

# Improving Cost Of Quality through benchmarking exercise

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## ABSTRACT

*Benchmarking is a must to achieve higher goals and productivity. This process not only helps in achieving better results, it also sets higher achievable standards. Benchmarking has been used quite effectively in all the industries. In Manufacturing industries it is easy to have quantifiable goals that can be used to benchmark the process. The nature of manufacturing industry being such that the process of benchmarking can be drilled down to the last component level of tracking. For example based on the over all benchmarking of annual productivity, we can decide the daily figure of production for each component/part for a month or even a week. This kind of benchmarking, however, will not be possible in Service industry. In Service industry, the nature of job is more of a qualitative nature and the response to the requested service becomes a factor for benchmarking. Hence the parameters for Service industry benchmarking is different from Manufacturing industry. Software industry is more of a service oriented industry, where requests from customers are serviced by way of developing software. The software developed for a customer will definitely vary from the software developed for another customer as customization is done for each customer.*

*Such being the nature of software industry, there has not been any quantitative approach to benchmark the industry standards. This paper attempts to study the characteristics of Software Industry in an attempt to standardize some of the features across various software projects and then benchmark one of its measurable parameter – Cost Of Quality. Software organizations are mainly concerned about their development process (productivity, defects, etc.) and this is therefore the thrust of any benchmarking. There are many organizations that offer benchmarking services, where project data can be submitted to get back information of where the project fits with respect to other “similar” projects for which data is available in the database of the service provider. The tricky aspect is “what is similar” and whether the database with the service provider has a sufficient number of projects to give a proper “industry wide” feel of the organization’s competitive position.*

## INTRODUCTION

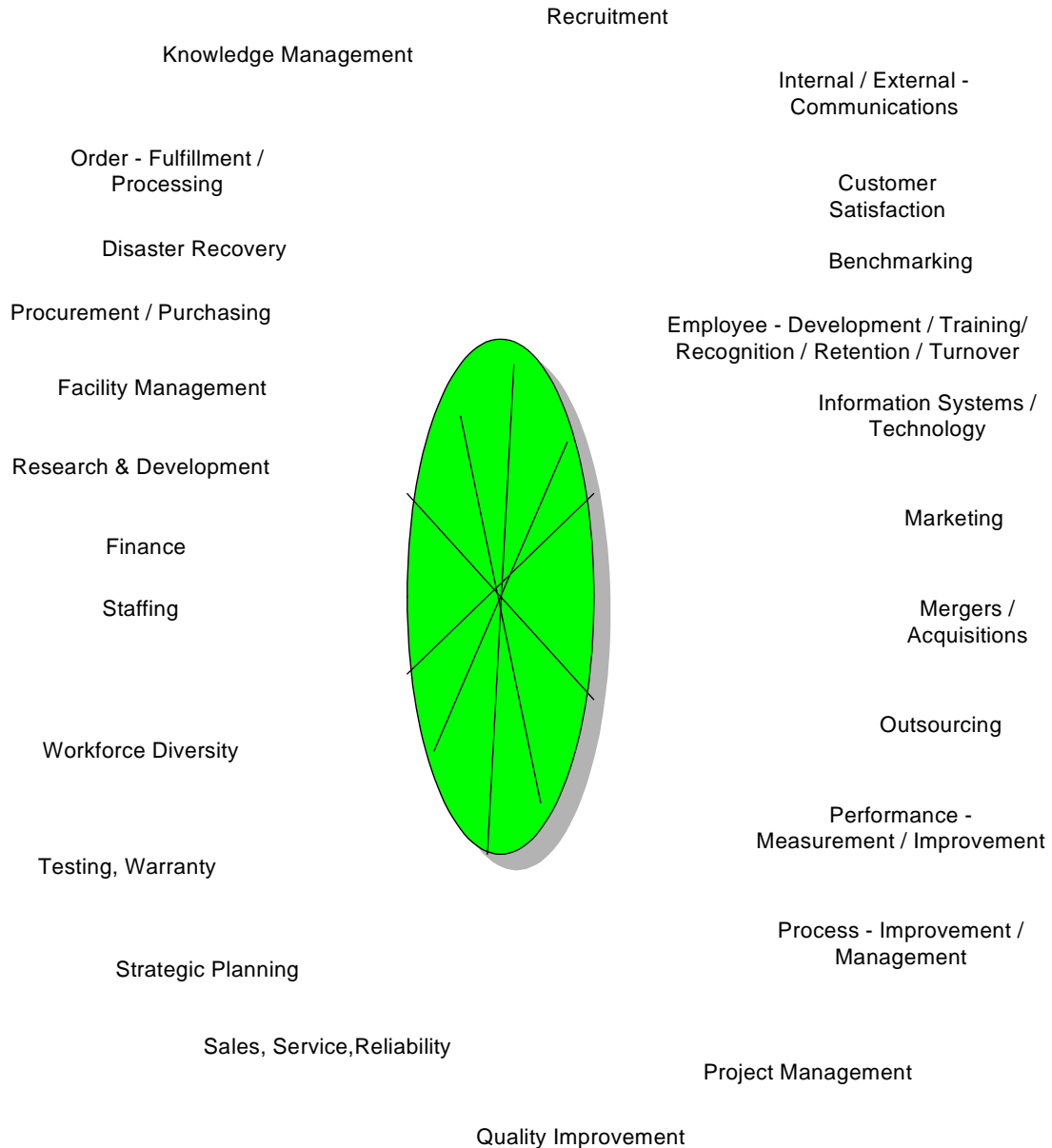
Benchmarking is a tool to help us improve our business processes. Any business process can be benchmarked. A benchmarking exercise can be done within an industry as well as across industries. It is easier to understand the dynamics of one’s own industry and hence sometimes an organization stops at benchmarking exercise inside the industry. But then who should carry out this exercise – the leader in an industry or some one who aspires to be a leader in a industry?

How about benchmarking a company that is well known for being a role model in its industry? For example Infosys in software development industry. This organization is known for various initiatives and business process, sometimes referred to as Best Practices, Exemplary Practices, Business Excellence. Bottom Line, it does the business process real well and has processes that are adaptable to any other organization. Hence who is the most compatible for it to benchmark. Does it need to conduct a full on benchmark study or can it get 80-90% of what it needs from just using the telephone, email, or an electronic survey. All these questions need to get addressed before you start. Most business processes are common throughout industry. For example; Infosys has the same fundamental Human Resources requirements for hiring and developing employees as does its competitors. Each of these players in this industry has the same Customer Satisfaction Survey process as is carried out by Infosys. These processes, albeit from different industries, are all common and can be benchmarked very effectively. It's called "getting out of the box".

## BUSINESS PROCESS

A Business Process is best defined as a function within an organization that enables the organization to successfully deliver its products and services. A simple analogy would be to look at an organization as a wheel and the individual Business Processes are the spokes to the wheel.

The spoke is the individual process (see figure 2) that make up our organization. Having just one or two spokes loose, can make a wheel roll out-of-balance. The longer a wheel runs out of balance the more damaging the effect to the wheel. When the wheel becomes so unstable that its primary function fails, we could simply replace the wheel. Obviously, an organization cannot simply replace itself; but our Customer can and will replace the wheel if it doesn't perform to the Customers' needs and expectations.



**Figure 2: Business Process Spoke**

Obviously this is a very simplistic and extreme analogy about the operation of an organization. But, when we step back and look at the products and services we purchase ourselves, it actually becomes a little more understandable. We wouldn't maintain a business relationship with a supplier if the suppliers' own internal Business Processes prevented the supplier from performing its best. We would probably go to another supplier.

Organizational structure varies, but for the most part, all organizations perform similar Business Processes. Whether we are from a large or small corporation, government agency, or a non-profit association, to a large extent, we share common Business Processes with other industries. The Business Process of Human Resources for one industry can be very similar to another. In fact, the Human Resource Business Processes may even be a Critical Success Factor for another industry such as an Employee Temp Service. So being able to Benchmark with that other industry is going to help you bring our own Software development Business Process to even higher standards than our own industry standard. Net effect, after implementing change from Benchmarking study, we hopefully could become the new Industry Leader for that particular Business Process.

In this paper a benchmarking exercise has been taken for software development process with cost of quality being the parameter to be benchmarked. This benchmarking exercise has been carried out for development projects that are being executed in one of divisions in Infosys and these data is being benchmarked against software industry in India. For projects in Infosys, data has been selected from projects that have size between 200 to 600 FP and these projects are standard projects that were executed between May and Dec 2000. Published reports from Indian IT benchmarking report 99-00 has been considered. This report was downloaded from [www.softwareindex.com](http://www.softwareindex.com) site. Criteria for 200 to 600 FP were selected so that we get projects which have spent similar amount for various life cycle stages. This means that projects of this size range will have duration of almost 3 to 4 months each and also would have time to stabilize the development process being followed by the project. As a result they will be able to collect data from project, do the analysis and decide on the action items needed to bring the project process back to its own course of execution.

### **BENEFITS OF BENCHMARKING STUDY**

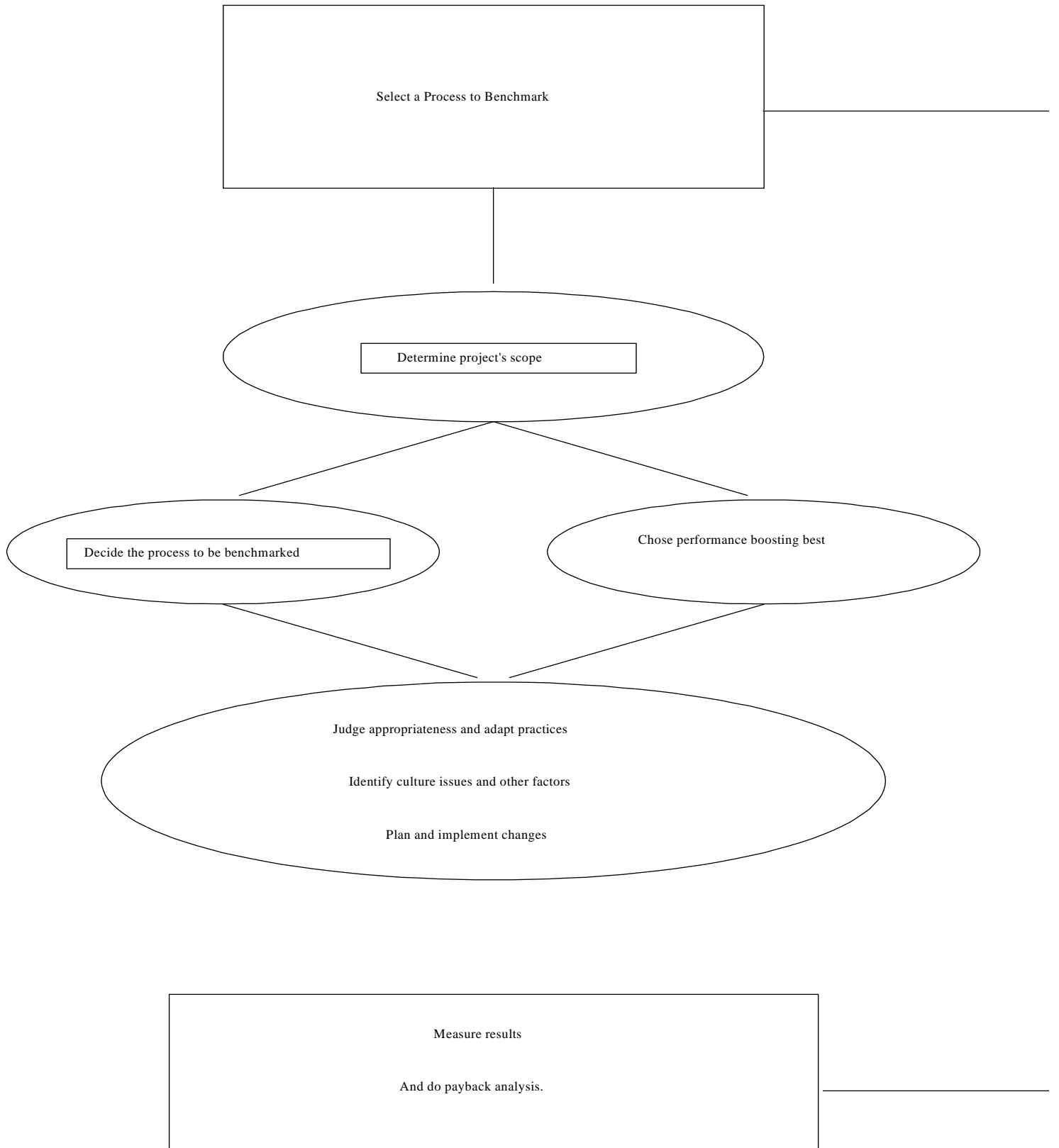
Benchmarking is a well planned, systematic discovery and learning process. Clear objectives and mechanisms to measure performance are a prerequisite to starting of any benchmarking study. Highly structured and focused site visits provide a detailed comparison of processes and practices to determine improvements. Discovering how to change your processes to achieve improved performance is one of the strengths of the benchmarking process.

Benchmarking not only tells you how good your business needs to be, it also tells you how to change your processes to get there. The flowchart in figure 1 depicts steps adopted for benchmarking. Benchmarking can be carried out internally between different business units within an organization, between organizations within an industry sector or between organizations across industry sectors. The most powerful results are likely to be achieved across industry sectors, because this encourages thinking outside normal industry paradigms. Out of industry benchmarking can assist organizations to leap ahead of their competitors.

Benchmarking is best done by small teams of people working in various aspects of a particular practice or process. However, benchmarking also requires overall strategic guidance to ensure that the right processes and practices are being improved for the most overall benefit to the organization.

Benchmarking falls into four categories as described by McNair and Liebfried.

1. Internal benchmarking identifies cost drivers and non value-added activities and is performed before comparing performance with external service providers.
2. Competitive Benchmarking is a one-to-one comparison with other service providers or competitors that assesses relative performance.
3. Industry Benchmarking identifies trends in baseline performance among categories of similar service providers.
4. Best in Class Benchmarking identifies breakthrough performance across various classes within an industry or field of operations.
5. "Benchmarking outside-the-box" is learning from processes in other industries to improve your own. For those who are used to thinking of benchmarking as a secret process of comparing one's performance to competitors, this shift in thinking requires new levels of openness and creativity. Based on this a definition of benchmarking could be:



**Figure 1: Steps in benchmarking process**

***The process of identifying, understanding, and adapting outstanding practices and processes from organizations anywhere in the world to help your organization improve its performance.***

Practices and processes range from customer service to human resources, from warehousing and distribution to leadership. Even industry-specific processes, such as claims processing in insurance, are candidates for learning from any organization that processes "orders" rapidly, including mail order houses and banks.

Speed is critical, if for no other reason than to overcome the enormous inertia of the status quo. As Jack Welch at GE has said, "Incremental change doesn't work very well in the type of transformation GE has gone through. If your change isn't big enough, or revolutionary enough, the bureaucracy can beat you." They benchmarked and found it would take 18 percent to merely catch up, and much more to stay ahead. Benchmarking outside the industry can legitimize stretch goals. Goals picked out of thin air and from off-the-wall guesses rarely inspire anyone. Numbers from competitors analyzed in a black box are equally suspect-and ignored-by most managers. But stretch goals based on believable external evidence, not only of results but the process that produced those results, are believable and give people a model from which to work.

There is a widespread need to benchmark software process parameters and this proposal is to make a study in benchmarking software development productivity. As is known industry wise productivity varies widely and the measurement methodology also varies with each industry. As is evident productivity in each industry is affected by its own parameters, so also software industry can bench mark some of its parameters. In software industry there are various types of projects. These projects are known by the type of process life cycle they adopt. Based on this process life cycle, the projects are classified as different projects. As a result a project can be development project or maintenance project or a project can adopt product development life cycle. There also can be projects that would follow Object Oriented life cycle or package implementation life cycle.

In this paper we have tried to explain details of a Development project life cycle and define various parameters for the project. These parameters are used to measure, quantify a development project and are also used to help the project team to manage a project. One such parameter is development productivity. This parameter is used to measure the size of the development project and it is the desire of this author to make a study on benchmarking development productivity in software industry.

You cannot beat competitors by following them. Whole industries can get locked into mediocrity, and few would get ahead by more than inches. They will remain a prisoner in their own industry. In the past, one could identify easily who the competitors were and monitor them. Today, industry lines are growing fuzzy. Competitors come from other industries, from other technologies, and certainly from other nations. For example, the Swiss watchmakers were overwhelmed by competitors that weren't even in the same business. The Swiss didn't even see them coming!

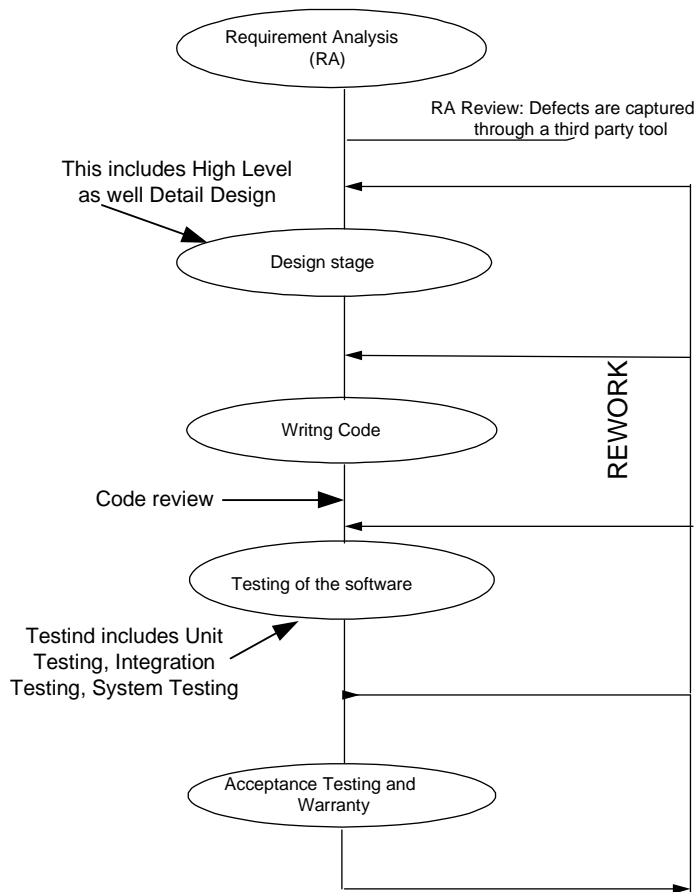
**What does it take to successfully benchmark outside your industry?**

- Knowledge of your own process and problems to see the underlying characteristics and spot analogies across other industries.
- Ability to look for common themes without having them spoon-fed to you.
- Information about outstanding companies in other industries. This information needs to be organized by process and not only by industry.
- Language that is common to all. One of the barriers to sharing across industries is finding a common language that describes processes regardless of industry. For example, the medical center had to equate its admissions process with hotel registration in order to see the analogy and potential transfer. With our members' assistance, we have developed a Process Classification Scheme that identifies generic processes from other industries and contexts.

**Software Development Process**

A typical software development process is being depicted in figure 3. This process starts with requirement stage. A team of analysts visit the customer site and study the present system as well as study requirements for the new system. With a proper understanding of current business process, the analysts start designing the new system. After a detailed level design is complete, programmers start coding as per the design. At each stage, review of work products are carried

out to iron out any defects that might have been injected. Still some of the defects go unnoticed and they would be detected during Testing stages. After software is developed and tested customer does acceptance testing for software developed and if required the development team remains in warranty support mode as per initial agreement.



**Figure 3: A typical software development life cycle**

### **METHODOLOGY ADOPTED FOR BENCHMARKING**

#### **Task definition**

We will benchmark against each other on the following metrics:

1. Size metrics
2. Cost of quality Metrics

Based on the comparative metrics, we would be able to decide on action items for further improvement.

#### **Objective**

1. Gain practical experience in results based benchmarking.
2. Capture best practices from the benchmarking effort.

#### **Exit criteria**

Generate a set of Best Practices.

Define action items to improve project practices being followed.

## Data Collection

### Internal data collection

During period of may and December 2000, there were number of projects (Development) executed from Bhubaneswar Division of Infosys. However as defined earlier projects with size 200-600 (measured by Function point Unit), were considered for data collection and analysis.

The formula used to calculate cost of quality was based on following principle :

Cost Of Quality = (Efforts spent for (training + review + testing + rework))/(Total Efforts for the project). Hence cost of quality was determined as a percentage figure. A table was prepared which had three columns, Name of project, size delivered (in terms of Function Points) and cost of quality. All these details are taken from Metrics Analysis report for the corresponding project. As per Infosys Process Methodology, each project needs to prepare a Metrics Analysis report that captures details of all measurable data. Data like efforts spent for each activity for the project, defects injected and detected in the projects are captured. These data are captured through various tools developed either in-house or purchased from third party. These data are validated by Project Manager as well by Software Quality Advisor.

### Results

In the period defined for collecting data, data from 13 projects were available. These data were then segregated for the defined criteria and then average figure for these projects were calculated. As was decided earlier cost of quality was decided for benchmarking and was the factor for considering a project for data analysis. The following table shows figures for various projects selected.

Projects	Size	Cost of Quality
Project1	258	25.37
Project2	535	44.22
Project3	567	33.11
Project4	221	34.61
Project5	281	57.44
Project6	232	31.21
Project7	335	29.58
Project8	450	27.46
Project9	572	28.65
<b>Average</b>		<b>34.63</b>

### External Data Collection

External data were collected from [www.softwareindex.com](http://www.softwareindex.com) which had published data for Indian Industry. This data was analyzed to find cost of quality metrics that we were looking for. From the published report Indian Industry, it was found that industry wide cost of quality figure stands at 32%.

### Gap Analysis and Action Items

As is evident here, benchmarking tells us as to where we are right now. The gap between the industry average and that of Infosys seems to be marginal 10%. Based on a brainstorming session, we have decided the following action items for beating the industry average.

1. Each project should identify its technological needs at the time of signing contract with the customer. This will ensure sufficient time for Training department to arrange training sessions with the help of volunteers/experts.
2. Arrange for a boot camp for each project at the start of offshore project; this will ensure adequate business and domain expertise.
3. Ensure to have self review checklist for detail design and coding; this will reduce occurrence of defect injection which will ensure less efforts for review, rework and testing.

## CONCLUSION

Quality-aware learning organizations tend to embrace benchmarking as a matter of course.

The concept of best practice benchmarking gives a wider choice of the process to be benchmarked, focuses on identification and sharing of best practices and their underlying enabling factors with selected partners, and, finally, results in implementation of the findings. Best practice benchmarking goes beyond mere standards and measurement against them. Furthermore, as best practice benchmarking focuses on processes it gives the opportunity to extend the search for best practices beyond the higher education sector. In the struggle for customers and profitability in a global economy, learning organizations will increasingly respond to rapid change with greater resilience and evolve winning strategies and practices more effectively. As the Malcom Baldrige criteria recognize, benchmarking importance will only grow in the years to come.

Benchmarking adds value not only by improving a given process but also by helping companies evolve more quickly and effectively into learning organizations and facilitate the transition to a total quality culture. Thus it is imperative that our organization has embarked on such an activity. If cost of quality can be reduced by 10%, this will also result in reducing efforts for the entire project. In a fixed price environment, this will result in higher productivity and this can be translated to better value for customer.