Questions of Quality

How Good Is Your Laboratory?

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Q: How can chromatographers improve the performance of their laboratory? A: Benchmarking!
Chromatography laboratories are under increasing pressure to improve performance and effectiveness. The current driver of productivity in commercial organizations is cycle time: getting your product to market faster than your competitor. This is mirrored in a shift away from managing cost to managing value to drive productivity gains. In short, your work must add value to the final product of the organization.

How should a laboratory approach the problem of improving performance? There are a number of ways, including:

- total quality management (TQM)
- added value analysis
- activity based management
- process re-engineering

TQM is an approach that results in incremental increases rather than step or large increases in performance. For large increases in performance we need to look elsewhere. Process re-engineering, discussed in an earlier "Questions of Quality" column (1), is one way of obtaining a large-scale increase in performance, but this and activity-based management requires benchmarking to drive it effectively.

Do You Measure Up?
Each of the approaches above requires that the performance of the laboratory is understood. This is rarely the case. For example, how many of you know the average, shortest, and longest turnaround time of your samples? The time (average, shortest, and longest) to complete a certificate of analysis or an analytical report? If you do, then you are in the minority.

Furthermore, if there is more than a factor of two between the shortest and longest time — your laboratory is probably in a mess, or regarded with disgust by your customers, or, even worse, both. You are probably also operating in a constant fire fighting mode, which adds the impetus and motivation for going to work on Monday mornings!

Aim for Consistent Performance
A key objective for any laboratory to strive for is consistent performance. Any laboratory is only as good as its worst performance — customers only remember the worst. Moreover, they expect the best or better as the norm.

The key to understanding your performance lies in benchmarking. Benchmarking involves deriving a series of quantitative measurements of laboratory performance. This process is immediately recognized by chromatographers and analytical chemists as related to their own discipline: i.e., derive a series of parameters and then measure them.

Two of the primary reasons for benchmarking are goal setting and process development. The measurements provided by benchmarking allow the laboratory to control and manage its operation: if you cannot measure your processes, you cannot control, and if you cannot control, you cannot manage.

Interested and intrigued? Read on and discover the fascinating world of benchmarking. Understand how it can help you, your laboratory, and your organization. This article will outline how benchmarking can be used to improve your laboratory's performance.

A Laboratory Performance Appraisal
Benchmarking is simply the process of comparing business practices and performance levels either within or between organizations to gain insight about them and to identify opportunities for making improvements.

In essence, benchmarking can be considered as a performance appraisal for a chromatography laboratory. We have all had/enjoyed/suffered performance appraisals ourselves in our work. They can be informal or formal. The formal type has a written evaluation of our work and usually at the end we are given objectives that are our personal target for the next evaluation period.

These objectives should be SMART (Specific, Measurable, Achievable, Realistic, and Timely) — your personal objectives are smart ones aren't they? The set objectives are monitored over time, and at the next performance appraisal an assessment is made of how well they have been achieved. This is a good analogy to use to give an impression of benchmarking.

Dream on! The analogy suffers from two problems.

1. It assumes that the working practices of the laboratory are efficient .

2. A single individual can affect the performance of a whole laboratory.

In contrast, benchmarking is a means of assessing the overall performance of a chromatography laboratory and identifying areas for improvement. The whole staff will be involved in the coordinated effort, rather than many individual and often uncoordinated efforts. As it is overall performance of the laboratory that is critical to its survival and prosperity, it is right that emphasis should be placed on a team approach.

To the horror of many in personnel, sorry, human resources departments, I would advocate the replacement of individual objectives with team or department ones. This would align individuals and teams with overall laboratory and organization objectives. Peer pressure is a greater force than managerial directives to obtaining and maintaining performance of both teams and the individuals within them.

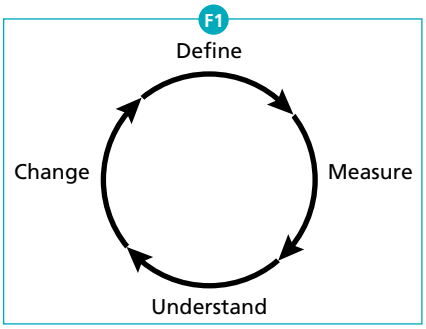

Figure 1: *Four phase approach to benchmarking.*

Aims of Benchmarking

The fundamental concept of benchmarking is to learn from the approaches used by other organizations that may have developed alternative solutions to common issues. In essence, it is easier and safer to learn from another organization's solutions, than to develop your own internal solution. The former approach results in the faster implementation of the improvements and increases the likelihood of getting your solution right first time.

One quotation about benchmarking is "stealing shamelessly" but this misses the target and can confuse the issue. The key to benchmarking is that you should understand the problem you are trying to solve: learn from the benchmarking initiative but do not copy blindly.

For instance, if a company does a particular task twice as fast as you. Why? Is it because they regard that task as very important and allocate twice the number of staff to do it than you have, or do they have a better way of doing the work? This is a simple example but illustrates the need for understanding before rushing into precipitate action.

Benchmarks are used to:

- measure the scale of performance gaps within the laboratory
- promote external awareness in the way other organizations approach the same problem
- uncover the best practices.

Motivation within a chromatography laboratory can be increased by demonstrating what can be achieved, which allows working practices to be benchmarked and compared. This promotes teamwork and enables realistic targets to be set for closing the identified gaps in key areas.

Four Phases of Benchmarking

Benchmarking comprises four phases which are discussed below and shown in Figure 1:

Define:

- what is the scope and purpose of the benchmarking project?
- what are the key issues and the key success factors?
- which processes will be benchmarked?
- what are the specific measures which will be chosen?

Measure:

- map and understand the processes
- review internal performance data
- interview customers and internal and external suppliers
- collect external data from the professional bodies or benchmarking partners.

Understand:

- identify Best-In-Class performance
- identify gaps and assess their significance
- identify opportunities for performance improvement
- prioritize the focus for change.

Change:

- create an action plan for change (e.g., simplify or eliminate processes)
- build consensus for change within the organization
- close the gap by specific improvement actions or projects
- monitor the progress of the change
- feedback improvement information to the staff.

Benchmarking is an ongoing process. It is not a one-off event. Procedures must be put in place to measure the benchmarks regularly, then to revisit and reassess the key processes.

As a result of benchmarking, the processes in the laboratory will probably change. The ideal process has four key facets (2):

1. Continuous operation versus batch processing

2. Known delivery time versus unknown delivery time

3. Minimal labour input versus >50% labour content

4. No reworks versus excessive quality control.

This gives a vision of the way a chromatography laboratory could operate: but all of these ideals may not be applicable to all laboratories. However, the maxim 'right first time' is a very good target to aim at and will avoid analytical reworks and help to achieve consistent delivery as a minimum.

Remember that the process includes your customers as well, not just the laboratory in isolation. So to help you achieve process improvements, the laboratory should involve the sample suppliers and information users (customers) rather than concentrate on just the four walls of the laboratory.

As a result of this shift, benchmarking has evolved from a simple comparative performance measurement to a powerful analysis of best practice processes, which provide the foundation for step changes in performance. The step change is defined as a large, circa 40% or more, improvement in performance. This is shown in Figure 2. The current laboratory performance can be plotted against the Best-In-Class laboratory and the gap established. The step change required to be Best-In-Class is identified and plans made to achieve that performance.

The points from benchmarking are that it:

- identifies and calibrates the performance gaps

- provides the basis for the strategy and goals to close the gap
- helps to measure the progress to close the gap
- maintains the stimulus which maintains continuous improvement.

The data generated provide a stimulus for change, and a basis for monitoring improvement. Innovation is encouraged by discovering new ways of approaching problem areas, challenging the status quo processes.

Benchmarking Partners

The main point of benchmarking is comparison with a partner. However, the main question is with whom? There are four different classes of benchmarking partner. Seeking a partner can only begin after all the processes to be benchmarked have been specified in some detail, such that the value of the comparison is clear to both parties.

Internal partner: These are the easiest data to generate from a similar laboratory within the same organization and establishes a baseline performance. Benchmarking principles are established and this helps increase the understanding of the process and builds teamwork. Understanding your own operation cannot be stressed highly enough: if you want to improve you must have these data. Exchange of staff from other laboratories can help improve your own processes more rapidly. The disadvantage is that it is usually limited to medium-to-large organizations. Notwithstanding the limitations, organizations can learn from each other as long as they can overcome the NIH (Not Invented Here) syndrome.

Same industry: This expands benchmarking from the parent organization but limits the scope to the same industry such as chemicals, pharmaceuticals, or agrochemicals. It does not include data from direct competitors. It allows industry trends to be compared with straightforward comparisons. However, the data gathered can be limited in its value as it tends to be general, subjective, and often is open to dispute.

Competitor: These data are more useful than same industry, although the difference between same industry and competitor may appear very fine. Here one obtains detailed information about the overall operation of a competitor organization. Informal competitor benchmarking is often carried out when you attend a chromatography meeting and talk to colleagues from other companies:

- what are they doing?
- are we better?
- what are the pay scales?

You know the sort of thing, you do it all the time. It's even better when carried out in the bar, especially with the other company paying.

This type of benchmarking can help the laboratory to focus on specific processes to improve, and can highlight the current disadvantages. However, competitors are usually very unwilling to share data and process information, which can often be higher level than required.

Best-In-Class: This provides the broadest perspective by allowing the laboratory to examine practices across industries. Many business processes are generic in nature and looking at unrelated industries can provide insight to your ways of working. Resource and economic pressures reach different operations at different times in different fields. Someone may have had your problem before and solved it.

The Local Supermarket?

For instance, the analytical laboratory can learn from the clinical laboratory and the latter from manufacturing industry. The Best-In-Class partner often provokes surprise, where the ideal partner may come from a completely unrelated industry.

The key point is that to identify best practice for a particular process, the comparison should be with an organization for whom that process is critical for success. For example, to examine performance in sample handling and management, the ideal partner may be a supermarket company as stock control, order processing, and bar coding are essential to success.

You don't believe me? Next time you go shopping have a look at the technology the supermarkets use when they replenish the shelves — the larger stores have radio links between the bar code reader and the host computer. Better than your hand written log book for samples?

Define Benchmarks

Benchmarks to be collected must be defined so that all involved know exactly what will be measured and that comparable data are collected. It is important that the data gathered are as accurate and quantitative as possible. Where records are not available, mechanisms for collecting this data should be set up as soon as possible. Such data will be required, in any case, to monitor the improved operation after any changes have been made.

Of course, I have not mentioned an important group of individuals who will make or break this effort: management. Benchmarking must have management buy-in to succeed.

A Benchmarking Example: Sample Turnaround Time

One example of how internal benchmarking can work is to look at a situation where the turnaround time from sample receipt to reporting results is investigated at one site. Turnaround time is one of the key benchmarks for a chromatography laboratory. It is what will make or break a laboratory's reputation: reproducible and rapid are the requirements here. Mind you, many laboratories try very hard to give the analytical equivalent of a black hole: samples go in and nothing comes out. Sample turnaround time, in our example, is defined as the time from receipt of the sample in the laboratory to the dispatch (not receipt) of the certificate of analysis by internal mail.

Oh Dear!

The shortest time for sample turnaround is five days, the longest 40 days, with an average of 10 days (Figure 3). You can look at these data from two perspectives: the laboratory and its customer base. Viewing these data from the laboratory perspective an average of 10 days will probably be considered a good turnaround time. However, from the customer perspective

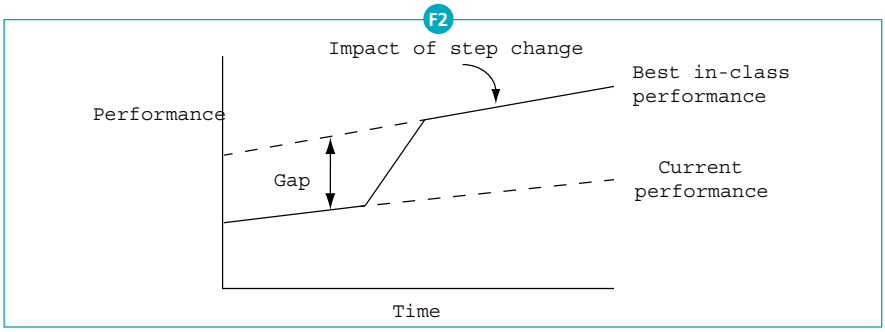

Figure 2: *Step change is a large improvement in performance.*

there is probably a different view. They see that the analytical laboratory service is slow and inconsistent (between 10–40 days, plus the time for report delivery). The few samples that are rapidly turned around will not be remembered against the majority of slow service times. Of course, if you don't have this data you can always live in ignorance of the storm around you. Ignorance is bliss!

Are We Going To Improve?

The next stage is to examine the process for analysing samples and producing reports: locating the bottlenecks and the reasons for them. Asking a few simple questions beginning with 'why' is a good start. Quantitative data for particular tasks in the laboratory will give you an idea of how good (or poor) the laboratory is. The aim should be to eliminate them and set standards for service support. For instance, for a specific analysis do you have a target turnaround time? No? Why Not?

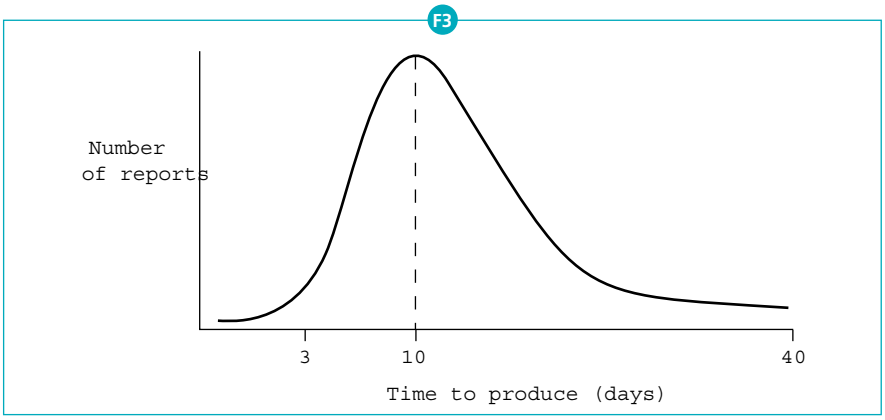

Figure 3: *Laboratory situation now.*

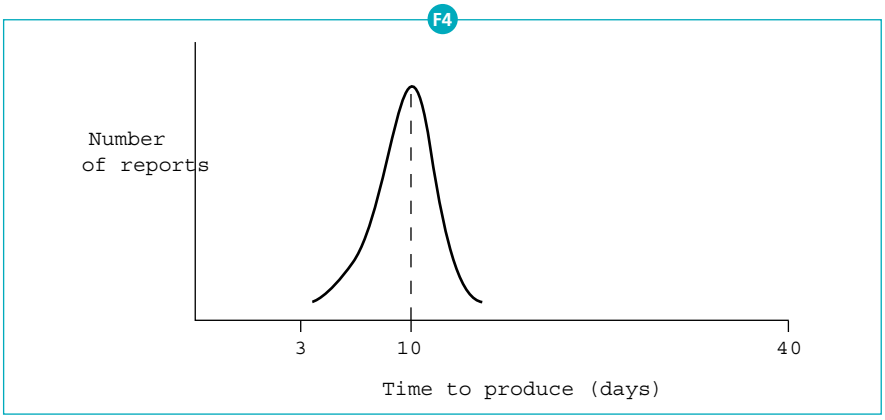

Figure 4: *Improve consistency.*

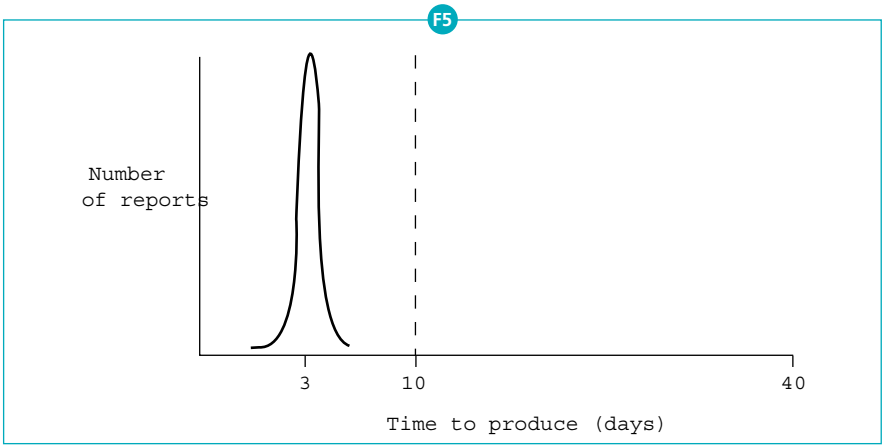

Figure 5: *Improve processes.*

Better planning will help you plan and schedule work. What! You don't plan what samples are coming from your customers or when they are expected? Then you deserve everything you get. If your customer is unwilling to help, then this requires a customer education programme. The old maxim, the customer is always right, needs updating to the educated customer is always right (provided they are analytically correct!).

The initial aim should be the removal of the tail from the elapsed time profile as shown in Figure 4. The laboratory response must become more consistent and there will be better customer satisfaction with the service level provided. It is not much to try and make a major improvement until you have a reasonable consistent operation. Then you can go for a great improvement of the process.

The aim of benchmarking is continuous improvement after the step change. In our example the average turnaround time is reduced further as the process is improved again, Figure 5.

Conclusions

Benchmarking requires adequate preparation, this includes both the benchmarking organization and any partners. The scope of the exercise must be defined and agreed before any work is carried out. However, before formulating improvement plans it is important to understand the reasons for any differences in the process and the importance the external organization places on it. Management leadership and commitment must be very visible during this whole process. The end result should be a more competitive chromatography laboratory, capable of meeting current demands, and responding to future needs.

This article is based on a paper published in *Today's Chemist at Work* by Paul Satchell and myself [3] where more detail can be found of the technique.

References

(1) R.D.McDowall, *LC•GC International* Jan–Feb. 1995 (Process Re-engineering article).
(2) R.Coulin, presentation at 4th International Symposium on Automation, Robotics and Artificial Intelligence applied to Analytical Chemistry and Laboratory Medicine, Montreux, February 1995.
(3) R.D.McDowall and P.Satchell, *Today's Chemist at Work 5* (1996) June, pages 28-32.