QUALITY TOOLS IN PROJECT MANAGEMENT

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Abstract: *Achieving desired quality is challenge which project manager should realize. In this paper will be presented basic quality tools which can be used in project. Also will be presented and benefits and cost of quality.*
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1. INTRODUCTION

A project is a temporary endeavor undertaken to create a unique product, service or result [1]. Temporary means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all other products or services.

Projects are undertaken at all levels of the organization. They may involve a single person or many thousands. Their duration ranges from a few weeks to a few years. Projects may involve a single unit of one organization or may cross-organizational boundaries. As projects are often implemented as a means of achieving an organization's strategic plan they are critical for the organizations growth.

Quality and customer satisfaction are one of primary aims which project should achieve. According PMI quality is the degree to which a set of inherent characteristics fullfill requirements [1].

Project quality management is compatible with ISO 9000 and ISO 10000 quality standards and guidelines. Project quality management includes the processes and activities of the performing organization that determine quality policies, objectives and responsibilities so that project will satisfy the needs for which it was undertaken [1].

Several quality-related problems are unique to projects. First, it is difficult to measure. In fact, often key stakeholders cannot evaluate the true quality of the project results until the benefit realization point, and then it is too late to do anything to resolve gaps.

And second, projects produce something new, there are few standards against which to evaluate results. This particular issue is not just at the overall project level, it often affects the individual assignment delegation process, when those doing the work cannot define the difference between "inadequate quality" and "good enough".

In this paper will be presented few quality tools which can be applayed in project in order to acomplish defined goals.

2. BENEFITS AND COSTS OF QUALITY IN PROJECT MANAGEMENT

The benefits of quality in project performance are many. First, a quality project and product will yield customer satisfaction. If project meet or exceed requirements and expectations, customers will not only accept the results without challenge, but may come back to additional work when the need arises. A satisfied customer may perceive greater value than originally anticipated, which goes beyond customer satisfaction to customer delight. Reduced costs are another benefit. Quality processes can reduce waste, improve efficiency, and improve supplies, all things that mean the project may cost less than planned. As costs go down, profits may go up (depending on the pricing arrangement in the contract on which the project is based) or reduced costs may mean more sales to an existing customer within existing profit margins. Finally, better products, better project performance, and lower costs translate directly into increased competitiveness in global market place.

There are numerous methods for calculating quality costs. For example, costs can be classified as either cost of conformance or non-conformance. Conformance costs include: training, indoctrination, verification, validation, testing, inspection, maintenance, and audits. Non-conforming costs include: rework, material waste, and warranty repairs [2].

Traditional prevention–appraisal–failure (PAF) model, classifies costs as follows:

Prevention - all amounts spent or invested to prevent or reduce errors or defects, that is, to finance activities aimed at eliminating the causes of defects;

Appraisal - the detection of errors or defects by measuring conformity to the required level of quality: issued architectural and structural drawings, work in progress, incoming and completed material inspection (e.g. reinforcement, door hardware, etc.);

Internal failures - due to scrapping or reworking defective product or compensation for delays in delivery; and

External failures - after the delivery of a product to the customer: costs of repairs, returns, dealing with complaints, and compensation.

Some quality costs can be estimated with a high degree of precision, while others can be only estimated. Costs will rise as more time is spent on prevention[3]. The greatest savings could be derived from reducing internal failure areas.

3. QUALITY TOOLS IN PROJECT MANAGEMENT

Delivering project with demanded quality is one of the most important goals of project management.

Quality control is a process that monitors specific project results to ensure that results conform to specifications. Many quality control tools are available to the project team.

Tools which are usually used in project management can be divided in few categories:

- Tools for collecting and understanding project data;
- Tools for understanding processes;
- Tools for analyzing processes ;
- Tools for solving problems.

3.1 Tools for collecting and understanding project data

Improper or incomplete collection of data is a fundamental error with an effect that may be magnified many times by subsequent action.

Some of tools which can be used for

collecting and understanding data are:

Check sheet - is a form used to collect data. Although a check sheet is used only to compile and record data, the collected data may provide a foundation for subsequent analysis.Check sheets are easy to understand and help translate opinions into facts. There are many different types of check sheets depending on the type of data and intended use. Each check sheet is custom designed for its special purpose. A thoughtfully developed check sheet permits the review of data from several viewpoints;

Graphs - are one of Ishikawa's seven basic tools. The purpose of a graph is to organize, summarize, and display data, usually over time[4]. Ishikawa described three different types of graphs, including line graphs, bar graphs, and circle graphs;

Histogram - is a type of bar graph that deals with data that exist in a continuous range from a low number to a high number. Histograms display frequency distribution, or how often (frequency) individual data points occur across the range of the data from low to high (distribution). Histograms summarize data in a form that is more easily understood than a table of collected numbers.

Pareto chart – is graphical tool that helps to break a big problem down into its parts and identify which parts are the most important[5]. It is a bar graph with data in descending order. This deliberate arrangement of data in descending order from left to right on the chart is its signature characteristic. It is named for Vilfredo Pareto, an Italian economist, who determined through study that wealth seems to be distributed in populations according to an 80/20 rule: 80 percent of the wealth is controlled by 20 percent of the population. This rule also seems to be valid for defects in administrative and production processes: 80 percent of the defects are caused by 20 percent of the possible sources of error.

Scatter diagram – is a plot of points to study and identify the possible relationship between two variables, characteristics or factors. The knowledge provided by a scatter diagram can be used enhanced more accurately by regression analysis [6].

3.2 Tools for understanding project processes

One of the most important step in managing project quality is to understand processes. Few quality tools for understanding processes are useful for project managers:

- Run charts;
- Control Charts.

3.2.1 Run charts

A run chart is a graphical display of data plotted in some type of order [7]. The horizontal axis is most often a time scale (eg, days, weeks, months, quarters).The vertical axis represents the quality indicator being studied (eg, costs, time…). Usually, the median is calculated and used as the chart's centreline. The median is required when using the probability based rules to interpret a run chart. The median is used as the centerline because it provides the point at which half the observations are expected to be above and below the centerline and the median is not influenced by extreme values in the data. Goal lines and annotations of changes and other events can also be added to the run chart.

A run chart is used to observe process performance over time. It is used for repeatable processes where performance is expected to be stable. A run chart will show defect trends, shifts, or cycles.

There are four steps in creating run chart: (1) Identify the process to be observed., (2) Collect data, (3) Create the graph, (4) Interpret the data.

3.2.2 Control Charts

Control charts are very powerful tools for monitoring, controlling, and improving processes over time. They are one of the most complex quality tools. Like run charts, control charts are useful to analyze repeatable processes in which results are expected to be stable over time. Control charts are the basic tools of statistical process control, which has been and continues to be widely used in manufacturing.

Control charts use sample data to generalize about a population. Small amounts of data, properly selected — and that usually means randomly selected — can provide sufficient information to make process decisions. Control charts use two types of data: attribute and variable.

Attribute data are binary. Something is or is not. Something is go or no-go. A report is either late or not late; the degree of lateness is irrelevant. Variable data are some kind of measurement. An environmental project may be concerned not about the presence or absence of contaminants in groundwater but about the level of contamination as measured on a continuous scale of parts per million.

The primary advantage of using a run chart is that it preserves the time order of the data, unlike statistical tests of significance that generally compare two or more aggregated sets of data.

Using control charts includes four steps:

(1) Collect initial data. This will be the baseline data for the process.

(2) Create the control chart. Plot the data. Calculate and plot the mean and the upper and lower control limits.

(3) Enter new data. This is the key. A control chart is not just a snapshot of collected data. It is a tool for use over time to ensure that the process remains in statistical control. Using the mean and control limits established by the baseline data, enter new data points and determine if they lie within or outside the control limits.

(4) Do not change the control limits based on new data unless the process changes. The control chart is the voice of the process. Do not try to change the voice unless you change the process. Completion of a process improvement effort to reduce random cause variation would be a reason to collect new data and establish a new mean and new control limits.

3.2 Tools for analyzing project processes

Action without analysis is limited to precedent, intuition, trial and error. One of the most used tools in analyzing is Cause and effect diagrams. This diagram is sometimes called a “fishbone diagram” because of its shape and sometimes called an “Ishikawa diagram” in honor of its developer, Dr. Kaoru Ishikawa. It is used to identify, explore, and graphically display all possible causes related to a problem, including root causes.

Causes in the diagram are often based on a certain set of causes, such as the 6 M's, described below. Cause-and-effect diagrams can reveal key relationships among various variables, and the possible causes provide additional insight into process behavior.

Causes in a typical diagram are normally grouped into categories, the main ones of which are:

- The 6 Ms: Men/people, machines, methods, materials, measures, mother nature
- 4 Ps – Places, Procedures, People, Politics
- 4 Ss – Surroundings, Suppliers, Systems, Skills

Causes should be derived from brainstorming sessions. Then causes should be sorted through affinity-grouping to collect similar ideas together. These groups should then be labeled as categories

of the fishbone. They will typically be one of the traditional categories mentioned above but may be something unique to our application of this tool. Causes should be specific, measurable, and controllable.

Using a cause and effect diagram includes four steps:

(1) Identify the problem - Write down the exact problem you face in detail. Where appropriate identify who is involved, what the problem is, and when and where it occurs. Write the problem in a box on the left hand side of a large sheet of paper. Draw a line across the paper horizontally from the box. This arrangement, looking like the head and spine of a fish, gives you space to develop ideas.

(2) Work out the major factors involved - Next identify the factors that may contribute to the problem. Draw lines off the spine for each factor, and label it. These may be people involved with the problem, systems, equipment, materials, external forces, etc. Try to draw out as many possible factors as possible. If you are trying to solve the problem as part of a group, then this may be a good time for some brainstorming.

(3) Identify possible causes - For each of the factors you considered in stage 2, brainstorm possible causes of the problem that may be related to the factor. Show these as smaller lines coming off the 'bones' of the fish. Where a cause is large or complex, then it may be best to break the it down into sub-causes. Show these as lines coming off each cause line.

(4) Analyze your diagram - By this stage you should have a diagram showing all the possible causes of your problem that you can think of. Depending on thecomplexity and importance of the problem, you can now investigate the most likely causes further. This may involve setting up investigations, carrying out surveys, etc. These will be designed to test whether your assessments are correct.

3.3 Tools for solving project problems

Collecting data, understanding and analyzing data, and analyzing processes are important. They are important as preparatory steps for taking action. These steps alone do not guarantee quality. Eventually, a project manager must *do* something to prevent or to fix quality problems.

In this section there are few tools which can be used:

- Brainstorming;
- Force field analysis.

3.3.1 Brainstorming

Brainstorming is a common quality tool that is much applied in the breach. That is, people think they are doing brainstorming, but they are really just having a discussion. True brainstorming is a formal process that may be applied in a structured or unstructured approach. The goal of either method is to generate a high volume of ideas creatively and efficiently, free of criticism and other chilling or disruptive influences.

3.3.2 Force field analysis

Force field analysis is developed by Kurt Levin, a way of identifying forces and factors that help or hinder problem solving..

In Lewin’s view, powerful forces that influence change are at play within any organization. These forces are of two types: those that help or enable change and those that hinder or restrain change. If you want to effect some kind of change within an organization, you must first identify and understand the forces at play and then use them in some advantageous way.

Force field analysis is a method that includes five steps:

(1) Define the challenge. Establish the scope of the analysis. The challenge may be very broad or it may be specific.
(2) Identify helping and hindering forces. Consider the organization's operating environment. Determine what aspects of the environment might push the organization toward change and what aspects might stand as barriers to change.
(3) Assume the forces are in balance. The opposing forces that may help or hinder change are probably in a state of equilibrium. That is why the organization is where it is at the current time; the forces that influence change are balanced.
(4) Develop action plans to change the balance of forces. Changing the balance of opposing forces will break the equilibrium and allow change to occur.
(5) Change the balance. Take the actions planned and pursue the desired change.

4. CONCLUSION

One of the most important goal in project management is to deliver project with demanded quality. Quality is a fourth among equals in relation to the project triple constraint of time, cost, and scope. Quality tools provide a mechanism for managing project quality.

Assuring quality except benefits implies and costs. Quality benefits include customer satisfaction, reduced costs, increased profits, and increased competitiveness. On other hand, quality management is sucesfull if quality benefits are higher than quality costs.

The most used quality tools in project management are: Pareto charts, control charts, brainstorming, scatter diagram, graphs etc.

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