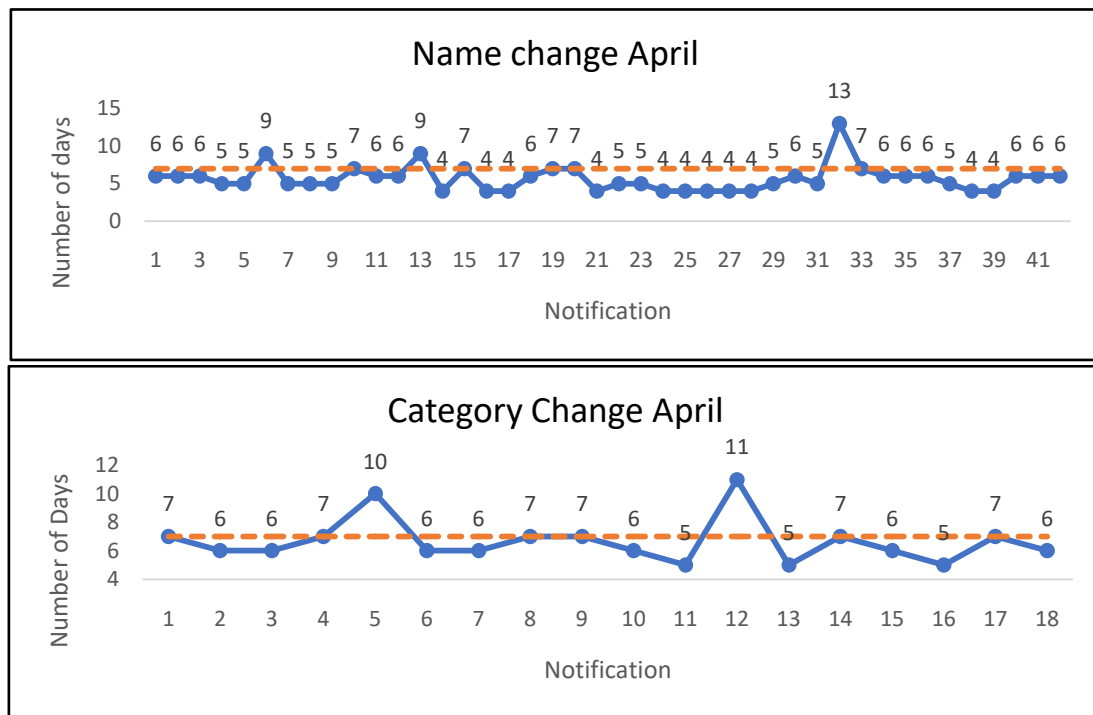


Fig. 8: Run chart for attribute change processes in April, 2018

➤ After plotting data through run chart, we come to the conclusion that our process has improved as compare to the previous month data.

❖ **Act Phase:**

- Based on the favourable outcomes from the project management decide to implement the project in two more districts.
- Digitally transfer of documents helps organization to contribute towards the environment perspective and decide to implement these kinds of idea in other activities also.
- In process check and time frame for each desk activity help reducing wastes in process, this idea is implemented in other platforms of the organization like in site visit schedule, site visit report etc.

IV. Results

- Results are classified into two categories
 1. Tangible
 2. Non-Tangible

❖ **Tangible:**

Name change process			
Scenario	Request beyond 7 days	Total request	% of request goes beyond 7 days
Before	24	41	59
After	3	42	7

Category change process			
Scenario	Request beyond 7 days	Total request	% of request goes beyond 7 days
Before	10	18	55
After	2	18	11

Table 5: Before and After scenario of Attribute change processes

➤ To validate our results, we use hypothesis testing technique using Mini tab.

Hypothesis Testing for Name change Process:

Sample	Total request beyond time	Total cases	Sample p
After	3	42	0.071429
Before	24	41	0.585366

Difference = p (1) - p (2)
 Estimate for difference: -0.513937
 95% upper bound for difference: -0.371498
 Test for difference = 0 (vs < 0): Z = -5.00 P-Value = 0.000

As the p value is less than the critical value of 0.05, there is significant evidence to conclude that proposed actions have resulted in reducing the time of the process.

Hypothesis Testing for Category change Process:

Sample	Total request beyond time	Total cases	Sample p
After	2	18	0.111111
Before	10	18	0.555556

Difference = p (1) - p (2)
 Estimate for difference: -0.444444
 95% upper bound for difference: -0.216501
 Test for difference = 0 (vs < 0): Z = -2.83 P-Value = 0.002

As the p value is less than the critical value of 0.05, there is significant evidence to conclude that proposed actions have resulted in reducing the time of the process.

❖ **Non-Tangible Results**

- Integrating Total Quality Management in utility sector improve the performance of the Attribute change process, help in identifying non-value activities and reduce them.
 - Recommendations suggested in these operations can also be applied in other processes like new connection, load enhancement, meter change process etc.
 - Digitally transfer of document decrease the use of paper hence, give positive result on environment.
 - Consumer has more than one platform to register and upload details which save time of consumer and results in customer satisfaction.
 - Maintaining Less paper records result in reducing the inventory of organization.
 - New services like SMS remainder, call remainder and e-mail will help consumer to submit the document in time
 - Requests are completed within time, hence result in satisfied customer.
 - The process in which maximum cases are completed beyond the time limit are now solved in time.

V. Conclusion

From the above study we come to a conclusion that Total Quality Management can be implemented in various operation of Utility sector and significant results can be achieved. Many time TQM is mentioned only for manufacturing industry but because of changing scenario its tools and methodologies also fit in Utility sector, yes there are some limitations regarding the use of tools in service sector but with proper guidance and practice this issue can be resolved. The above case study is one of the examples. Significant results obtained from this study shows that implementing Total Quality Management helps in achieving stable improvement in less time.

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