

Keys to Successful Implementation of Continuous Quality Improvement in a Statistical Agency

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Many organizations are actively involved in improving quality. While improvement in methods and technology are common, improved work practices and quality management are less frequent. This article describes key steps in successful implementation of CQI in these often-ignored areas. Examples are given from statistical agencies in the United States and throughout Europe. Topics include top management commitment, the structure of an organization, self-supporting operations, excellent communications, teamwork, and continuous improvement.

Key words: Current best methods; communication; teamwork; continuous improvement.

1. Introduction

To continuously improve quality requires a focus on product or service characteristics of importance to your customers. This involves identifying key processes that affect those characteristics, mapping those processes, measuring key variables, improving and stabilizing the processes, and documenting the resulting current best methods (Morganstein and Marker 1997). Continuously cycling through these steps allows quality to improve while regular operations are conducted. In this article we focus on six key factors that have emerged as vital to the success of continuous quality improvement (CQI) efforts in statistical agencies.

- Top management commitment;
- The structure of the organization;
- Self-supporting operation;
- Excellent communications;
- Teamwork;
- Continuous improvement.

The importance of all of these factors became clear from our work with national statistical offices (NSO) in Sweden, Finland, Norway, the Netherlands, and Denmark. These agencies were trying to improve quality using a more coherent planned approach than had been used in the past. In the United States we have assisted the U.S. Census Bureau, National Center for Education Statistics, and other Federal agencies in similar efforts. For

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20 years we have worked with private sector organizations throughout North America and Australia in similar quality improvement work.

2. Top Management Commitment

Far and away, the most successful improvement work has had top management's commitment to and personal involvement in continuously improving quality. While it is possible to make selective improvements, driven by groups of committed individuals or middle managers, continuous improvement cannot be sustained without top management making such efforts a priority. Top management is also needed to break down barriers between units, barriers that impede progress.

Why do managers make this commitment? Changing the ways that were successful in the past is not easy. Our experience has been that managers are willing to change if they are confronted by a threat to the status quo, or perceive the imminent likelihood of such a threat (Striner 1988). Without this, it is very difficult to summon the strength to lead an organization in a different direction. For statistical organizations, we have seen such threats in the form of Finance Ministry directives to outsource work that had previously been sent directly to the organization, or the passage of laws requiring new procedures.

Management sets the priorities regarding how their staff should spend their time. If the priority is production deadlines, or explanations for problems with previous production, then the staff will quickly see that extra effort spent on prevention is neither valued nor rewarded. As an example, consider an automated procedure for determining which maps to review during the production of millions of maps for a large-scale in-person data collection study. When it was suggested that review of this procedure and the development of flow charts might identify ways to make it even more efficient, and that other parts of the organization might benefit from learning how this automated procedure worked, the response from the lead person was "How will I benefit?" There was no sense that this person's manager had made it clear that improvements to any part of the organization would be beneficial to all. The staff perceived no benefit in identifying how to improve what they did nor did they perceive that their manager considered this an integral part of their job responsibility.

Top managers must demonstrate their personal involvement. They must understand the goals, methods, and cultural change required to become an organization focused on continuous improvement. The best way to demonstrate this involvement is for Directors General to use these methods in their own work: re-examine their work operations for possible activities to improve, participate in relevant quality improvement teams, make sure they understand their customers' needs (Carling 2002) and, most importantly, change the questions they ask of their staff.

One very successful Director General was known for stopping managers and non-managers in the hallway to ask, "How are your quality improvement efforts going?" "Have you mapped your key processes?" "Have you identified obstacles to improvement?" These types of questions show a level of knowledge and commitment that cannot be communicated by simple slogans or speeches. New questions that show an understanding of continuous improvement indicate that top management is focusing on the processes that determine the quality of products and services.

Another Director General was a regular attendee at staff meetings to review proposed updated current best methods (standards). His active participation in this effort helped move forward their adoption. He also demonstrated to other staff the importance of their participation in this process.

Management's support for CQI must be consistent. An important mechanism for this is to incorporate quality leadership into the evaluation/reward structure. Most organizations review their staff's performance annually (or at the conclusion of major projects). Does their evaluation value participation in quality improvement efforts? Does it reward cooperative activities, like teamwork, that will improve the overall quality of the organization, or does it force units within the organization to compete against each other?

One type of reward worth special mention is quality awards, which have been created at a number of statistical agencies. These awards can either be supportive of CQI, or undermine such efforts. If an award is given to the "best" team each year, the message sent to staff is not to share your success (at least initially) because then another team might use these ideas to "beat" your team for the award. This sets up barriers to communication that actually slow down improvement efforts. Alternatively, awards can be given to all outstanding teams deserving of recognition. This implies that some years there can be multiple winners, and other years there may be no winners. This process demonstrates a better recognition by management of the need to reward *all* worthy efforts.

There are many forms such rewards can take. Many national statistical offices are constrained from changing staff salaries. Alternative rewards can include: promotions, participation in desirable projects, opportunity to attend conferences on interesting topics or in interesting locations, recognition at staff meetings, etc.

Management must set the priorities. One priority should be finding new areas to improve. It is neither possible nor desirable to attempt to improve everything in an organization simultaneously. Initial priorities for CQI should be processes that affect key product or services characteristics (as defined by customers), have a high likelihood of being solvable, and involve parts of the organization where management supports CQI. Three examples of early quality priorities that have been set are these: improving the content of press releases, shortening the time between data collection and the reporting of economic statistics, and improving survey documentation.

While some processes are being investigated, others should be identified for future effort. Managers must plan for the resources necessary to continue these efforts. Staff who have completed participation in a quality improvement team are usually anxious to use the tools again to improve other parts of their operations. Unfortunately, management is often not ready for follow-on activities as soon as the staff is ready. Obviously such activities have to be balanced with other job responsibilities, but management's lack of advance planning is often a strong impediment to building the self-sustaining effort that is required.

One obstacle faced in almost every organization (and described in Deming's 14 Points) is the barrier between departments. This is particularly true of governmental organizations with stovepipe organizations (as described in Dillman 1996). For-profit companies eventually recognize that if successful ideas are shared the entire company can become more profitable. It is not so obvious why employees of a governmental statistical organization should share their successes. In one statistical organization, staff working on wage statistics identified improved methods. Their management did not understand why

they should take the time to share these results with employment statistics staff. Only top management can convince their staff that the reputation of each part of the organization affects that of all other parts. Breaking down these barriers is vital to improving the communication and efficiency of the entire organization. Staff from multiple divisions, as well as customers and suppliers, can be included in the same quality improvement effort. Training programs and other activities can involve staff across departmental boundaries. Overcoming existing barriers is an excellent opportunity to improve quality throughout your organization.

Dale and Lascelles (1994) discuss the evolution of an organization through stages of the quality improvement process. They describe six easily recognizable levels as follows:

1. *Uncommitted*. Not yet started.
2. *Drifters*. Quality improvement perceived as a program, rather than a process. The management has no plan for deployment throughout the organization. Teamwork is superficial.
3. *Tool-pushers*. Employ a selection of quality management tools. Looking for the latest panacea. Meeting output targets is management's key priority. Emphasis on solving current, rather than future problems.
4. *Improvers*. Understand CQI involves long-term cultural change. Members of senior management have demonstrated commitment through understanding and leadership. Policy deployment and infrastructure in place, a proactive quality system. Long-term education and training. Process improvement activities throughout the organization.
5. *Award-winners*. Leadership culture that is not dependent on the commitment and drive of a limited number of individuals. Effective cross-functional management processes. Strategic benchmarking practiced at all levels. A participative organizational culture. Powers of decision making relinquished by management to people at lower levels.
6. *World Class*. Total integration of quality improvement and strategy to delight the customer. Probably taken ten years to reach this level. Management focuses on enhancing competitive advantage by increasing the customer's perception of the organization and its products and services. Total quality is a way of life.

Notice that a critical discriminator at all of Dale and Lascelles's levels is the degree and nature of management involvement in changing the culture of the organization. The overwhelming majority of statistical agencies (and private sector organizations) we have worked with are at Levels 2 and 3. To achieve higher levels top managers must take personal steps to change how they conduct their jobs. Since managers achieved their positions by being successful under the previous expectations for managers, it is not surprising that they are wary of change. However, without changing their personal behavior and their priorities it is impossible for organizations to move on to Levels 4, 5, or 6.

Two final comments are worth considering by management. First, communications must be two-way. For example, it is a good idea to ask your staff for suggestions. However, you must be prepared to be responsive to reasoned suggested improvements. This does not mean that you must agree with all suggestions. But if you wait a year before

responding to suggestions (as happens in some governments), staff will quickly determine that “you do not really want my opinion” and will stop participating.

Second, do not view CQI as something done in “Quality Projects.” When you begin a CQI effort, it is necessary to demonstrate the process of improvement through quality improvement teams working on specific projects. But this is an interim solution, the goal is to use the tools and procedures widely and make them the way of working in your organization. Always be on the lookout for opportunities to use these tools and procedures in your other activities. In this way you will eliminate any confusion that “quality work” is different from “regular work.” This artificial separation can lead some to infer that the methods of CQI do not apply to “regular work.” Nothing could be further from the truth.

3. The Influence of Organizational Structure on Quality and Innovation

The structure of the organization, the patterns of control and communication, the centralization or decentralization of critical skills, and the reward system, all affect the speed at which the organization can evolve. Changes in these components change the resulting output.

In his 1996 JOS article, Dillman argues that there are important barriers to innovation in a statistical organization: “differences in the dominant value systems of operations and of research cultures; and, the difficulty of resolving those differences in a hierarchically oriented organization.” His four-step solution for improving accuracy (one component of quality) is:

- The presence of professionals with training in the theories relevant to defining, identifying and resolving measurement and nonresponse error issues;
- The capability for understanding and working to overcome measurement and nonresponse error in operations, as well as, the research culture;
- Dealing effectively with organizational structure; and, finally,
- Increasing people’s understanding of the multidimensional nature of survey error (people both within and outside of the organization).

There are, of course, other factors that affect the pace of innovation, even among the most educated of scientists (see for instance, Kuhn 1970 and Goleman 1985). Dillman’s observations are important. Notice the theme of differences between the research culture with its historical focus on modeling, measuring, and reducing errors, and the operations culture where the budget and schedule may have priority over error control or reduction. Deming (1982) reminded us to “break down barriers between staff areas.” The cultural differences mentioned by Dillman are some of the barriers to which Deming referred.

Dillman’s solution focuses on survey errors, but organizational structure affects other improvements as well. An important quality improvement effort at one statistical agency consisted of examining why methodological improvements developed by the central methodology staff were never or only very slowly implemented by other staff. There was perceived to be a lack of communication between operating and research departments until after the “improvements” were developed, which resulted in a (real or perceived) lack

of ownership on the part of the operations staff. As a result the operations staff did not feel the methodology staff's "solution" addressed "their problem."

Hierarchical organizational structures are likely to inhibit or reduce communications. Decentralized services and geographically isolated units are likely to cause this, as well. Reward systems that pit one group against another discourage cooperation, "If the other units win a bigger slice of the budget pie, then our slice will be smaller." These attitudes discourage the development and use of effective, efficient, standardized software and create the "not-invented-here" syndrome. For example, practically all Westat surveys use a standard set of software for sampling, imputing, weighting, and variance estimation, for both household and business surveys, with in-person, telephone, or mail data collection. Standardized software speeds these operations and reduces development time, development costs, and errors. It also assures standardized output will be reviewed that has been demonstrated to catch common errors. A few NSOs use common software for sets of surveys, such as all business surveys, but we are not aware of any that have made a concerted effort to use common procedures across all surveys.

Hierarchical organizational structures require that approvals for change traverse up and down a chain of command. They may be well suited for static on-going surveys where consistency with previous practice is paramount. However, they do not encourage cooperation across departments and are therefore not as adept at dealing with rapidly changing environments, such as the harmonization process being faced by many European statistical agencies. Gross and Linacre (1997), in their discussion of Australian Bureau of Statistics' efforts to harmonize estimates across business surveys, identified three requirements for quality management, all of which are made more complicated by stovepipe organizations: a thorough understanding of user requirements, full knowledge of their processes, and an on-going commitment to teamwork and continuous improvement. The staff in these hierarchical organizations knows well how to repeat the same survey they have conducted year after year. However, they are not as prepared to make wide-scale changes in survey instruments, sample designs, and delivery schedules.

How, then, can these barriers be reduced?

In a discussion about Quality Improvement in the Australian Tax Office, Godfrey (1994) reviewed his experiences with the problem of typical government organization structures and presented some solutions. It was clear to him that the hierarchy inhibited change and that teamwork, as we discuss in more detail later, would help bring down the barriers. He focused on the training process as a key to changing attitudes and behavior.

"We recognized that we needed to re-create training and development as one part of a whole system of policies (job design, rewards and promotion, work force planning, career planning), which might help us change attitudes and behavior. The most successful approaches, we have found, begin with whole teams."

We suggest that a better balance is needed between an organization that conforms to regulations, rules, and policy dictates and one that sees the purpose of public administration as creating quality outcomes – delivering a service. Godfrey proposed that the change needed was a combination of training, teamwork, and a refocus of the reward system on those who can lead. These steps will help overcome the inertia of a static

hierarchical structure that is good at following the rules but may lack innovation and the skills and motivation to evolve.

4. Self-supporting

A CQI culture must become self-supporting if it is to be truly *continuous*. In the initial stages, there may be a need for outside consultants to train management and key staff, to provide additional skills as needed, and to help with benchmarking and other activities. But the goal should be to develop the in-house skills necessary to continuously improve, with less and less dependence on outside resources.

All managers need to be trained so that they can be supportive of the quality improvement efforts. However, they must do more than provide verbal support. Their decisions should be consistent with a change in culture.

A key to making the new culture self-supporting is to train internal facilitators who will be knowledgeable in tools for quality improvement, guide quality improvement teams, look for opportunities to use the tools in other settings, and generally serve as spokespersons for the CQI effort (Saebo et al. 2003). Their personal involvement helps persuade other staff of the usefulness of this effort. Their commitment breaks down barriers of suspicion that might result if the effort is only being pushed by management. These facilitators need to be good communicators, respected by other staff, and comfortable with statistical concepts (although they do not need to be statisticians).

The other key to the development of self-sustaining CQI is the organization of a Guidance Team. The goal of the Guidance Team is to provide the resources and “mid-course corrections” often needed to successfully implement the initial CQI effort. They must carefully select internal facilitators and areas for experimenting with teamwork. By regularly communicating with both top management and to those actively involved in CQI, the Guidance Team helps break down barriers between management and staff. The Guidance Team should regularly seek feedback from teams and internal facilitators on the progress, or lack thereof, to date. On the basis of this information, they can decide when additional resources, training, or policies should be implemented.

Without a Guidance Team it is very difficult for CQI to spread throughout an agency. The person given responsibility for CQI would not have the authority to allocate resources in departments not under their direct report. A Guidance Team with a wide range of representatives also facilitates sharing lessons learned across departments.

For a Guidance Team to succeed, it needs to have the confidence of both management and other staff. Thus its membership should include representatives of top management, representatives of middle management, and facilitators. Someone who reports directly to the Director General and is present at all regular senior management meetings should be part of the Guidance Team. Such representation helps to assure that those with the power to modify existing practices will address the Team’s recommendations on a regular basis.

As CQI becomes more ingrained in an organization, the need for the Guidance Team will decrease. When staff regularly view identifying, and acting on, opportunities for improvement as part of their job, when managers regularly encourage staff to improve

quality through their actions and their words, there will be no need for a Guidance Team. While we are not aware of any statistical organization that has yet reached that point, we look forward to the day when such teams are no longer necessary.

5. Excellent Communications

Excellent communications is key to CQI and is the goldmine of improvement opportunities. Communications can be improved between managers and staff; between units in the same departments or across departments; between people and the process they are responsible for; and between experts and novices. There is nothing as depressing as doing the wrong thing well. If we do not communicate clearly what we want someone else to do, we should not be surprised when we do not get it.

Every agency we have worked with decided that they needed to improve internal communications. In some organizations asking a question was viewed as a sign of lack of knowledge. Others had different levels of open communication in different departments. Even the suggestion that improved communication across departments was beneficial could often produce anger and frustration. In agencies with relatively open communications there still was generally no systematic procedure for documenting decisions and rationales.

To demonstrate the need for improved communications, we often ask staff from one operation to identify their customer. We ask them to define what would make an excellent quality product/service for them to deliver to that customer. Then we ask the customer to define what an excellent quality product/service would be for them to receive from their supplier. Comparing these two definitions can be surprising. When you realize that the supplier does not understand what is truly important to their customer, it is easy to understand why we are always redoing work that was not done “right” the first time. There is an American expression that “there is never time to do a pretest, but there is always time to redo the work.”

Communication is so fundamental that one of the first current best methods (CBMs) (see Morganstein and Marker 1997, for a thorough discussion of CBMs) that should be developed in any organization should deal with this topic. A CBM documents what is currently the best method known to the organization. While often called standard operating practices, we prefer the term CBM because it recognizes that these are living documents, requiring periodic update. They reflect knowledge of the organization, and are therefore not written by outside experts. CBMs should be short, frequently including a checklist of actions that even the most experienced staff member would benefit from reviewing. The rest of the CBM gives brief explanations of the items on the checklist, aimed at less experienced staff members, who need to understand why such a step is recommended.

CBMs have been written for statisticians – programmers communications; project staff – statisticians/programmers communications; and, project staff – field staff communications. Communication issues include what to specify regarding data files, what output to check to confirm accuracy, what documentation to provide, standardizing result codes from field operations, and much more.

A senior manager at a statistical agency complained that “50 percent of the tables I requested are wrong” when first delivered. He then explained that this was not the fault of those preparing the tables, rather it was due to incomplete specification in the request. The appropriate weights, subpopulations to include, file versions, check totals for comparison, etc. were not clearly stated in the specifications. Worse, this happened repeatedly. The staff concerned had not taken the time to develop a CBM for such requests, but had instead suffered repeated delays and potential uncaught errors, over and over.

A different communication issue was demonstrated when the part of an NSO responsible for preparation of an annual database “improved” the database at the request of one of its users. Instead of being dropped, units that were no longer in business were retained on the database, but with a code indicating their ineligible status. This allowed for easier longitudinal analyses. Unfortunately, other users were not aware of this change unless they had the database documentation. They conducted analyses of the entire database assuming it had not changed. Luckily the resulting estimates were so surprising that the mistake was caught just before publication. The need for metadata that accurately communicates changes like this is becoming more and more vital as we make data available to a wider array of users.

Continuously improving communications will avoid many serious mistakes, result in fewer unexpected delays, and reduce frustrations among staff members. Excellent communications will be noticed both by staff and external customers. If explicitly described as part of a CQI effort, the effort to improve communications will receive strong support throughout an agency.

6. Teamwork

We have found that many of the most efficient quality improvements come from teams established to review and improve processes. The teams have a facilitator trained in CQI, they include customers and suppliers of the process, and novices as well as experts. In this way people knowledgeable in the process inputs and outputs, along with those involved in the process itself, can select the best methods for their processes. This implies that team composition will frequently be drawn from multiple departments, sometimes including people from “supplier” or “customer” organizations. The team is encouraged to share its findings with others involved in the process. Ideally this sharing takes place throughout the team’s lifetime, not just when a final recommendation is ready. Numerous teams have posted preliminary process maps or cause-and-effect diagrams where nonteam members can suggest additions or corrections. These changes are discussed at subsequent meetings and incorporated into the final recommendations. This improved communication provides valuable insight while gaining cooperation and trust from those not on the team. Such activities increase the likelihood that everyone will be supportive of the recommendations assembled by the team.

Teams generally begin by understanding and sometimes sharpening the goals for their activity. These goals may be established by their managers, or through discussion with customers. The existing process is then mapped to better understand the current way the process operates. Key processes are identified and measured, if possible. Improvements are made until a stable, reliable process is developed that meets the expectations that have

been established. Quality assurance procedures are established to assure continued compliance with these expectations.

Language and culture can have a major effect on the success of any program. We have determined this to be particularly true concerning teamwork. Some cultures are accustomed to working in teams, while others traditionally work individually. Also, the word “team” can be translated many ways in some languages. For example, in Finnish, the word *tiimi* implies a group where everyone’s responsibilities are taken over by the team, with the individuals losing their personal responsibility. Alternatively, in a *rhuma* the individuals maintain responsibility, but work together to achieve their goals. It was important to translate team as *rhuma* to connote the type of teamwork encouraged by this section.

7. Continuous Improvement

The most important word in continuous quality improvement is continuous. CQI is not a destination; it is a way of working. Senior management needs to adopt a philosophy that makes continuous improvement a part of how the organization operates. The entire staff should be encouraged to look for ways of improving what they do and should be rewarded for any such improvement. This philosophy should be a core value of every organization.

Continuous quality improvement means moving away from reliance on checking quality after delivery of products or services, to focusing on improving the processes that affected the resulting quality. There are many ways to focus on these processes. Many organizations make use of some of them, but few take advantage of the full range of opportunities that exist.

Many official statistics are produced annually or monthly. Take the time to debrief project staff at the end of a cycle and prepare a short memo summarizing lessons learned. Are there things that could be done better, or activities that should be avoided? Such discussions can be a vital source of improvement efforts and provide excellent documentation for future staff. Unfortunately, there are many stories of a new staff member taking over and receiving output from a process but receiving no documentation saying why this output is important and what should be reviewed. The new staff has to relearn everything, recreating the same errors discovered by previous staff.

Summarizing lessons learned is also important for less frequently produced statistics. The Australian Bureau of Statistics maintains a database of issues identified during conduct of its population census. Senior management must act upon these issues before the next census is conducted.

In the spirit of better communication and teamwork, often it is important to involve field staff. Many organizations do not regularly ask their interviewers for suggestions for improvements. Few activities are repeated more often by governmental statistical agencies than the interaction between interviewer and respondent. There is a tremendous opportunity for higher response rates and better cooperation rates through improved question wording, contact procedures, collection of information on nonrespondents, etc. Agencies sometimes credit differences in response rates among interviewers to an “experience factor,” but few bring interviewers with different experiences together to share these factors or develop Current Best Methods and thereby improve all data collection.

Many key processes can be monitored to determine how they might be improved. These can vary from management budgeting procedures, to telephone interviewing information, to register updating procedures, to time and errors involved in producing reports. To the extent that such monitoring can be tracked numerically, tools such as control charts can be used to measure the effectiveness of improvements and accurately predict likely outcomes in the future. It is worth noting that monitoring by itself will not result in continuous improvements. Procedures must be established for responding to the information in a manner consistent with the numerical results.

We have seen many organizations that set arbitrary numerical goals for budgeting accuracy. If departmental costs (or revenue) are off by more than this amount, managers must spend extensive amounts of time explaining why. Using control charts to determine the expected accuracy of predicted budgets regularly demonstrates that the arbitrary goals are much too tight, budgeting procedures cannot achieve these levels. Instead of wasting their time explaining why, managers should be improving the budgeting, or more important, the processes that result in the costs (or revenue).

The lack of process measures has been one of the glaring weaknesses in CQI efforts at statistical agencies. Key processes that should not be difficult to measure and improve include cooperating and response rates, coding and editing time and errors, number of staff hours (and calendar days) to complete an activity, timing of press releases, and magnitude of revisions to economic statistics.

To continuously improve it is important to periodically develop and revise CBMs for key processes. As quality improvement teams determine best methods for achieving quality, these should be discussed and then documented, and the relevant staff trained in their use. This will spread the knowledge that has been gained and encourage everyone to adopt these policies.

As technology changes and other improvements are implemented, it becomes necessary to periodically re-examine old practices. As an example, at Westat we had an excellent CBM for implementing the Mitofsky-Waksberg method for conducting random digit dialing (RDD) telephone surveys. However, improved lists of telephone numbers have become available, making alternative list-assisted approaches preferable to Mitofsky-Waksberg in most situations. We have therefore had to revise our CBM for conducting RDD surveys.

Technological change is a given for statistical agencies. To name just two examples of the effect of such change, the World Wide Web and mobile telephones have created new opportunities and new challenges in the last ten years. How will your agency change to adapt to these new realities, and how can this lead to consistent quality improvements, not headaches?

8. Summary

Successful implementation of continuous quality improvement in a statistical agency involves a coordinated effort led by top management who demonstrate their commitment through their personal actions. They must establish a self-supporting structure that is flexible and favorable to innovation so that the organization can continue to improve. Communications between levels of employees and between departments must

be improved, so that barriers can be overcome and successes spread throughout the organization. Teamwork must be encouraged and rewarded so that everyone can understand how their actions fit into the larger organization, and will use that understanding to produce better products and services. Finally, the goal must be to continuously improve. CQI is not meant to be a program; it should be the basic philosophy of how an organization learns.

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