

# Implementing Benchmarking Recommendations in the Offices of Construction for the Iowa DOT

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The Iowa DOT's Offices of Construction are seeking ways to use benchmarking, the concepts of quality management, and outside facilitation to improve their methods and processes. ISU researchers and the Offices of Construction Benchmarking Steering team have developed a performance measuring system and have collected considerable baseline data. The baseline data has been examined and process improvement teams have been launched in areas that require improvement. In many cases, process improvement team recommendations have been implemented. This paper will present the results of those process improvement team efforts. Keeping continuous improvement efforts on track for many organizations is a challenge. It is easy to develop a vision and mission statement and generate enthusiasm, only to have the efforts die when participants discover the amount of effort and persistence required to continue the efforts. The Iowa DOT Offices of Construction has engaged in a quality improvement effort. The effort is expected to continue for the foreseeable future. The authors will share their experiences regarding starting and supervising PIT teams, including writing charters and member selection; forming a steering team that represents a vertical slice of the organization; encouraging team participation, including the technical staff; helpful interactions between the facilitators and the technical staff; design and use of employee surveys to support the improvement efforts. These experiences will be helpful to others who are participating in quality improvement efforts.

## INTRODUCTION

Quality leadership helps organizations to meet expectations in a rapidly changing world. Emphasizing the quality of the organization's products and services in effort to meet customer needs does this. First, measures of quality are developed and monitored; then continuous improvement is used to enhance quality.

Many organizations start on the road to quality leadership and take the first few steps. Then somewhere along the way, the organization loses its quality focus and returns to business the way it was previously done. The Iowa DOT Offices of Construction started its journey in quality leadership in May of 1995 with the formation of the Benchmark Steering Team. Since then the steering team developed a mission statement, a set of key functions and perfor-

mance measures; it has collected performance data three times (1,2). Four process improvement teams (PITs) have been launched. They have drawn membership from the entire state. The teams have completed studies and made recommendations and these recommendations are being implemented. Several Work-Unit PITs have been recently organized in the construction field offices. They are recommending improvements for more specific problems. The organization is firmly committed to quality improvement after three years of activity.

## PROCESS IMPROVEMENT

Process improvement efforts started after performance measurements for the first year were reviewed; an explanation of the key measures is provided in Chase et al. 1996. The key functions with the lowest ratings on the Offices of Construction Employee Survey were *Resolution of Technical Issues* and *Providing Pre-letting Information*. *Providing Pre-letting Information* also received a marginal rating from Iowa DOT employees outside of the Offices of Construction. The Offices of Construction Employees help with plan development by collecting pre-letting information. Typical tasks involve tabulating cracks for repairs and surveying wooded areas for clearing density calculations. Process improvement teams (PITs) were launched in each of these areas. Members were selected from a list of people who indicated an interest in serving on such teams when they responded to the first Offices of Construction employee survey. Care was taken to obtain a vertical slice of participants and provide representation from various geographic areas. One lesson learned from commissioning these two PITs is that more care was required in chartering the teams. Direction in what the steering team wanted was crucial to ensure the PITs were effective and efficient in their use of time.

The Benchmark Steering Team decided that it could do a better job of writing charters and assisting PITs if they performed process improvement studies themselves. They selected three areas that flowed out of the PITs recommendation and their own discussions: developing a list of contacts for technical problems, pavement smoothness specifications, and PCC patching problems. Using resources provided by several members, the Steering Team developed the list of contacts. The pavement smoothness review resulted in recommendations that specific areas be clarified in an instructional memorandum. As a result of the PCC patching study, a PCC patching fact sheet was developed that combined information from several sources including the specifications, the standard

drawings, and the *Construction Manual*. This fact sheet was distributed to the construction field offices. The steering team actively participating in quality improvement was important in helping the team understand more fully the quality improvement process.

Next, a process improvement team was launched to develop recommendations to improve contractor concern regarding safe traffic control. Following the recommendation of the Quick Draw Resolvers, this PIT was set up as a regional group. They were chartered as follows:

1. This process improvement team is charged with improving the effectiveness of the temporary traffic control zones. Temporary traffic control zones are considered effective when they are safe for the traveling public and workers and administratively efficient for the Iowa DOT and contractors. The cost and scope of work should be reasonable and well defined by the plans and specifications.

They made the following recommendations:

1. Require that a certified traffic control coordinator be present on the project whenever work is being performed.
2. Noncompliance penalties will be coordinated on a statewide basis to ensure that they are applied uniformly. A flow chart provided additional assistance.
3. An evaluation form for contractor traffic control was provided.
4. Work zone safety training should be increased.
5. A traffic control information directory should be included in Iowa DOT's Construction Manual.

Written comments from the Offices of Construction Employee Survey, *Documentation of Work Progress and Pay Quantities* key function indicated a considerable amount of concern regarding the Electronic FieldBook, a new computer system. The FieldBook allows field personnel to record work progress by using notebook computers in the field. Bi-monthly contractor payments are issued using this program. The written comments pointed out several difficulties in operating the system and dissatisfaction the documentation, training, and amount of help available. A PIT was chartered to review this situation.

The team flowcharted the entire operation from generating a template for a particular project to the final payment for the contractor. Then they recommended several changes that ranged from quick fixes to major program revisions. It is expected that most of the recommendations will be implemented.

During discussions with the Benchmark Steering Team, concerns about risk management during inspection became apparent. The construction budget for the Iowa DOT has been steadily increasing in the recent past. Meanwhile, the number of Offices of Construction employees has held steady or fallen slightly. Although this has reduced the cost of inspection as a percent of contract cost, it has resulted in an increased workload for the staff. Traditionally, an inspector was able to watch every construction operation to make sure the work was being correctly installed. Today this is not possible. Therefore, the inspector must prioritize tasks and concentrate on the most important item while spot-checking everything else. Inspectors would like to have more guidance on how to prioritize their time. Also, it is vitally important that the Iowa DOT limit inspection and testing to only the most important items that have the greatest impact on quality.

A PIT has been chartered to assess which aspects of PCC paving have most influence on quality. This PIT will review research publications and filter the findings with their experience to develop recommendations that are tailored for the Iowa DOT.

## **Process Improvement in Field Offices**

The Benchmark Steering Team saw many opportunities for quality improvement that could be harvested by launching PITs in the construction field offices. Launching PITs in the field offices would also increase involvement in and understanding of quality improvement. This action would also allow study of many more topics and would reduce travel time. The Benchmark Steering Team encouraged the field offices to develop a list of interesting topics and to choose one or two; a field office PIT would be launched to study each choice. The field offices were especially encouraged to tackle narrow technical issues that repeatedly caused problems. Assistance for meeting facilitation and topic selection was available from the writers. Five studies were launched, three examples are provided below.

### ***Joint and Crack Sealing Work-Unit Improvement Team***

One office felt that the procedures for measurement and payment of joint and crack sealing were overly complex. Although there were several different classifications of cracks, contractors often bid the same unit price for some of the classifications. This suggested that some of the classifications were unnecessary. They also pointed out that measuring the crack length required them to be away from the area where the work was being done, thus compromising their effectiveness as inspectors. This group made recommendations for changes to the specifications. These changes are currently being sought.

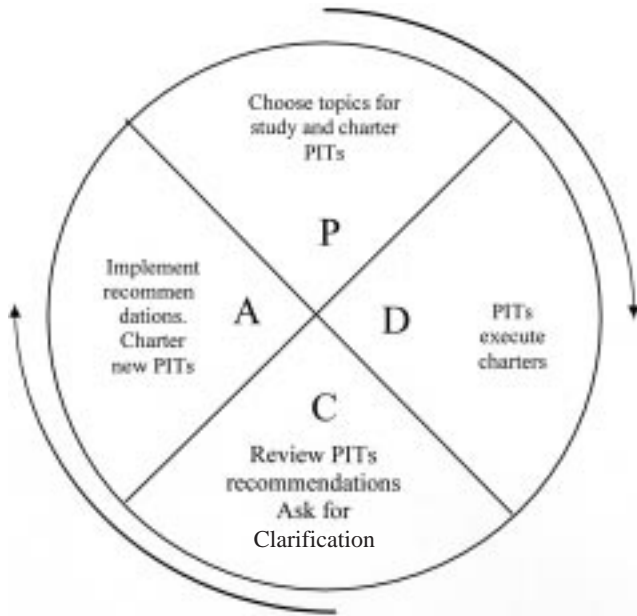
### ***PCC Pavement Removal Work-Unit Improvement Team***

Another group sought out a more efficient way to measure PCC Pavement removal. Currently considerable time is required to manually measure the number of square yards of driveways, parking lots and sidewalks. This did not seem reasonable because when plans were developed, the measurements are made to determine the plan quantity. This group developed a process whereby PCC paving removal would be paid for by plan quantity. The original survey notes would be transferred to the construction field office. Field forces would only need to note changes that occurred after the original survey and check for calculation mistakes.

### ***Field Fences Work-Unit Improvement Team***

Field fences are an item that the Iowa DOT occasionally builds. Several details exist for field fence construction in the standard plans. However, these details were developed long ago, and fence-making practice has changed since then. Also, since field fence is rarely built, inspectors cannot remember the details from one time to the next. A field office PIT reviewed this problem and recommended updated standard plans for field fences.

In general, the field office PITs were successfully launched when the leadership was interested in quality improvement and the team selected a topic that was of interest to itself. Some field offices produced products that can be shared with and benefit other field offices, while others developed improved methods for internal of-



**FIGURE 1** Plan-Do-Check-Act cycle for quality improvement.

office management; it is possible that these methods could be modified and applied at other offices.

**REASONS FOR SUCCESS**

During the past three years, the quality improvement process of the Iowa DOT has gone through many peaks and valleys. Enthusiasm is easy to generate, but hard to maintain. PITs are easy to empower, but providing adequate and detailed direction requires significantly more work than saying, “Go solve this problem!”

Resource constraints, especially hiring limits, make continuation of the process challenging. We have found that these challenges can be overcome if five factors are constantly and consistently addressed.

*Top Leadership Commitment.* The top leadership of the Iowa DOT and the Offices of construction strongly encourages quality activities. The state construction engineer leads the Office of Construction. He chose to lead the start-up of quality activities for this office. The director of the Iowa DOT led the start of quality activities for the Department before they were started specifically in the Office of Construction. The Development Division Engineer occupies the level of authority between the State Construction Engineer and the Director. He has also actively encouraged quality activities.

*Previous Training.* Most people in the Iowa DOT have had training regarding quality activities. In general, Iowa DOT employees have good meeting skills.

*Quality Activities in Iowa DOT.* The Iowa DOT has PITs operating in areas surrounding the Office of Construction. These support Office of Construction activities in three different ways. First, many of the PITs include Office of Construction Employees. This gives them training and understanding in quality processes. An-

other is that the other PITs provide input information for Office of Construction PITs and the Benchmark Steering Team. Finally, the other PIT teams often try to solve problems that have been identified by the Office of Construction, especially if the problems cross the boundaries of several offices.

*Full Participation in Discussion by Entire Steering Team.* During the monthly meetings of the Benchmark Steering Team, the facilitators noticed that there was a tendency for conversations to be dominated by the engineers and while the technical staff was left on the sidelines. Technical staff participation was increased in two ways: First, during discussion periods, the team was broken up into small groups. After the small group discussion, a representative of each group was asked to report to the team. The technical staff felt more at ease about contributing in the small groups. After they had a chance to voice their opinions in the small groups they were more likely to make further contributions to the entire team during the small group reports and at other times. Second, the technical staff was asked to report on specific problems that they or their colleagues had experience recently, especially with regard to resolving technical issues.

*Desire for Self-Determination.* Some, but not all, Iowa DOT employees are pleased the opportunity to have a hand in shaping their future. Past management styles often did not allow this to the extent that it is encourages as part of the quality improvement program. Therefore, there is a pent-up desire among some employees to make their contribution. It is desirable to identify these employees and ask them to volunteer for PITs. They contribute with considerable energy and enthusiasm.

**PDCA Cycle for Process Improvement**

A Plan-Do-Check-Act (PCDA) (Figure 1) cycle shows how process improvement using PITs works within the Offices of Construction. Here, planning activities include selecting topics for study and developing the initial charters for the PIT teams. The topics are selected by reviewing the output of the performance measuring system to identify areas where improvement is needed the most. The performance measuring system for the Iowa DOT Offices of Construction includes attitudinal surveys Office of Construction Employees, Other DOT employees outside the Office of Construction, Contractors, Law enforcement Officials and Truck Drivers (1,2).

The steering team should also consider the following:

- Other studies or activity related to possible topics. For example, an area that has high priority for improvement may be currently under study or in the process of change. In most cases it is best not to duplicate the efforts of the study or to wait until the system has reached a steady state after changes have been made.
- Written comments on attitudinal surveys that may provide additional insight.
- Conversations of Steering Team Members with colleagues and other customer groups will also help to clarify how a particular measure may be improved, especially when the measure was part of an attitudinal survey.
- Recommendations of previous PITs

The charter must be carefully written so the PIT fully understands its charge. An initial meeting between the PIT and the steering team is also helpful. Doing occurs when the PIT executes its charter. While the PIT is working, it is wise to have a member of the PIT report progress to the Steering Team and ask for clarification.

tions, if necessary. Checking is reviewing the results PIT study and asking for clarifications. Acting is implementing the PIT recommendations. In some cases the recommendations may include further study by other PITs. In this case another PIT is launched.

### Summary

Long term quality leadership requires top management commitment, a pool of participant who have the proper skill for teamwork, and a clear understanding of the organization's mission, key functions, and customers. A steering team that includes a vertical slice of the organization leads the effort. A performance measuring system provides direction to improvement efforts. It focuses attention on areas that are most in need of improvement and follows a PDCA cycle on a regular basis to update the Steering Team on areas where improvement is most needed. Process improvement follows another PCDA cycle for devising plans for improvement and imple-

menting recommendations. Strong foundations and the two PCDA cycles ensure the continued quality leadership.

### REFERENCES

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