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Abstract: The author details areas in need of benchmarking and ways projects are conducted. He also touches on this author's bent to engineer through benchmarking, telling about the power of QFD as a benchmarking tool. He also introduces a new idea, illustrating that benchmarking encompasses far more than the analytical and data intensive "Japanese" tool as an item for further investigation.

BENCHMARKING IN INDUSTRY

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Abstract

Benchmarking could be considered simply one of the Japanese Total Quality Management (TQM) fads to hit America recently. At a glance it may appear that it has fizzled, "just another ill fated program!" Looking carefully however, it becomes clear that benchmarking is quietly behind the scenes and has been there a lot longer than the Japanese culture.

The current literature on benchmarking is really quite similar, differing mainly in the specific focus and background of the author. The one consistent difference in the literature is that an author will either emphasis the areas that are commonly found in need of new performance standards (benchmarking) or they will give a road map used in conducting a benchmarking project. This paper will cover both, the areas in need of benchmarking and the way a project is conducted. In addition this paper will touch on this author's bent *to engineer through benchmarking* telling you about the power of QFD as a benchmarking tool. As an item for further investigation, this paper will introduce a new idea, with respect to current literature, illustrating that Benchmarking encompasses far more then the analytical and data intensive "Japanese" tool.

Although not credited as such it is a well taken fact that the first Benchmark occurred when God made man in His own image. Defined in a Universal context, Benchmarking is the act of translating insights, concerning existence's reality, from one point to another. In scientific terms Benchmarking is the use of empirically derived insights from a like system to help define the system of interest.[1]

[1]This description is the basis of my paper and is not referenced, or to my knowledge, available from any source.

Key Words

CI: continuous improvement
DFM/A: design for manufacturing/assembly.
JIT: just in time.
QFD: quality function deployment.
TEI: total employee involvement.
TLA: three letter acronym.
TQM: total quality management.
SQC: statistical quality control.
WCM: world class manufacturing.

Traditional to Modern Benchmarking

From the Webster's New World Dictionary[1] it is defined as, "bench mark 1. a surveyor's mark made on a permanent land mark of known position and altitude: it is used as a reference point in determining other altitudes 2. a standard or point of reference in measuring or judging quality, value, etc." This definition makes it clear that benchmarking[2] should not be included in a list of the latest advanced engineering techniques, since measuring oneself against a known reference has been a common practice for mankind.

As in much of engineering the techniques, irrespective of their varying degrees of theoretical basis, are commonly taken from practical experience. From the traditional definition of benchmarking has come a modern application focused on optimizing organizational operations. In keeping with the nature of organizations benchmarking had to become more flexible including a transitive reference point. The established criterion for this organizational reference is the recognized "Best Organization" within a particular operational discipline. The literature is reasonably consistent in defining this organizational benchmarking and describing it's fit and function within a company's strategic and tactical activities. In Dale Compton's paper on benchmarking[2] he describes it as, "The quantitative comparison of one's current performance against the world leader is the essence of 'Benchmarking'." He concisely describes the practical use of benchmarking and how it is a changing format depending on what the organizations goals are.

Compton's article goes on to describe the metrics used in the benchmarking process to make financial, operational, and system-oriented comparisons. In addition to Compton the following description of benchmarking utilizes B. Maskell's, *Performance Measurement for World Class Manufacturing*.[3]

New methods of performance measurement to control production plants are needed as companies introduce the veritable cornucopia of advanced manufacturing and management techniques. These new methods are needed due to many factors. For example, benchmarks of traditional management are not relevant to most advanced techniques of manufacturing control: customers are requiring higher standards of quality, performance and flexibility. New management methods employed by TQM adherents require different kinds of performance measures. The

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[2]The literature consistently spells "bench marking" as one word (benchmarking), but I find no official substantiation of this new spelling. I will use "benchmarking" as one word despite its apparent informalness.

following attributes are always included even though world class companies introduce world class manufacturing in different ways. These attributes include[4]

- a comprehensive approach to quality,
- JIT manufacturing philosophy,
- changes from management to leadership of the work force
- and a more comprehensive approach to meeting customer needs.

Seven common characteristics of new performance measures can be identified, although the specific measures being used and the way they are interpreted by successful organizations vary considerably. They are

a) strategically oriented,
b) primarily use operations relevant measures,
c) vary as situation requires (plant location, product mix etc.),
d) reviewed and changing as required
e) are straight forward and to the point,
f) provide fast feedback to operators and managers and
g) as a program are focused on improvement.

Many of the performance measures chosen are not new, and have been used for many years. However, what is new is the importance attached to them. By replacing the traditional management accounting and operationally decoupled aggregate measures, these new measures truly drive the productivity process.[5]

In people's experience product value benchmarking is the most natural in that we do it every day, "which tooth paste or breakfast cereal will I buy today or what clothes will I put on to go to work?" For an engineering product specialist, the job of benchmarking to the leading product has become a science with many objective test and measurement tools available. It can be fairly simple within the strictly deterministic metrics such as Design for Manufacturing/ Assembly (DFM/A) to find a ranking of limited scope for competitive products. The difficulty with this area of benchmarking is that the customer sets the leading standard using everything, but DFM/A, and there are a lot of very different customers! This is the performance item of real value for a company in that all other metrics are important only to the extent in which they can improve the companies long and short term position in the customers eyes. As was illustrated with the Ford Edsel, doing well in all performance measures, but designing the wrong product (valueless to the customer) will lead to failure. It is clear that bringing focus to this area is critical and this paper will give product value more attention in it's discussion of QFD.

During the industrial revolution and in the early part of the twentieth century traditional management accounting was developed. The techniques of this accounting have not changed much since the 1930s when industry-wide standards were adopted. Now that enormous changes have taken place in technology and production techniques, this old style of management accounting is no longer useful and most often irrelevant. The primary problem with the classic method of accounting is that it altogether ignores the daily requirements of production control and discounts manufacturing strategy. The traditional style of accounting was developed to meet the needs of the financial accounting systems which causes confusion and makes the cost accounting information much less useful. This is evidenced in the experience of product pricing decision makers (this paper's author for one) must carefully analyze the traditional accounting information due to cost distortion caused by a corporation's assuming inaccurate cost patterns such as not correctly distinguishing direct and indirect costs and by apportioning overheads incorrectly. Inflexibility was another problem as reports may not vary from plant to plant and from time to time and they are often too late to be of value. In the worst case the traditional accounting systems act as an impediment to progress in WCM by assessing capital projects incorrectly, concentrating on machine and labor efficiencies, encouraging large batch sizes, causing managers to do wasteful activities, and maintaining wasteful and obsolete processing systems.[6]

At Warn Industries Incorporated, as in most companies, financial metrics and reports are driven by many Government regulations and stock holder information requirements. Most of these reports do not fulfill the benchmarking requirement for the metrics and goals to focus on all aspects of leadership in a particular field. In fact it is broadly agreed that limiting one's focus to these financial metrics, as is common in America, is one of the major stumbling blocks for realizing a revolution toward fulfillment of WCM in this country as was experienced in Japan these past twenty plus years.[7] The specific comparative mandate of benchmarking obviously requires a common frame of reference which from company to company can be difficult to obtain given complexity of financial reporting, the different national requirements and the secrecy of a company's internal knowledge of it's competitive position.[8]

Measurement of delivery performance is summarized by Maskell into key areas: vendor delivery performance, production schedule adherence, order and schedule changes, customer service level, and lost sales analysis. This list seems rather unrestricted and as such could include all other deliverables from funds release in capitol projects, to final specification delivered by design to manufacturing

capability. So along with tracking metrics it is necessary to know the level where the metric is used and who controls the measured item. Traditionally scrap rates are largely a tactical issue where operators and line engineers take responsibility and can solve most problems, but manufacturing flexibility is largely an upper management issue where the line engineers and operators act only, if at all, to feed information to top management decision makers.

Improving quality in every area needs to be a major goal of WCM firms. Although there are many aspects to measurement of quality, some of the most commonly used are[13]

- incoming quality from suppliers with knowledge of it's effect on internal processes,
- production quality starting with the use of statistical process control charts,
- data accuracy within departments and as a system (including inventory accuracy, bill of materials accuracy, routing accuracy, and forecast accuracy),
- effectiveness of equipment capability and reliability reviews driving preventive maintenance programs,
- direct measures of the customer's satisfaction,
- and the aggregate cost of quality.

Measuring the company as a whole is clearly important. This aspect of benchmarking would include the prerequisite financial metrics, but it must go far beyond these. It is possible the financial reporting will have to be expanded when the financial measures are limited to meeting outside requirements. Tied into the financial and strategic corporate direction is the comparative measurement of investment into company wide quality, flexibility and technological advancement from the standpoint of a global marketplace. Benchmarking becomes very interesting in this arena because the leaders in the various aspects of the company activities are often in other industries. Benchmarking allows for general discussion and philosophizing on the merits of various methodologies, but traditionally it is a discipline of taking an item and measuring it. Performance measures that are financially based including scrap rate, inventory turns, value-added analysis, cost productivity measures, overhead efficiencies, checkbook accounting methods, and system complexity are best avoided. Financially based performance measures are well ingrained, but nonfinancial ones are much clearer, easier to use and more relevant. There are, however, some instances when financial measures can be beneficial. These can usually occur when a company

has a diverse range of products or operations and needs a common denominator for reporting purposes.[14]

There are many issues critical to the success of an enterprise which are not easily measured and which have not yet been adequately addressed. They deal with such issues as defining work force morale and it's effective drivers, instituting teamwork within the company, the extent to which the employees are committed and involved in the company's quest to excel to the benchmark, leadership abilities of the managers, the education and training level of the work force, and the company's commitment to it's workers and society at large (including safety and environmental issues). It is very important that these be taken into account by a company wanting to move into WCM and TQM status.[15]

Along with traditional benchmarking it is useful to establish other clearly defined targets to measure the performance of each department within the company. There are numerous sophisticated techniques that can be used to determine the correct goals for each department. The application of a system of cost control techniques focusing on controlling the component value optimization throughout the initiation and design phases of a new product can assure a successful design. This technique known as "price targeting" will result in a detailed breakdown of cost and customer perceived quality targets. Another technique is the "half-life concept" where an analysis of the rate of improvement that can be expected for different kinds of continuous improvement tasks is helpful in assigning priorities. Lastly, common sense and a WCM mind-set will provide realistic and motivating targets for companies involved in continuously improving toward their benchmark.[16]

A benchmark could be consider synonymous with a target. Setting targets is not always good and according to W. Edward Deming it is to be avoided, but according to both Philip B. Crosby and Joseph M. Juran carefully developed and implemented targets are acceptable.[17] In general it is agreed that there is a wrong way to institute targets wherein the target becomes a limitation upon individuals and organizationally it stymies continuous improvement.

There are systematic benchmarking Process Steps, as given by Robert C. Camp, *Benchmarking, The search for industry best practices that lead to superior performance,*[18] which must be rigorously applied. The front flap of R. Camp's book gives the following outline:

Planning

1. Identify what is to be benchmarked
2. Identify comparative companies
3. Determine data collection method and collect data

Analysis

4. Determine current performance "gap"
5. Project future performance levels

Integration

6. Communicate benchmark findings and gain acceptance
7. Establish functional goals

Action

8. Develop action plans
9. Implement specific actions and monitor progress
10. Recalibrate benchmarks.

1. Identifying what is to be benchmarked requires focus and direction:[19]
   - Using the Mission Statement
   - Output deliverables
   - Performance measurement
   - Testing the appropriateness of outputs to be benchmarked
   - Level of detail

There are uncounted ways to attacking a problem, but in benchmarking it is preferred to establish the project from the Firm's Mission Statement. The one alternative being the immediate application of known information which would be less systematic, likely producing a nonoptimal solution, but it would be much faster in showing results.[20]

Output at a strategic level will be defined by the Mission Statement. Benchmarking as a very practical discipline will have tangible results and there will be clearly defined deliverables including: the critical areas for Continuous Improvement; confirmation that tracking of variables is producing WCM results and whether results

are in line with current targets; confirmation whether the current or future products meet customer needs. Benchmarking is a cyclic activity moving from the strategic plan into significant operational detail, finally producing bottom line results and then starting over again.

Integration with current performance reporting systems can streamline the process of benchmarking and it will increase the usefulness of competitive information. The one problem with traditional reporting systems is that they may not produce appropriate outputs.[21]

Benchmarking is to be applied in such a way that the appropriateness of information produced will be evidenced in the people requiring it. That people will be waiting for that information to make decisions at all levels. Questions, such as required level of detail in reporting, or the integration of functional areas in the presentation of information, are answered through the decision maker's requirements.

2. Identifying comparative companies and determining the best competitor and functional industry leader will initiate the process for several types of benchmarking:[22]

- Internal benchmarking
- External benchmarking
  - Competitive benchmarking
  - Functional benchmarking
  - Generic benchmarking

The basis for choosing the external sources of benchmark information will hopefully be based on the internal activities of the company. This will add to the efficiency of initiating the study and help assure consistency with company practices.

Often in external benchmarking a first step will be to tour an available cooperative industry, but this is a mistake. Resourcing available information (described later) and pulling together a firm understanding of the intent of the study will allow possible tours to become well integrated into a project.[23]

Where the competition goes we must go. The excitement with benchmarking is taking the high road against the competition, but first the current status must be recognized and dealt with. This type of benchmarking is the most marketing relevant with even a competitor of mediocre operational characteristics being interesting from a market history standpoint.

Comparative studies on functional characteristics is the real meat of WCM benchmarking. Often the best industry practices are going to be in a non-competitive industry and it will be the inclusion of the best which marks the leader in a particular industry. A significant advantage of benchmarking against a noncompetitor is that the relationship is noncombative and information is less sensitive. Generically, benchmarking is the activity that every successful inventor uses to realize an opportunity through the transfer of technology or methodology.

Identifying the Best Firms involves several avenues of information:

- Public data bases
- Professional associations
- Other sources

Information from public sources and professional associations is worthwhile mostly because it is inexpensive (discounting labor). Time and ingenuity is required to make full use of public information due to the widespread sources of that information. Professional associations can be a good starting point as they will often have knowledge of which companies are leading in an area. Participation in a local industry tour or attending a trade show can open opportunities for benchmarking. Other sources are many and varied from internationally recognized consultants to neighboring industries.

3. Determining the data collection method and collecting data requires a criteria for information gathering.[24]

Gathering all potentially relevant data would require an unreasonable investment of resources and so establishing the criterion to fulfill a strategically effective benchmark is essential.

Data-gathering approaches can include internal information, public domain information, original research and investigations, direct-site visits and focus groups (panels).

Internal Information

- product analysis
- company sources
    - internal experts and studies
    - study piggybacking

If internal benchmarking is not in place it indicates that the corporate culture may be rigidly functional, attached to their own methods and quite some distance from fulfilling WCM benchmarks. The return on investment for internal benchmarking is high and the only down side to it is that innovation is seldom experienced.

Always of high relevance is comparing competitive products or benchmark products of similar technological basis. This type of testing is usually of high return due to the low cost and many insights it can afford.

Sounds obvious, but everything that is already known by an organization should be taken into account. People in the company may have insights or leads toward filling out the benchmark portfolio. Past studies, conducted by groups not directly affiliated with the benchmark project group, may be useful in completing the benchmark study.

Public domain information

- library search
- professional and trade association data
- consultants
- external experts

This area was touched on in the examples of information for identifying competitive companies. Developing a relationship with the local libraries, especially if a technical research department is available, and the local trade associations can be very fruitful over time. Making use of the electronic data bases, available in many libraries, is incredibly powerful with abstracts of the publications from around the world at your fingertips. Professional and trade associations can be one of the best sources of information through the members and group activities. Information from individual's experience and that from professional and trade associations, having aggregate data with limited scientific rigor in the compilation and conclusions, must be received with a grain of salt.

The use of consultants and external experts can open up possibilities for information virtually inaccessible to the firm conducting a benchmarking study. This method is best described by, "you get what you pay for." Hopefully anyway! Many individuals and consulting firms make it their business to be the expert in a particular industry or industrial practice.

Direct-site visits will quite often be included in a benchmarking study.

- Contacts
  - Referrals
  - Company representatives
  - Professional to professional
- Preparation
  - Visit itinerary
  - Attendees
- Debriefing

The way people work shaking hands, discussing details eyeball to eyeball and having the item of interest in view can be the best way of gaining insights. It can be less then satisfying to simply gain data on a quality program without seeing the results and talking to an operator to gain his point of view.

Clearly, making an initial contact can be ominous since it can open vast opportunities or significantly damage or destroy the possibility of a study's success. When there is no basis of previous relationship, networking for referrals can become a gold mine in opportunities. When there is an existing relationship, carefully exploring the history and going through prevailing channels is critical in assuring success. Opening up new channels of communication can be achieved through introductions of individuals in like functions encouraging the exchange of information.

Preparation for the visit includes the expectations of how the visit will be conducted, the main points of interest and what information will be collected. Having an itinerary and a list of people attending is critical for the visitor's preparation, but it is also important for the host firm. Preparing a list of questions which can be smoothly interjected into the visit format and will be have adequate statistical foundation for comparative study is critical. Generally such a list should be filled in by the visitors during discussions and not as a questionnaire to be filled out by the hosts which can be counterproductive.[25]

Many aspects of such a visit are subjective and to become most useful are requiring objectification. This can take place in an after visit debriefing where insights can be confirmed, modified or discounted and then recorded.

Original research and investigations for really dedicated souls.

- questionnaires
- mail administered

- telephone administered surveys
- Focus groups (panels)

This area of investigation is expensive and will not always produce stellar results. One area clearly worth the trouble is customer surveys (see QFD later in paper) where the output of all variables is being tested by the final arbitrator. If nothing else the customers can show up problem areas and indicate where the competition is falling down. This area is a well documented science with many challenges and pit falls.[26]

4. Determining current performance "gap" is the essential analysis step.[27]

Types of performance gaps

- negative gap, parity or positive gap
  - competitive
  - noncompetitive
    - benchmark analysis superiority
    - marketplace leadership

Certainly some differences will be found between the benchmarks and ones operation. Compared to the competition it is likely that the results will be mixed, with one being a market leader and another best filling a particular niche. When ones industry has a positive gap over the competition the job becomes more interesting. In this case the main points of interest are noncompetitive benchmarks, future prospects and possible leaps into new technologies. If a company has market leadership, but is shown to fall behind in the benchmarking analysis it becomes clear that the study was needed to insure market share. The Auto Industry is a great example of not listening to early warning signs and then losing market share hand over fist. When the picture is mixed with analytic superiority, but not holding market leadership, the reason is probably market driven and is difficult to generalize.

More often then not a company will have some opportunities for improvement with many of these being from noncompetitive benchmarks. These type of gaps should be constantly flowing into the continuous improvement hopper to be prioritized and acted upon.

Comparative analysis of the gap

- practices opportunities

- performance metric
  - what is to be quantified
  - quantification means comparability
  - quantification precision
  - alternatives for quantification

In describing the "gaps" it is important to first emphasis the qualitative side of the benchmark results toward winning understanding and support for the efforts required to fulfill quantitative objectives. The practices which are to be changed are best given a qualitative description thus framing the changes necessary and producing a foundation for the many quantitative details.[28] Focusing on practices and using tools like flow charts and simple constructs of the costing and efficiencies will allow a highly presentable format. This also allows for overview analysis and review of the strategic plan in light of the benchmarking results.

When the job gets down to actual items measured to move toward a benchmark gap definition discretion is called for. Often in benchmarking one will find they are more than 20 percent behind the WCM firm.[29] In quantifying a specific operational area it is important that the numbers are reported in such a way that they illuminate what the area will be like if it fulfilled the benchmark. There will always be some discrepancies in the comparative analysis due to nonlaboratory conditions, but generally these too can be quantified and the damage minimized. Illuminating the comparison of the best practices to ones own, in a credible and precise report, will help nullify opposition through it's objectivity.

One attractive alternative to comparative analysis is to view the benchmark from a green field concept or as a clean sheet potential for your existing company. Clearly if the changes are large enough this could be the best approach.

Practices contributing to the gap

- process practices
- business practices
- operational structure

In any given area there will be the process, business and operational aspects making up the total potential for improvement. The process activities are the most flexible with people's mode of operation making up the significant element requiring change to meet the benchmark. The business practices are flexible if the managers

can adequately address the requirements of new control systems and measures of performance. The operational side is relatively static with plant equipment and work cell configurations being the only possibility of major changes in a short time span.

Clearly this all falls apart if the best available benchmarks are not used. Finding the best may involve exploring widely to find that new method which will transform the previous benchmark or use intuition to pick among competing possibilities.

5. Project future performance levels.[30]

The "Z" chart

- historical productivity
- the benchmark gap
- future productivity

As was used in the defining and describing the gap, the projections of the future should have an easy to understand format. R. Camp uses line charts with performance measures on the vertical axis and time along the horizontal axis which are called "Z" charts. These charts allow for presentation of historical, current and future trends on a variety of benchmark performance items.

Understanding the gap

- tactical actions
- strategic actions
- extent of the gap

Foremost in many people's minds in talking about future increases in performance is how this will effect me today? Including benchmarking into today's tactical activities will do two things: bring in a strategic view to the plans for improvement and require a rate of improvement previously thought to be unattainable.

Establishing goals

- operational terms
- the significant few
- practice changes

The benchmark in its raw state is an appropriate goal statement; benchmarking is virtually synonymous with goal setting. Generally the benchmark will be operationally intensive which is appropriate for the people at the operational level who must carry out the improvement actions. As a goal statement it is important that the various aspects of the benchmark study and action plan are in a prioritized format to facilitate tactical planning. When the reports and strategic direction emphasize the practices needing change it will facilitate the process of change.[31]

6. Communicate benchmark findings and gain acceptance.[32]

Communicating findings

- the audience
- methods of communication
- organization of the analysis

It is important to realize that any suggested change, no matter how good, will meet with some resistance and that this resistance may cripple the entire program. At all organizational levels the benchmarking ideas must be sold and this will require different sales pitches (up to now the operational "doers" have been emphasized). From suppliers to distribution outlets the effects of the project will be felt and having an appreciation for what is happening, and why, is important. All normal organizational communication tools should be used to keep people updated and this activity should be used early in the benchmarking process to help acclimate people to the idea of moving toward the best practices. This is one good use of posters in the illustration of basic benchmarking concepts and an overview of the methodology. It is important that the communication be organized to maximize people's understanding, encourage networking and generally enable people to feel a part of the benchmarking excitement.

Gaining acceptance

- initiative for change
- operational acceptance
- validation from multiple sources

Communicating the basic information of what benchmarking is will open the door, but to really establish commitment each individual must enter the process of change. The initiative for change is a major hurdle. Benchmarking, being based in a

practical example of the best available practices, will automatically provide initiative to people interested in doing well in their jobs. The real beauty in the benchmarking project is that it includes all the details for how and why and it is specially designed for each operation. Benchmarking is not some fly-by-night program instituted solely on the content of a TLA weekend seminar. Verifying the results through differentiated sources can be helpful in establishing the credibility of the study and assuring that the suggested changes are an appropriate long term direction. Top managers may want to see sources of financial results to indicate consistency with bottom line results which may involve hiring outside help to develop this area of reporting.

7. Establish functional goals.[33]

   Functional goals and benchmarking

   - process
   - rationale

It is important that the goals implicit in the benchmark findings are established in a controlled manner with designed intent. The process starts with evaluating existing goals against the benchmark findings and detailing the comparison (it is possible that optimal strategic planning was part of the benchmarking study). The important characteristics in the comparison will be whether a change of direction is required and how large the performance gap is. Secondly the near term, next fiscal year, goal needing to be developed may be very different then the benchmark level due to resource limitations. R. Camp suggests a hierarchical cascade of mission statement, planning principles, performance goals, strategies and tactics as a goal setting methodology.[34] It is part of the thesis in his book that the planning principles and the performance goals are only valid if based on benchmark information.

8. Develop action plans.[35]

   Action planning

   - task considerations
   - behavioral considerations
   - action plan process capability
     - analysis for implementability
     - analysis of activities
   - effectiveness and efficiency

The action plan will have many details, but it will be built on a simple base of goal, practice and enabler.[36] The goal is a quantified improvement identified through benchmarking. The practice is the focus of the benchmark improvement actions. The enabler for operating at the benchmark level is often the specific point of attention, but it is important that it not become the focus.

The action plans will have distinct areas requiring specific attention. For example, descriptive and comprehensive task assignments and management plans for the likely behavioral issues which will arise. These plans must start with some forecast of capability for the new processes in the existing company. The ability to implement the new standards and remain capable, and then move toward the benchmark goal must be tracked and adjusted for. R. Camp notes that changes of effectiveness verses efficiency must be treated differently. Efficiencies tend to reside in a particular process or work cell making changes simpler. Effectiveness involves getting the right job done which often involves systems and cooperative arrangements and is much harder to change.

9. Implement specific actions and monitor progress.[37]

Alternatives for implementation

- line management
- project or program management
- process czar
- performance teams

Managers will be burning the midnight oil to make these wondrous benchmark practices a reality. The focus is the change in practices which mainly falls on the production people, but will also effect the management practices. The fact that the managers are the enablers in the process requires that they submit themselves to the needs of the benchmark areas. If the line managers are fully educated on the benchmark requirements this is a simple, nonbureaucratic, way of bringing about the changes. To some extent the total benchmarking project must be managed, if nothing else to facilitate and enable line managers and to deal with system wide changes. Depending on the specifics of the benchmark changes, different approaches to management of the total project will be most effective. Making lateral changes of people is obviously simplest and can be effective if the technological changes are within people's capabilities. Often the changes are monumental and a special person

or team is needed to address the changes. Having a process czar to over see technological leaps is one of the methods being used to insure changes consistent with the benchmark and with minimal interruption to normal business. In any change affecting operations, the use of performance teams or quality circles is very effective.

Monitor and report progress

- ensuring program/project success
- integrate benchmarking into vital business processes
  - planning process
  - management process
  - quality process
  - financial process

Progress must be monitored and in most cases this monitoring is simply an aspect of the benchmark practices needing to be implemented. Certainly implementing new methods into the business and operations management areas can be a major project all by itself.

10. Recalibrate benchmarks.[38]

Recalibration assessment

- understanding benchmarking
- attitude toward benchmarking
- management behaviors

When the project is wrapping up the first full implementation cycle the personnel who have been involved should have important feedback on the process of implementation and on the benchmarks themselves. People should have a very different view of the benchmarks and this change will be highlighted by increased understanding. A comparative survey showing the change in attitude toward benchmarking will be an important addition to the quantitative data. If designed carefully this survey should also illicit information on the changes in corporate culture. How the managers have bared up against the challenges of sweeping changes, as evidenced in the culture, will say volumes concerning the appropriateness of current methods in bringing about change.

The Other Side of the Coin

"Benchmarking? Who are you to tell me I will be measured by someone else's standards, Hey! I got *core competencies* here ya see, what about these?" It is true there are other points within this WCM business besides measuring my lawn against blue grass in Kentucky. Benchmarking should take into account current strengths along with the weaknesses, but from the literature search this appears as a problem area in benchmarking implementation. Just as I found literature on benchmarking primarily ignoring core competency, the literature on core competency for the most part only briefly mentions benchmarking. This of course is related to an authors focus on his subject matter, but it also indicates limited application of TQM in the available literature. A study by M. Lafrance and J. Doutriaux, "Sustained Success Through the Management of Core Competencies: An Empirical Analysis," is summarized in the following section.[39] Contrary to the single minded focus of most literature this study has benchmarking as a significant component of the study.

High technology companies are turning to the leverage of the core competencies in order to meet constantly changing market needs. In doing so these organizations are able to react quickly to changing market requirements instead of managing end-product portfolios. If a high tech company is to have functional quality teams, they must also deal with rapidly changing technologies and market needs. These teams, how they are organized to address these changing requirements and what different levels of success might be expected was the focus of this study by M. Lafrance and J. Doutriaux.

The 80s has been marked by the increased introduction rate of new products especially in high-tech fields. The fact that the average life cycle of technology has decreased from l0 years in the early l960s to an estimated 6 months in the year 2000 places an enormous stress on companies that are faced with shorter windows of opportunity yet relatively longer lead times required to acquire new technologies. Many companies have shortened the new product introduction process in order to be able to respond more rapidly to this challenge. In turn they meet customer demands and beat their competitors in terms of speed and number of successful new products they will deliver to customers. The effective use of core competencies (doing what you do well) is a requirement for those expecting to stay competitive.[40]

As described by M. Lafrance and J. Doutriaux, "A core competency is defined as a base skill or combination of base skills critical to attaining sustainable competitive advantage in a broad range of end-products; an end-product is defined as a revenue

generating customer deliverable. The management of core competencies deals with the selection, building, benchmarking and leveraging the firm's core competencies.

Selection of the correct core competencies is a vital step in the management of them. One must be able to understand the customer in order to determine the skills which will provide basic customer value. Since basic customer value does not change as fast as day-to-day requirements, a team that possesses the correct skills will be in a better position to provide timely customer solutions."[41]

To build core competencies, it is necessary to recognize and nurture the core competencies the team already possesses or needs to expand control over. In all cases this is both a long and short term process.

The benchmarking of core competencies is the evaluation of the core competencies against some type of internal or external best example of the state of the art. It is important to be able to evaluate the level of expertise, possessed in the various disciplines, against what competitors possess or are likely to possess in the future.

The leverage of core competencies is the important step in the management of core competencies. Obviously the team must be able to optimize the use of its core competencies in order to maximize the return on the investment made in building these competencies.[42]

The hypothesis chosen for M. Lafrance and J. Doutriau's study are very conservative and it is unlikely any of them are untrue.

- Hl: Functional quality teams in high-technology companies that are organized around the management of core competencies are more successful in the long run than functional quality teams which are not.
- H2: Different functional quality teams have different core competencies. The portfolio of core competencies depends on the specific role played by the team.
- H3: The portfolio of core competencies of a functional quality teams evolves with the changing role of the team.

The study consisted of a survey of functional quality teams in high technology firms. To identify core competencies a list of expertise was presented to the interviewees (this list ,following, was developed from informal talks with quality engineers). The rating of each expertise to a team was developed through scoring its importance to the team, the proficiency of the team in the expertise and the level of effort that will be put into building the expertise within the next year.

List of Expertise Presented to Functional Quality Team:

EXPERTISE	DEFINITION
1. **Process**	understanding of processes used by the team to perform its tasks.
2. **Metrics**	evaluation of quality of product/service.
3. **Benchmarking**	ability to compare its effectiveness against other functional quality teams (in and outside the company).
4. **Technologies**	understanding of underlying technologies of the product/service and their evolution.
5. **Improvement**	ability to improve over time the processes and procedures used by the team.
6. **Defect Prevention**	ability to use knowledge gained during testing in order to propose improvements to the design group.
7. **End-customer View**[3]	ability to understand end-customer requirements.
8. **Productivity-Means/Tools**	ability to use procedures/tools to increase productivity.
9. **Flexibility**	ability to adapt to new requirements.

The main roles of functional quality teams were identified and labeled as four main "quality roles"

- TQM,
- Consultant,
- Auditor and
- Verifier.

The TQM quality role is characterized by the non-existence of a separate functional quality team. The design personnel is totally responsible for product/service quality.

The Consultant quality role ensures quality by cooperating with the design personnel and its main goal is to facilitate the implementation of quality.

The Auditor quality role ensures quality by verifying that the design personnel is implementing quality. This is more a policing role than a participative role.

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[3]Note that the term "end-customer" is used to mean the customer of the firm, as opposed to the customer of the functional quality team.

The Verifier quality role is concerned with the verification of the product/service through a series of tests. This is more the control of quality rather than an effort to build quality in.

M. Lafrance and J. Doutriaux notes that these quality roles parallel the concept of "quality phases" which symbolizes the typical evolution of the "quality maturity" of a functional quality team.[43] As the functional quality team or the firm matures in the implementation of quality principles, it will progress from quality control (Verifier), to quality audit and support (Auditor and Consultant), to finally reach the pinnacle of quality (TQM).

The quality teams were performance rated on execution of duties by themselves and their in-house engineering and management colleagues. As this interview process was finished each quality team was classified: teams scoring high in the "Perform thorough testing" dimension were classified as Verifiers. Teams scoring high in the "Oversee quality during all phases of development process" dimension were classified as Auditors. Consultant teams had high importance of the dimensions "Provide quality objectives to rest of organization" and "Provide a quality process to rest of organization". The sole TQM team identified itself as so. The relative importance score was taken as the average importance rating of all respondents for a particular functional quality team.

The M. Lafrance and J. Doutriaux survey results are graphically illustrated focusing on the relation of Quality Roles vs. Main Core Competencies and Management of Core Competencies vs. Performance.[4]

Quality Roles vs. Main Core Competencies[44]

Although three core competencies (Metrics, Customer View and Process) seem to be important for all quality roles, there are core competencies which differ in importance between different roles. This would seem to give some support to the hypothesis that there is a relationship between the set of core competencies and the functional quality team's role (H2).

It is anticipated that teams and people mature and that this will drive peoples roles from Verifier, to Auditor, to Consultant and finally to TQM. The survey results indicated that people in different roles had different core competencies indicating that competencies do evolve as roles change (H3).

Management of Core Competencies vs. Performance[45]

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[4]See Appendix A for view of the graphs illustrating these variable relationships.

The measure of the performance of the functional quality team is quantified by the performance score. The performance score of the functional quality team is determined from the performance ratings given by the design group and management against the list of mandate dimensions. There were 15 dimensions given in the interview and each functional quality team had an average of 10 dimensions applicable to it. The performance rating for each dimension was given relative to what they perceived to be management expectations; the rating scale went from 1 'Far below expectations' to 5 'Far above expectations', 3 being 'Meets Expectations'. The performance score of the quality team is equal to the number of performance ratings greater than 'Meets expectations' minus the number of ratings lower than this middle point. Only the ratings given by the design group and management were used as they were assumed to be more objective.

Functional quality team's core competencies management: In order to determine how closely a team used a management of core competencies, each team was given a core competencies management score for each of the core competencies management steps (selection, building, benchmarking, and leverage).

- The first part of the interview reflected the score for 'selection' where the respondent had to justify the selection of the two main core competencies.
- The score for 'building' is based on the results of the second part of the interview where the respondent was asked to describe the type of training done by and planned for the team.
- For benchmarking, the respondent was asked to identify the methods used to evaluate the proficiency level of its main core competencies.
- The fourth part asked the respondent to indicate incidences where its proficiency in certain core competencies was used to build procedures, tools or other means to increase its productivity (leverage).

When M. Lafrance and J. Doutriaux reviewed the scores for management of core competency and the performance scores were tallied (see figure 2) and compared, a positive relationship appeared to exist (H1), but it was not statistically verifiable. In general a synergism was found between the four steps of core competency management all of which led to better performance.

In reviewing the entire study, the study intimates that knowing where one is at and understanding the natural evolution in a function role is critical to high performance. One could argue that gaining knowledge through internal audits is as important as the external benchmarking, although the external, latest greatest, vision

gets a lot more press from fast track managers. The thing about core competencies is that they are often without flash and flare. Take an example from Warn Industries, "Joe" in the welding department: due to an unusually high work ethic and an unpresuming genius for his work Joe is the basis of manufacturing competence in that work cell, but the top managers see him as an insignificant cog in the works. Joe is the foundation of core competency in that cell and he would be the easiest avenue through which the company can expand competence through benchmarking. If the company believes that his area needs to be integrated into a system wide TQM system, putting great resources to that end, they may be surprised to have mixed results as it will not happen if Joe is treated as a cog.

The job of implementation is very hard given the seemingly opposing variables of pride in our core competencies and the need to systematically let go of methods which are below the benchmark. This is especially true if our own industry is not currently emulating that benchmark, thus providing no market impetus.

Wide Spread Examples of Bench Marking

For industries and academia concerned with staying on the cutting edge, the activity of traditional benchmarking is ingrained as the basis from which all other activities must spawn.[5] This love for measuring is the central theme in the Japanese success and it is to their credit that they could make such huge strides using only a calculator. At some point of it's life cycle every concept, system and tool coming out of Japan is data intensive. For example, the phenomenal success and particularly the *simplicity* of JIT was not an easily won prize. The JIT capability has come about through various forms of intensive measurement and CI such as the use of Statistical Quality Control (SQC).[46] In Japan all people receive intensive education in quantitative methods[47] with the intent of producing an ample human resource to feed the broad based SQC requirements of industry. Japan's response is not simply academic; it is nationally and socially comprehensive with the intent of having every aspect of their corporate and individual activity ending in efficient top level results.[48] When measurement leads to repeatable profound results, having breakthroughs like JIT and providing the practical foundation for application, "Measurement" becomes

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[5]I have not found a specific reference for this, but there is overwhelming evidence in every point of my experiance. For instance all literature covering WCM techniques will have *measuring against a known BM* as a critical element of their discussion.

an unquestioned element in everyone's activity. So there is a whole lot of benchmark measuring going on, but just how widespread is this phenomena?

There is no limit to the examples! Analytical people, irrespective of their vocation, tend to rigorously benchmark in everything they do.[49] Often the benchmark has proven to be sheer stupidity as seen in the practical example of an organization using only a Theory X approach on people, the equivalent to using a tidal benchmark which is submerged half the time.[50] We also find benchmarks used that are simply substandard as in the common American example of measuring nothing but Labor Utilization as compared to measuring utilization subservient to the full picture of Real Productivity and Total Resource Requirements.[51] It is a fact that many of the best benchmarks are from a person's experiences of what holds true as in the simple measure of sales dollar per employee as an estimator of change in productivity.[52] What is often lost when an organization comes to trust a simple measure (like sales dollars per employee) is that the item benchmarked is not always the item to be improved, in this case going back to throttling labor utilization. Looking at benchmarking activity from a variety of view points should bring home it's widespread usefulness.

Bench Marking Done Right!

An excellent example of benchmarking is found in the study performed by A. Porter, J. Roessner and H. Xu of, "High tech Competitiveness: Comparing 29 Countries with a Set of Three Indicators."[53] This study used new composite indicators of high tech competitiveness over a representative sample of countries. Their paper was drawn from the results of two studies which looked at the major variables in high technology market: four drivers of high technology competitiveness and the three results from the competitive positioning. They defined "high technology" as the research intensity of the producing industry in a particular area of technology. The cross section of industries included chemical production, communication equipment and engines.

By measuring a country's Standing, Emphasis and Rate-of-Change in the high technology industries, it is anticipated that accurate forecasting and planning can be performed. This is an excellent case of benchmarking in that the study was based in a currently established series of studies which built and expanded the view of the benchmark. In addition, the study is reasonably broad based to allow for a verified assessment of who the benchmark is and how that leader stands relative to oneself

and the competition on well defined critical competitive indicators. The studies intent is to be empirically based and continuously improved which is a pragmatic way of approaching benchmarking.

QFD as a Premiere Bench Marking Tool

Quality Functional Deployment (QFD) is a matrix analysis tool for relating and then establishing a customer's view of quality into a company's requirements. Often the new company requirements include change which makes the use of QFD much more than just an isolated tool available to quality control experts. QFD uses benchmarking methods which fit in with a concurrency of methodologies providing for and supporting a product life cycle toward achieving the goal of maximized corporate potential.

QFD is novel among the many quality methods in that it attempts to include every aspect of product development into a single system. The "House of Quality" (HQ) is the QFD matrix given the most attention and for the most part it is the totality of what people understand QFD to be.[6] In fact, all the QFD matrices are built from this house, yet it is but one of 24 matrices with a dozen additional matrices and charts to fill out the list. These various charts are connected in a variety of ways to allow for the clear identification of the customer requirements driving down through the many decisions made by an organization while it seeks to design, manufacture and market a product.

In practice, many systems and tools are used with, or in place of, the QFD charts. The tendency to mix and match new tools with old proven ways of doing things has led to a flourishing of hybrid QFDs. The use of a variety of techniques with the first chart, the House of Quality (HQ), is the most noted example. The particular system is not important, but rather the accomplishment of goals through a organization's strengths and weaknesses is essential.

The HQ[7] in bringing the voice of the customer into the strategically planned activities of an organization fulfills the most important aspect of benchmarking. Information is gathered concerning the customer's view of a product or service and

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[6]Four out of five text and every article in an extensive literature search on QFD found the HQ to be the only item cover to any depth and it is usually the only item mentioned. Y. Akao, *QFD, Integrating Customer Requirements into Product Design,* Cambridge, Mass.: Productivity Press, 1990.[54]

[7]See Appendix B for view of the HQ.

how it might be improved. This information is separated into three types of customer wants: assumed, expected and exciting.[8] The customer's view of competitors' products is also gather and all competitive products are rated according to the customer's perception of quality features. Involvement in these activities and the resulting documentation become the foundational benchmark for most of the activities in a company. The involvement in the QFD activities produces, or refines as the case may be, experts in the product and market of interest and, with a little luck, it engenders a well directed enthusiasm about meeting the goals at hand. The documentation drives activities beyond the HQ team's responsibilities and it acts as a consistency of reporting on the history of a company's work toward serving a particular market and customer.

Church Growth and Bench Marking

This may seem far afield from benchmarking in manufacturing and it is. I have included this example to show that benchmarking is a part of every aspect of our lives and is utilized by all forms of professionals. In this case, the benchmark is Dr. Paul Cho's church in Korea with 10,000 members attending per service and still growing. The goal has remained the same, bringing souls to Christ, and the measurement has been consistent, avowed belief, but the benchmark has shifted radically. The difficulties in a church attempting to grow are many, and to a large extent center around the ability of a Pastor to measure and respond to needs beyond what 50-100 people require. In recent history deriving the benchmark has been exclusively focused on measurements performed one-on-one with a lack of delegation as the prevailing theme. The specific measurement and ensuing action have in most cases been acceptable, but the efficiency of the process has been abysmal. In Dale Galloway's book "20 20 Vision" a method for attaining a higher benchmark is given.[55] Interestingly, the problems that cause a lack of church growth are some of the major problems in implementation of WCM. In Galloway's book, he lists the 12 points of stagnation that stop the flow of transformation.[56]

Number one is *blindness* to the possibility of change where the opportunities, the obvious need to benchmark, are ignored and even specifically excluded from one's thinking.

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[8]See Appendix C for view of these variable relative to fulfilling customer desires over time.

Number two is *unbelief* where people will be so ingrained in their way of viewing the world that even when exposed to really exciting benchmarking examples they will stand in the face of the truth and deny it.

Number three is a lack of *leadership*. Galloway gives an interesting example of parishioners waiting for communion follow the first person to stand up, but unfortunately that person was headed to the restroom. Leadership clearly focused on an appropriate benchmark is required to bring people beyond the undirected and unchallenging goals they set for themselves.

Number four is too much *leadership,* where the manager will not delegate and promote Total Employee Involvement (TEI) in the organization. When the leader is very good at doing everything there is a great tendency from everyone to expect all the decisions from that person. Everyone needs to participate in the benchmark vision and have some autonomy to promote it.

Number five is the focus on *doctrine.* Certainly correct rules of conduct and unanimous agreement on direction are important, but rules can also kill the life in the organization. By definition benchmarks are some place you're not and getting there requires change, human change.

Number six is *RUTS,* I like this one because it's so challenging a problem, is always present and comes under many guises not the least of which is NIH (not invented here). Ruts are a catch 22 where you have a core competency, because people have dug an efficient rut to get the job done, and you have a lack of flexibility, not suited to achieving the benchmark.

Number seven is the *exclusive attitude* where every one is right in their particular rut. In my experience opposing groups in organizations tend to very quickly point fingers and declare who the problem is. It is never our rut that needs some jack hammer work. While the arrows are flying among the doers in the organization, the throw back 60's anarchist and human resource professionals are giving lip service to a warm fuzzy I'm OK You're OK. There is no real meeting in the middle and wrestling the issues to a reasonable facsimile of the benchmark.

Number eight is *isolationism,* which is really a symptom of the people not coping with the other eleven points of stagnation. If people are not making real progress, but only putting on a facade of being with the program then a certain amount of isolation is required to hide the truth.

Number nine is *impossibility thinking* often disguised as the "common sense" reasons why something will not work, but may only be excuses for a persons

stagnation. Standing under the benchmark it is hard to envision all the details and hurdles swept away so that the goal can be attained.

Number ten is *busyness* on things which do not achieve the goal. People who are busy, either at nothing or to the wrong ends, and have a knack for looking as though they have the company interest at heart can be solid road blocks to the real work of achieving the benchmark.

Number eleven is *aimlessness* which can be found in areas of an organization or it can be the total lack of direction. Direction is the first fruit of benchmarking and it is vital in that it provides for wiser utilization of all resources. It is the one good example of "Quality is Free".[57]

Number twelve is *pride*. In my experience introducing a benchmark can raise the ire of older workers who have been successful in their way of contributing to the company and therefore resent being treated like "kids". As in dealing with ruts this area is challenging since the worker's pride works primarily for and only on occasion against the organizations goals.

These twelve impediments to church growth and the solutions for them are critical factors for churches wishing to grow, but why grow? The logic in this planned targeting for growth is that new church goers equals new converts. It would be a major flaw in ecclesiatical thinking if church growth does not equate to increased conversions. This example illustrates the one major pit fall in benchmarkings general usage. One can fulfill every aspect of benchmarking on the wrong item and not recognize it due to personal zeal to get the job done. In the case of Mr. Galloway's work there are no statistically significant studies show the tie to conversion, but rather he has found the tie in his experience.

I believe Mr. Galloway's insights are a critical element in understanding the work of seeking the benchmark level. Once management stands 100% behind the need to actively seek a benchmark it is relatively straight forward (everything is difficult in WCM), given the resources, to find the best, define what that best is and describe how you measure up to the best. What is much harder is to have real insight concerning what it would mean for your organization to be that benchmarked best or if in fact we need to set a differentiated goal of *our* own best. I believe that the reason measuring is easy and insight is hard is that the techniques of WCM, and benchmarking in particular, have not been adequately benchmarked themselves. We need to call into question the basis of what people understand benchmarking to be and then identify a new benchmark from which to exceed our old ways.

A New Opportunity

If the world were round and the earth revolved around the sun we might all agree on what is up and who is on first. The fact is there is a lot of agreement, even among people who think they do not agree, but all this agreement is not looking to change or new possibilities, it is simply superficial. Perhaps the world really isn't round?

I postulate, in bold affront to a data intensive world filled with thinking minds, that there is a difference between a scientifically defined, "rotation of the earth around the sun," and the earth's rotation around the sun.

Everything exists first and foremost; a distant second is our rigorous modeling of that existence. Rene' Descartes, the French Philosopher and Mathematician of the 17^{th} century, coined the phrase, "I think, therefore I am." This concept is entrenched in our society and certainly among the intellectual professionals who are the basis of our current WCM and TQM. Most engineers, academicians and management professionals would disagree on the exact form and method required to fix our productivity and quality problems in the United States. Yet they would agree that getting the thinking mind around the situation is the way to find a solution to the problem. It is very powerful to scientifically explore, define and grapple with solutions for an item of interest (in TQM we should deal with everything not just "problems"). It is characteristically foolish of us to assume that these techniques of penetration will take us to a point of directly interfacing with the existence of the item of interest. It is powerful to scientifically continuously improve. Yet the questions should be why and what takes place when an existing practical application takes an unexpected leap forming a new benchmark? How is it that new ideas lie just beyond our grasp until, one day...Bam, it hits someone over the head that there is a much better way which obsoletes the old benchmark?

Concluding

The insight derived from benchmarking is very powerful. When all forms of organizations establish a path to defining appropriate benchmarks and then become established in the process of continuous improvement we will see a revolution in our society. It seems foolish to expect islands of WCM to exist in United States if the

entire country does not move to a higher expectation. The difficulty is that this higher expectation is a lot of work with results that are easy to talk about and quantify, but much harder to instill in people's outlook, motivation, capabilities and output.

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