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Improving Key Performance Indicators for Distribution Facilities Through Action Research

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Abstract

This Action Research Project is a study of the challenges faced in collecting consistent data for the development of Key Performance Indicators at three Cement Distribution Terminals in Michigan. The organization is described in detail and the key responsibilities of each functional department set forth. The competitive environment of the organization is presented and its impact on the problem issue discussed. The problem of gathering data for Key Performance Indicators is discussed and the history of the problem detailed. The data gathering methods are described and the Results of the Survey discussed and suggestions made. The project leader uses Action Research to determine where improvement can be made in the collection of data and where the organization could benefit from shared best practices.

Improving Key Performance Indicators for Distribution Facilities

Through Action Research

The focus of this Action Research project is on examining the issues involved with gathering, entering, and understanding the key performance measures used by Lafarge North America at three of its Great Lakes distribution facilities. Gathering and dissemination of accurate performance data is critical to understanding how well the business is performing. The current system of data collection is not well understood by all in the organization who are affected by the process. It is imperative that action research methods be used to clarify the needs of the organization and the requirements of the individuals inputting and using the data. Both the human and technical factors involved in the gathering and reporting process are researched and used to develop an action plan for implementing changes to address the problem.

History of the Organization

Lafarge North America is the largest diversified supplier of construction materials such as cement, aggregates and concrete, and other materials for residential, commercial, institutional and public works construction in the United States and Canada. Lafarge North America is part of the Lafarge Group, a world leader in building materials that is active in 75 countries, and employs more than 75,000 people (Lafarge, 2005).

These products are used in the construction of roads, offices, factories, hospitals, department stores, sports stadiums, banks, museums, high-rise apartments, amusement parks, swimming pools and bridges. In 2002, excluding the Managed Assets, the company generated net sales of $3.3 billion and shipped 117.1 million tons of aggregate, 11.1 million cubic yards of ready-mixed concrete, 13.8 million tons of cement and 2.0 billion square feet of gypsum drywall (Lafarge, 2005).

The company has experienced rapid growth in North America over the past 10 years through acquisitions, mergers and new developments. As the company has grown, the need to develop standard practices and reporting procedures to measure the performance of its dispersed geographic holdings and wide product diversification has emerged. The company is in the implementation phase of many of these programs and there are challenges that must be overcome before they are uniformly used and delivering performance data that is reliable and understandable.

History of the Competitive Environment

The construction materials business environment has always been highly competitive. Some areas of the business such as concrete and aggregates are relatively low tech and have few barriers to market entry, which encourages competition. Other areas such as drywall and cement are capital intensive but are subject to the many pressures of the economy and its effect on the construction industry.

Although being a "low-cost" supplier is a strategic advantage to any distribution company, it is not the primary concern for cement distributors at this time. Most cement companies sell out of product during the summer months and must scramble to meet demand. Being a low cost supplier would only exacerbate this problem. It is far more important to focus on doing business with large stable customers who demand service and who are able to pay their bills. For these customers, truck loading times, product quality, and safety are all performance expectations that can be measured at the terminal.

A company that plans to survive and grow in this environment must understand how it is performing. Lafarge North America has taken steps to measure this performance by using Key Performance Indicators. The intention is to use this data to create a baseline and improve its

ongoing performance. This data can also be used to identify best practices at a high performing facility and spread these practices to other facilities. The focus of this action research is on the gathering and use of Key Performance Indicators (KPI's) at regional cement distribution terminals.

History of the Problem

Until recently, most of the performance data was gleaned from accounting data and centered primarily on financial performance. After the acquisition and merger of differing operations, the need to have clear performance measures became clear. A few desired performance indicators are: (a) Production per Labor Hour, (b) Production per Maintenance, (c) Truck loading Times, (d) Production per Utility Cost.

The problem with gathering this data is the inconsistencies between facilities in the methods of capturing and entering the data into the reports. Some of the data comes from systems already in place such as Marketing and Sales for production or Accounting for utility costs. However, loading times must be captured at the facility and maintenance costs must be coded correctly to capture consistent data across the organization.

The instrument for gathering this data is a simple spreadsheet which the terminals update monthly. Below is a partial sample (Table 1). Although this data is useful in a limited manner for monthly comparison at an individual terminal, it provides the user no information on the operating conditions, such as (a) the number of employees, (b) if the facility packages the material and (c) what the operating hours are.

Table 1

Sample of Key Performance Data

MONTH	TOTAL VOLUME	TERMINAL COST	COST PER TON	KILOWATT HOURS	MAINTENANCE COSTS
January	6454	$ 50445	$ 7.82	169440	$ 11043
February	3902	$ 111647	$ 28.61	81840	$ 9205
March	5276	$ 99815	$ 18.92	79200	$ 16796

Furthermore, there has been little or no instruction on where to find the data and what data to enter into the spreadsheet. This lack of instruction has contributed to the confusion and the lack of accurate data.

Finally the physical differences between the terminals also create large differences in the data that are not taken into consideration in the spreadsheet. For example, gate-to-gate times for customers are one of the measures. This varies greatly based on the physical layout of the terminal and can lead to inaccurate data if not captured in a predetermined, accurate manner using consistent methods.

The inaccuracies result from both the methods used to capture the data and the differences between terminal layouts. Also, equipment is not standard throughout the facilities which make valid comparisons difficult.

Problem Statement

The company is having difficulty making accurate resource allocation decisions at various distribution facilities. The purpose of this project is to determine how to standardize the performance data collection process between facilities and to implement a measurement system that is accurate and meaningful to executive management making allocation decisions as well as the facility managers at each location.

Importance of the Problem

Without reliable data to use as a management tool, it is very difficult for any organization to improve its performance and remain competitive in today's marketplace. A company as large and stable as Lafarge expects to have information that can be used to gauge its operational performance. These measurements must be used to determine what steps it must take to improve in areas like customer satisfaction, cost control, product performance and productivity. The gathering and entering of these Key Performance Indicators is the subject of this action research project. Through this research it will be possible to identify areas of improvement and implement changes that will ensure the highest standards are met in the collection and use of this data.

Literature Review

The literature reviewed for this Action Research Plan consistently emphasized the importance of clear and accurate performance indicators. An article retrieved from the Institute of Internal Auditors (2005) likened managing a company without KPI's to a pilot flying without gauges. Although on a good day an experienced pilot might be able to fly from Point A to Point B without the gauges, no pilot would choose to do so. The article stresses that if KPI's are well chosen, timely, accurate, and presented in easily understood formats, they can provide vitally important information to the management of such organizations.

Benefits of Key Performance Indicators pointed out by the Institute of Internal Auditors include the following:

1. Keep management and employees informed and focused on risk identification and risk management issues, encouraging prompt attention to any problems that arise
2. Keep the audit committee informed about major risks and what's being done about current exposures

3. Enable auditing to focus more of its attention on current problems and emerging issues rather than on routine auditing of well-controlled activities. (Where appropriate indicators have been established and are reliable, and where such indicators report acceptable risk management performance, such routine auditing may be substantially reduced or curtailed).

4. Enable the organization to demonstrate to outsiders (such as external auditors, regulators, analysts, and investors) that the organization understands and is effectively managing its risks.

The establishment of KPI's and their consistent use throughout an organization is critical to the establishment of "Best Practices" (Heskett, Sasser & Schlesinger, 1997). They point out the practice by Banc One of distributing monthly measures from the "Management Information and Control System (MICS). This data is distributed to all operating managers in what the company calls "Compare and Share". According to John B. McCoy CEO of Banc One at the time, this system had began to self manage itself. The bank managers now communicate among themselves and drive improvement rather than involve senior management. Like the KPI's data distributed at Lafarge, this information is intended to identify outstanding performance and create a format for interaction between the operations.

Having established that there is a need for Key Performance Indicators, it is equally important to identify and establish performance indicators that are relevant to the organization. Harris (1998) pointed out that the use of bad performance indicators is quite common. A classic example is the "Top Ten" list that is often created by a CEO or executive management. This list provides no measures, is general and may or may not apply across all functional areas of the organization.

Instead of generalization, Harris (1998) pointed out that selecting targeted measures is critical. Some important considerations for selecting the right measures are (a) Does it measure, or provide an accurate indication of what we want to achieve, (b) Is it the best measure to provide this information, (c) Is it linked with a causal chain that leads toward the desired result, (d) Are supporting or linking measures necessary and in place to ensure undesired consequences are not obtained?

Harris (1998) also pointed out the danger in focusing on indicators that only measure financial performance or are used to control the actions of people. A well thought out system of measures will include customer satisfaction, quality of production and other causal factors that are indicative of the entire system performance. This point is particularly applicable to the KPI gathering process, since the measures are attempting to measure performance of each terminal as a whole.

While the establishment of focused, accurate and measurable KPI's is essential, the process must also include the support of top management. According to The Institute of Internal Auditors (2005), top management sponsorship, or at least support, is vitally important for implementation of a comprehensive key performance indicator system. Gaining this support will mean validating the importance of the performance measure as well as proving the accuracy of the data.

<div align="center">Method</div>

In this section, the processes and principles of action research are discussed and the reasons for selecting action research are reviewed. The model selected for this project is detailed and the steps involved in the process described. The process of entering and contracting and the role of the action researcher and the collaborative team are presented.

Action Research Methodology

Action Research is a scientific, collaborative method of problem solving. The process typically involves defining an issue to be addressed in a problem statement and developing specific, measurable steps aimed at solving the problem. These steps include data collection, analysis and presentation of findings, developing an implementation plan and assessing the effectiveness of the intervention. The result is a system of continuous improvement that can be used to refine organizational processes and measure the impact of these refinements

This process is very cyclical by nature (O'Brien, 1998). This cycle begins with diagnosing the problem and creating a plan. Data is gathered to research the problem using data gathering instruments like interviews, observations, questionnaires or unobtrusive measures (Nadler, 1977). Action is then taken using the results of this data. The impact of this action is observed and evaluated. The diagnosis of the impact starts the process over again creating a cycle of continuous improvement that leads to systematic enhancement of organization processes (O'Brien, 1998).

An early pioneer in the field of Action Research and the person generally given credit for coining the phrase "Action Research" was Kurt Lewin. His work had a large impact on social sciences, group dynamics, and psychology as well as the field of action research. His approach involves a spiral of steps needed, which is composed of a circle of planning, action, and fact-finding about the result of the action needed (Smith, 2001, p. 1). This process results in the same cycle of continuous improvement as pointed out by O'Brien, however this model provides a more complete view of the data gathering and analysis process.

The basic cycle involves the following (Figure 1).

Identifying A General
or Initial Idea

Reconnaissance or
Fact Finding

Take First Action Steps

Planning

Evaluate

Amend Plan

Take Second
Action Step
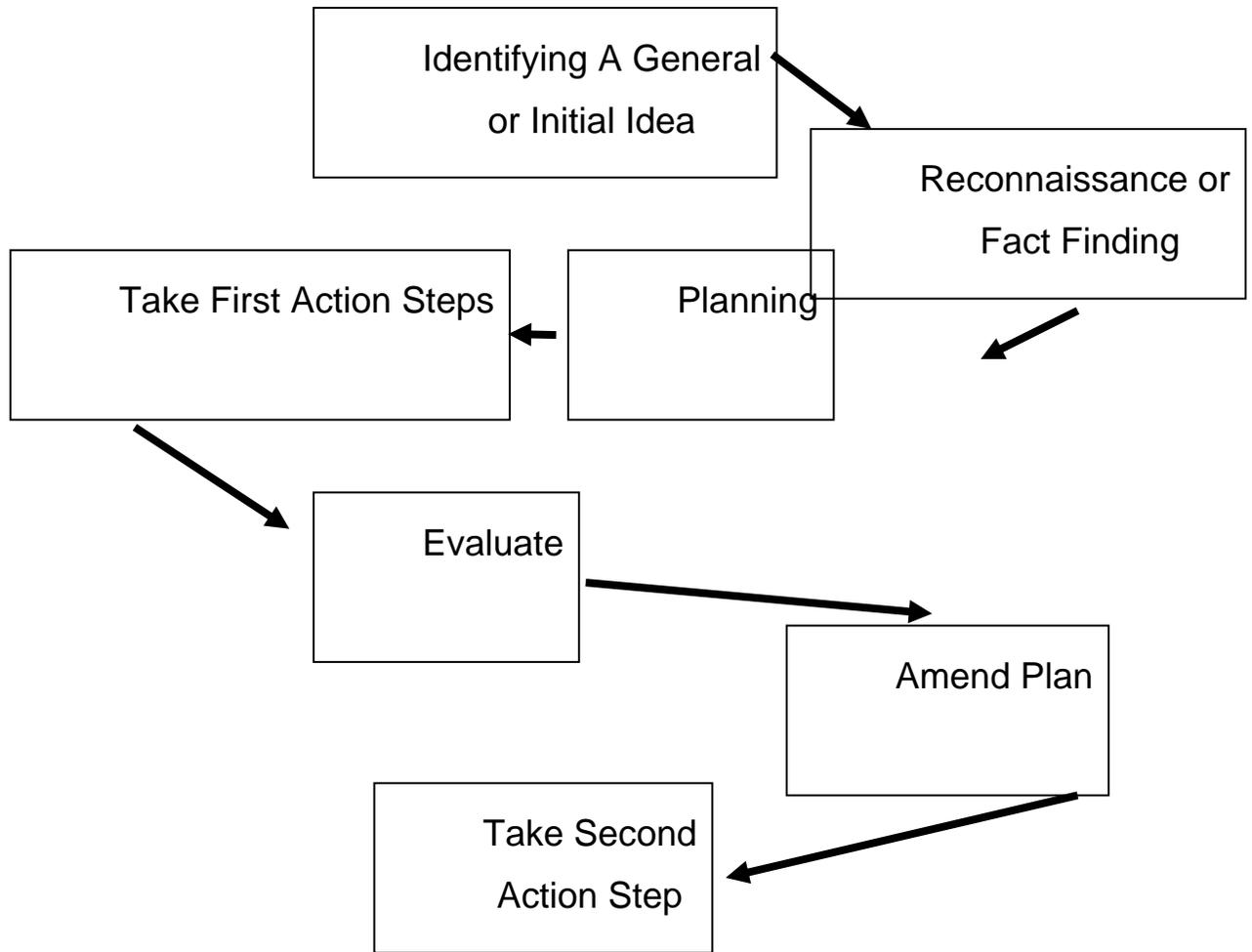
Figure 1 Action Research Cycle (Smith, 2001, p.3).

This model reflects the process that will be applied to this action research project. The

data gathering and analysis that is displayed as "reconnaissance or fact finding" and "evaluation"

will be used to determine the action steps involved in the research project.

Action Research Model

Action research is particularly applicable to the problems affecting the development of

Key Performance Indicators at Lafarge. The problem involves a system of data collection and

entry that impacts several geographically separated facilities, with differing operating

procedures. Each area, however, is still required to enter consistent data. The collaborative

process of selecting a solution and implementing change will facilitate a heretofore, unperformed

interaction that will provide the team with an opportunity for organizational improvement.

The Action Research Model used in this project is the Pearce and Robinson's Six-Step Model (Pearce, 1998). An example of the model is found in Table 2. It best suits the nature of this project and will create the needed "ownership" of the project by the members of the team. The team members are faced with exactly the same problem and the differing experiences will provide a unique view of the issue. The participation of the team will provide the feedback and evaluation critical for the success of action research. As the company sponsor I will act as the change agent to facilitate the interaction of the members.

Table 2

Pearce, Robinson, and Sandberg's Action Research Model

Step	Activity
1.	Recognize the problem
2.	Diagnose the situation
3.	Identify the problem and admit it exists
4.	Select a solution
5.	Plan and implement the change
6.	Evaluate the change

Note. From "Change and Organization Development," by J. A. Pearce II, R. B. Robinson, Jr., and M. E. Sandberg, 1989, in J. A. Pearce & R. B. Robinson, Jr. (Eds.), Management, pp. 386-390.

In step one, I have recognized the problem as being "Reporting of Key Performance Indicators is varied and inaccurate at various locations in the distribution system." Step two involved the identification of the "who, what and where", which in this case will be the five distribution terminals in the Michigan distribution network. Step three involved the use of a questionnaire, interviews and observations to gather data, confirm the problem, and gain ownership. The questionnaire was emailed to the facility managers, and their responses kept confidential. The interview and observation involved a on-site visit to collect data. In step four the results of the survey was used by the collaborative team to develop potential solutions, from

which the most promising was selected. During step five the intervention will be planned and

implemented throughout the distribution network by the collaborative team. Finally in step six, I

will evaluate and document the effects of the change. This will involve feedback from the

collaborative team to discuss the impact the change has had on their data gathering and entry

process as well as a review of the Key Performance Indicator report for any changes.

Entering and Contracting

A key element of this process is the collaborative effort of a group or team. This

teamwork should involve the very members of the organization that have vested interest in the

effect of the action research. Collaborative involvement results in a focused, energetic and

practical system of problem solving. By involving the key stakeholders in the entire process, the

data collection methods will reflect the actual improvement needs of the organization.

The project required the support of senior management and the involvement of the

collaborative team. As the manager of the largest distribution terminal in the system, and the first

terminal to implement the KPI entry process, I was able to take a leadership role in ensuring the

project was implemented. I also have the support of senior management to implement the

process.

To foster buy-in, I conducted an informal survey of the terminal managers involved in the

KPI process. After noting that each of the managers had issues with the data entry and reporting

of the KPI's, I proposed an action research project to our manager. After he reviewed the

problems that we were experiencing, he committed to supporting the action research project and

its goal of improving the process.

Project Sponsor Role

The project sponsor will be the Area Distribution Manager who all Michigan Distribution

Terminals report to. His role was to support me as the action research project leader and to provide the resources required to perform the research. The resources required included (a) research time, (b) email use, (c) interview time, (d) conference calls, (e) paper work, and (f) travel time.

Project Leader Role

As the project leader, I conducted the research, the interviews, conference calls and site visits that the project required. This included the development of the data gathering instrument and interview questions as well as the organization of the conference calls and onsite visits. The communication between the project leader and project sponsor was the key to understanding the project as well as the implementation of the action plan.

Collaborative Team

The collaborative team members were the five distribution terminal managers. These are the individuals are the most involved in creating and using KPI's for feedback and for continuous improvement. After the team was interviewed to determine the problem, I asked each member if they would be willing to be part of a team to improve the process. Each team member was enthusiastic about the possibility of providing input to the improvement of the KPI information.

Their willingness to participate provided additional validation that the collection and use of the KPI data is a widespread concern and that the issue is impacting a wide range of data providers and end users. The need for clarification of the process and data use was clear. Knowing that this data was being used by executive management as far away as Washington, DC and Paris, France, to make decisions that could affect the terminals operation, created a need for "ownership" from the team members.

Each team member was interested in defining the processes so that they would be consistent across the board and reflect the reality of their operating environment. For example, it would not be fair for a performance indicator that measures the amount of overtime a terminal was paying for to be compared between a union and a non-union facility. Yet, this is exactly what the existing KPI process does.

Another concern of the team was operational differences concerning the customer. If a terminal was producing high amounts of packaging vs. bulk product, the monthly volumes would be lower. This would also result in higher energy costs, which are also measured on the KPI sheet. Therefore, the package product, although contributing a higher profit per ton of product delivered, would still negatively affect the KPI sheet by showing higher utility costs and lower volumes factors all contributed to the buy-in of the project and underlined the need to work as a collaborative team.

After obtaining team member commitment I met with our Area Distribution Manager to present the project and obtain his approval. This approval was shared with all team members and laid the groundwork for our collaborative team. The role of each team member was to provide open and honest feedback concerning the process of creating the KPI data. It has been explained that this is the best way to improve the process and the resulting data to better reflect the performance of their terminals.

Progress Monitoring and Communication

Conference calls were held every two weeks to discuss progress. The first of these calls involved the Area Distribution Manager who oversees all of the concerned terminals. These calls included the five terminal managers as well as the assistant terminal manager for the Detroit terminal. Minutes of the conversation and agreements made were kept by me.

Data-Gathering Methods

Questionnaires. The first method used in this action research project was questionnaires (Appendix A). Since there is a common link of e-mail communication between the five facilities involved, this was an effective method to begin the project. The questionnaire was designed around the issues were expressed by the team during informal feedback as well as past experience with KPI gathering processes. The questionnaire was emailed to each of the terminal managers and their responses kept confidential.

The questionnaire was a fixed-response instrument so that the data would be easy to analyze in a fairly short time frame (Nadler, 1977). The response choices to the questions range from strongly disagree to strongly agree, in increments of five steps. The questions were structured so that a "strongly disagree" response will indicate that there is need for attention to the issue. These responses were used to measure the level of agreement or disagreement with a question and to identify the major issues.

The collaborative team and the project sponsor developed the questionnaire. The questions were worded to produce consistent responses from the various locations and different work environments.

Interviews. The second method of gathering data was a structured interview. Interviews were conducted in an informal setting and provided the opportunity to probe for additional information. Interview questions were designed to cross check and validate issues that became evident from the questionnaire data. For example, if the responses from the questionnaire indicate that there is an issue collecting labor data, the interview will try to determine the root cause of the problem.

Interviews took place at each terminal location, requiring a trip to each location by me, the project leader. To ensure that team members were prepared to spend the necessary time for the interview with me, and to collect their thoughts in advance of the visit, all interviews were scheduled well in advance.

Observations. Observations were conducted to note operational differences between the facilities that might impact the quality of data. Preparations for the observations were made during the Interview portion of the project. All observations were conducted by me personally while accompanied by the local terminal manager.

Based on the questionnaire and interview results, the observations focused on operational issues that impact the KPI process. The focus was on the functional differences between the facilities that create inconsistencies in the KPI data. For example, is the work performed in a manner that is inconsistent with the other terminals that make comparison invalid? Would there be another way of measuring this performance that would more accurately reflect the actual environmental differences between facilities? These issues and others that impact the collection of data were the focus of the observations.

Reliability, Validity, and Triangulation. Methods used for the initial gathering data included a combination of questionnaires, interviews and observations. By focusing on terminals located within a well-defined geographic area these methods allowed for current, accurate information to be gathered in a timely manner. Participants in the data collection were familiar with local operations and had management responsibilities, which helped to gather credible and accurate information. Information gained through real-time observations also provided pre-impact assessment that will be compared with post-impact assessment following implementation of an intervention.

According to Fink and Kosecoff (1998) a reliable survey results in consistent information. A valid survey produces accurate information. Obtaining consistent and valid information is based largely on well-grounded theory or experience. Each data collection method in an action research project must be selected for its relevance in reaching both reliable and valid information.

By using a well-designed survey, interviews and observations, using well grounded theory as well as an experienced collaborative team, this research project has ensured to the greatest degree possible that the results are both consistent and valid. The use of survey instruments that returned specific unbiased responses consistently is one example of valid results. Also the observations were performed in a consistent manner by experienced team members comparing the facilities to each other for performance data that is measurable in a common manner.

According to the Regis Module for Masters on Science in Management (MSM), course 696, "Triangulation is the exploration of research questions from different angles and perspectives through a multifaceted approach" (Regis University, 2005, p.37). This requires more than one research method be used to facilitate the use of different approaches to the issues. Only by examining from these different angles and comparing different data can the researcher conclude that they are obtaining reliable results.

This research project uses the multiple data collection methods. The differing viewpoints of the collaborative team and the geographic distances between the locations also helped the project maintain its multifaceted approach. The use of consistent surveys, interviews, and observations to focus these differing viewpoints kept the project reliable and valid, while

examining the issues from as many angles as possible. This approach provides a cross check of

data that produces a complete review of the problem areas.

<div align="center">Results</div>

Summary of Findings on Each Data Gathering Methods

   Questionnaires. The first data collection method used was a questionnaire sent to three

facilities. All three were returned completed. This tool showed that there were varying degrees of

understanding, effort, and compliance with the data gathering for the KPI's and the use of the

end report.

   The question of whether the intent and usefulness of the KPI's were understood, all three

facilities responded negatively as displayed in (Figure 2). Although one of the respondents had

been involved with the creation of metrics and had worked with a traffic consultant on KPI's

previously, they still responded that they did not believe the KPI's were understood.

   Another key question was whether the location believed the data to be accurate. All three

facilities responded with the lowest rating (Figure 3). Again this indicates that even where the

methods were understood to some degree, they still did not believe the data was accurate.

   A leading contributor to inaccurate data could be the lack of data availability as indicated

in (Figure 4). This was also given the lowest rank by two thirds of the respondents. Facility three,

which has some background with the data collection and use process, only gave a 3 or "Neutral"

ranking, indicating that indeed the required data is not completely available.

   More encouraging were the responses to the question of whether the KPI report could be

a useful tool for managing a distribution facility (Figure 5). These results indicate that although

there are concerns over the data collection process, accuracy, and availability, there is agreement

that the data could be useful to the facilities for performance monitoring and decision-making.

This is encouraging as it shows that the facilities management as well as executive management

understands the need for established metrics to make decisions.

Understanding of KPI's

	Facility 1	Facility 2	Facility 3
■ Understand KPI's	1	2	3
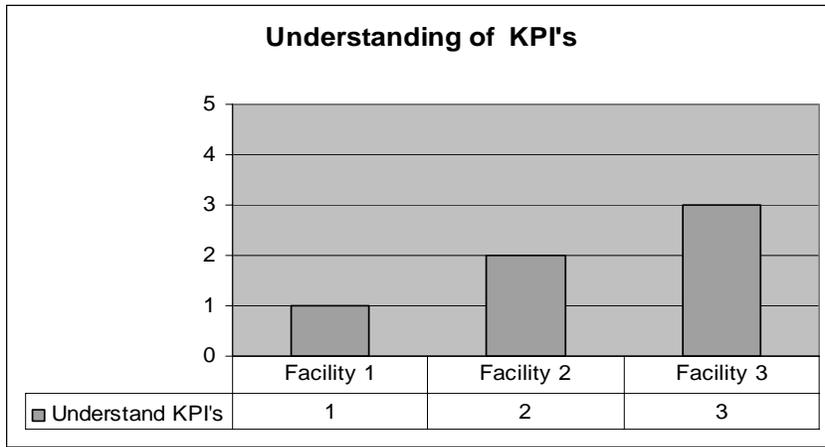
Figure 2. Understanding of KPI's

Believe Accurate

	Facility 1	Facility 2	Facility 3
■ Believe Accurate	1	1	1
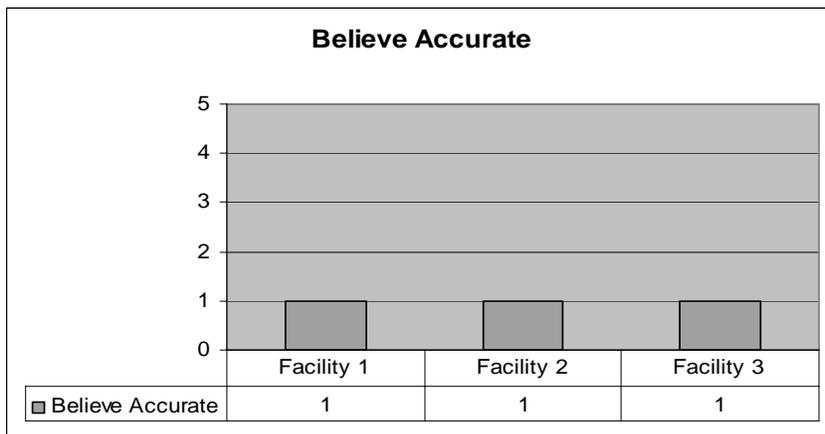
Figure 3. Believe Accurate

Data Availability

	Facility 1	Facility 2	Facility 3
▢ Data Available	1	1	3
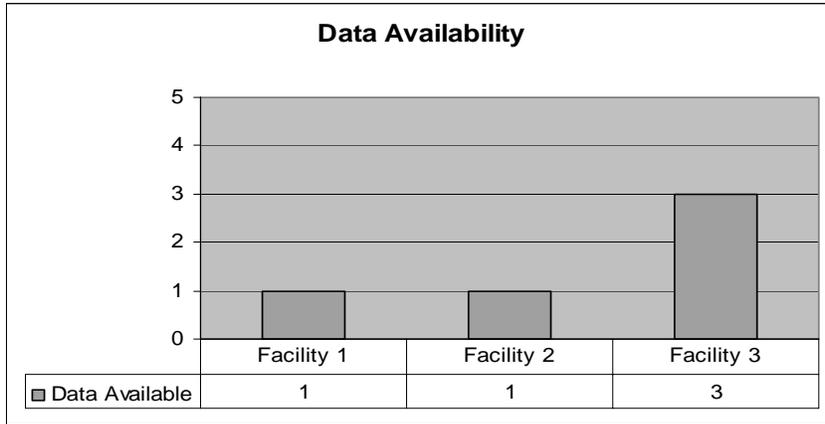
Figure 4. Data Availability

Useful Tool

	Facility 1	Facility 2	Facility 3
▢ Useful Tool	2	4	5
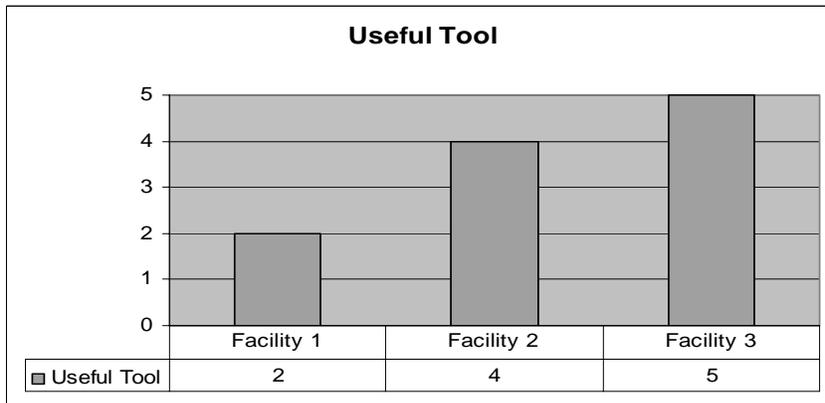
Figure 5. Useful Tool

Interviews. After the responses to the questionnaires were summarized I returned to Michigan and conducted interviews at each of the three facilities. During the interviews I discussed with the facility management the layout of the terminals to determine the impact that traffic patterns, obstacles, and equipment could affect the Key Performance Indicators and create differences in the data comparison between sites. There was lively discussion of these differences and discussion of ways to standardize measurements.

I also discussed with the managers of each facility the differences in labor regulations such as non-union versus union and the various types of product that each facility distributed.

The hours of operations and customer expectations were also discussed and the difficulty of setting standards between facilities with different market forces was examined.

Finally we reviewed the process of receiving, documenting and retaining records such as production data, labor and equipment costs, and utility costs. All of these are key components of the current KPI reports. Although there were many similarities, there were various methods that did not lend themselves to consistent reporting of the data. There was very little agreement on the correct methods and indications were that no one was willing to alter their current collection methods.

Observations. The final method was observations. For this method, the collaborative team physically observed the traffic patterns obstacles and equipment that were in use at the plant during business hours. Early morning traffic that can build up and affect loading times was observed and the differences between facilities were striking. Equipment and personnel performance were also observed and the differences noted.

Overall Findings of Data Collection methods

Use of KPI's. Generally the facilities gave a lower than average response to the understanding of the KPI's intent and its use. This is important from a motivational standpoint because the terminal managers do not understand that the data is being used to make capital decisions concerning their facility. Even where the uses of the KPI's are generally understood, there is concern about the lack of guidelines in collecting and reporting them. Furthermore, they don't understand how the KPI's can be used to improve their own facility and bring about efficiencies and behavioral changes that will create a more effective environment.

Facility physical differences. The physical differences between each facility are known to the other managers and this contributes to the concern over accuracies. For example, one facility

has an extended entry due to the length of the property along a rail line. One of the KPI's is

labeled "Gate-to-Gate Time". This facility logs a haulers arrival from the time they check into

the gate at the entrance of this entry. The hauler could wait in line for up to an hour before being

loaded. Another facility is on a main road with room for only two trucks in line, the other haulers

must wait outside of the gate before entering and logging in. On the morning that I was

performing my observations, there was a line of 14 trucks waiting across the street that waited up

to three hours before being logged "in the gate".

Equipment. Cement distribution facilities are typically constructed of very thick concrete

walls and heavy metal. The infrastructure of these facilities usually last over 100 years. The

loading equipment, ticketing systems, monitoring and communication systems, however, have

undergone radical improvement over the past 20 years. The result of this change at the three

facilities I visited is vast disparity of equipment at each location.

One of the terminals is located near an airport that had recently undergone a major

addition. Much of the cement for that project had come from that facility. Whether it needed it or

not, the company had invested in new loading spouts and video loading monitors to help

facilitate the volume being delivered during that time. The other two facilities did not have this

newer equipment, and although one of them was currently out producing the upgraded facility,

they had been unsuccessful in persuading management that the upgrade was necessary. On site

observation indicated that this outdated loading setup was requiring an additional three minutes,

or 30%, to load a truck.

Personnel. All three locations had Union hourly employees and Non-Union management.

However, all three belonged to different unions and were governed by different contracts. For

example, one terminal could determine a schedule for employees on a daily basis. The contract

read that "Employees will generally be scheduled to work an 8 hour shift during a 24 hour period, beginning at 12 AM until 11:59 PM". This allowed that terminal to change schedules as needed to fit business needs without paying overtime before the employee had worked 8 hours. The other two plants had to pay overtime for hours worked before 7AM and 7PM and after 8 hours. This had huge ramifications since summertime requirements are often around the clock when vessels are delivering cement and customers have a wide range of hours.

There were also functional requirements that affected the cost of personnel. Only one terminal also ran a packing operation that bagged cement. Nowhere in the KPI's was there a delineation between sites that had a packing operation and those that did not.

Data. Finally the data collected at each facility was done differently and produced different results because of the lack of standard guidelines. For example, at one facility there were two employees assigned specifically to maintenance. This facility included the cost of these two individuals in there maintenance cost's and therefore included it in their KPI report. The other facility did not have dedicated maintenance workers and therefore did not include any labor costs into the report.

Energy was another inconsistently reported area. The KPI report only tracked Kilowatt hours and not natural gas or propane. The packing facility only had natural gas which it used to heat the office and the working areas of the package warehouse. This facility therefore had enormous gas bills in the winter time, while the electric bill stayed relatively low. The other two facilities without natural gas, heated their office and drivers room with electricity. Although the combined electric and gas cost of the package facility far outweighed the electric of the other facilities, only the electric was reported.

Discussion

Recommendations

The collaborative team met to review all of the data, explored several alternatives and arrived at the following recommendations for improvement.

Gate- to- gate data collection. Before the terminals can begin to standardize data collection methods it must be made clear what data they are to collect and where to find it. For example, the terminals must use a standard gate-to-gate time. The terminals have been asked to record this without any guidance on where and when to begin the measurement. One method that the terminals are not currently using could be the mandatory fall protection that was installed for safety reasons over the past few years. In all facilities this is located just before the truck enters the loading bay which meant it is the next truck in line. It would be a fairly low cost option to have the intercom moved to this location from the front gate. It would still allow plenty of time for entering the loading information into the system and may also reduce the confusion of keeping track of multiple trucks in line after communicating their order.

After loading, the employee who loads the truck currently enters the time that he believes the truck has left the yard, after closing his hatches and receiving his Bill of Lading. Instead of using this estimated departure time, there is an opportunity to use the exit fall protection also. All drivers are required to use the fall protection upon exiting to close their hatches. Instead of having the driver close his hatches and walk back to the office for their ticket, a pneumatic delivery system could be used to deliver the ticket to the fall protection. The time that the ticket is sent could be used as the exit time for the "gate-to-gate" metric. This would also create efficiencies for the driver and have the welcome benefit of keeping the driver out of the loading area where they are often a distraction.

This system would allow for clear cut guidelines that would be nearly identical between each location.

Terminal costs and maintenance costs. This category includes hourly and salaried employees' labor cost. As discovered during the interviews and observations, there are many different conditions that affect this metric and make standardization difficult. Two of the locations have dedicated maintenance personnel whose costs are always captured in the maintenance cost component of the budget. The third location does not have dedicated maintenance personnel and therefore there costs are not separated. This made the reporting grossly inaccurate when compiling both the terminal costs and maintenance costs.

In order to standardize these two areas, the facility that currently does not break out costs should establish a labor log and adopt the current maintenance budget format of the other terminals. This would not be difficult to do since the accounting codes are already in place and a weekly time card is already used that would allow for the logging of maintenance hours. By doing this, all three facilities can use the monthly budget report to complete the KPI, input sheet.

It is also recommended that during the upcoming union contract negotiations that the regional labor relations specialist be involved in standardizing the contracts between terminals. Adopting the language that is more favorable to the working conditions of a cement terminal should not be difficult in today's labor environment and could result in considerable labor saving as well as standardization.

Kilowatt hours. This metric should be revised entirely to include all utility costs such as natural gas, water and electric costs. In decades past, there was very little natural gas or water use at a terminal. However, in recent years there have been increased requirements for heating of

high tech equipment in cold weather and the replacement of electric office and space heat with natural gas.

Water has also become a high cost utility for a distribution terminal. New regulations require the terminal to provide fresh water to docked vessels. These costs can run as high as electric or gas bills in the summer months and would be valuable for a terminal to include on the KPI metric.

Again, this would require standardization of reporting by each terminal that could be done with current accounting codes that would result in standardized monthly budget numbers that could be put directly into the KPI input sheet. Management should create a documented process of how to code the three utilities that would result in a consolidated report on the monthly budget report. By using three separate codes, the three could be analyzed individually if necessary, but combined on the KPI report to provide an accurate and standardized metric under the heading of "Utility Costs".

Implementation Plan

Develop political support. In order to create political and management support, I included the Distribution Manager in several of our conference calls. During these calls we discussed the added efficiencies that the recommendations will have at the terminals. He has been very supportive of the plan and has indicated his willingness to convey the recommendation in a positive light to the Regional Director.

The scope of the research project involved every stakeholder in the improvement process. There has been enthusiastic support for the change from this collaborative team which will greatly assist in our plans to expand the new methods and metrics throughout the distribution network facilities.

Dealing with resistance. Most of the resistance will be concerning the cost of installing the intercom system at all plants. Although this is a relatively low cost option and the Distribution organization supports the idea, there will still be some hesitation to require it at all three facilities. To minimize this resistance, I have obtained three different quotes from vendors, which I will supply to management to eliminate any doubt of the cost and indicate that the collaborative team has worked together and done its homework.

In addition to the pricing, I will also emphasize the efficiency and safety that an intercom and ticket delivery system will enhance. As mentioned in the "Gate to Gate" section, this system will save the time of having the driver reenter the facility to retrieve his Bill of Lading. Instead he can stay with the truck which will save him time as well as eliminate the potential for interrupting the terminal employees in the office. This will also contribute to the safety culture we are trying to create by eliminating the need to walk across traffic and potential trip and fall obstacles.

Implementing the New Processes

Data collection forms. The collaborative team has determined that two new forms will be required to collect the data needed for the new process. Since the collaborative team involved all three terminal managers, additional training will not be required at the management level. Each of the terminal managers will be responsible for training their employees on the process and procedures of collecting gate times and costs (Appendix B), as well as the employee maintenance labor costs (Appendix C).

These two forms will allow the facility to collect the previously uncollected actual loading time for the haulers as well as maintenance costs. To implement these forms, I will visit each of the facilities with the managers and perform half day training sessions that will help the

employees understand how to use the new forms as well as emphasize the importance of completing them correctly.

Assessment of the Change

With the three facilities using the new standardized forms of data collection, the information will be much more useful as a resource allocation tool. As the changes are implemented the collaborative team expects to identify areas for improvement, such as wait times and load times. The tracking of maintenance costs will also identify which facilities are expending costs to keep the facilities running. These costs can be identified for resource allocation opportunities the can create efficiencies and save ongoing maintenance costs.

To track the implementation of the changes, the three managers at each facility have agreed to share their data collection forms with each other and myself. I will discuss the data and the challenges of collecting it as well as the resulting indicators that the data produces with the terminal managers. I will solicit feedback from the Director of Distribution on a monthly basis to ensure that the data is being interpreted and is adding value to the organization.

Key Learnings

This action research project provided valuable lessons for all involved. Perhaps the most important was the value of having a collaborative team. This team was able to point out the different challenges faced by each facility in collecting data in a standard format. Coming to consensus was not always easy, but the differences provided us with a complete picture of the issues that were lacking in the original implementation.

If there is one component I would change, it would be the questionnaires. Although they were helpful overall they did not contribute greatly to the final outcome. This may have been because the collaborative team was made up of the facility managers who were intimately

familiar with the operations and challenges faced by their locations and therefore did not find the responses useful.

On the other hand the interviews and observations provided the most important information required for the research. Given that most of our issues were on-site process related this provided the most valuable input. After seeing each of the facilities in person, it was much easier to identify areas for improvement and share these findings while leading the collaborative team.

Conclusion

This action research project has delivered a great deal of alignment to the standardization of data collection for the distribution network KPI's. As I implement the changes that the research has identified as necessary, I should see improvement in the ability to make resource allocation decisions that will in turn improve the operating efficiency of each terminal.

In addition, the organization's upper management can feel more confident that their decisions are having a positive impact on the facilities and will allow them to accurately analyze the effects of these decisions.

References

Harris, M (1998). *Value leadership: Winning competitive advantage in the information age.*

Milwaukee, WI: ASQ Quality Press

Heskett, J., Sasser, W. & Schlesinger (1997). *The service profit chain: How leading companies*

link profit and growth to loyalty, satisfaction and value. New York: The Free Press.

Lafarge North America. (2005). *Corporate Website.*

Retrieved April 4, 2003, from http://www.lafargenorthamerica.com

Nadler, D.A. (1977). *Feedback and organizational development* (Chapter 7). Upper Saddle

River, NJ: Prentice Hall/Pearson Education

O'Brien, R. (1998) *An overview of the methodological approach of action research*

Retrieved January 12, 2005 from http://www.web.net/~robrien/papers/arfinal.html

Regis University. (2005). *Interim Module MSM 696 Through MSM 697 v2.* Retrieved February

5, 2006 from http://academic.regis.edu/spsgrad/msm/modules_and_pdfs/ MSM697.pdf

Smith, M. K. (2001) *Kurt Lewin, groups, experiential learning and action research, the*

encyclopedia of informal education, http://www.infed.org/thinkers/et-lewin.htm

The Institute of Internal Auditors. (2005) *Key Performance Indicators*

Retrieved February 6, 2005 from http://www.theiia.org/index.cfm?doc_id=2338

Appendix A
QUESTIONNAIRE CONCERNING KEY PERFORMANCE INDICATORS AT YOUR TERMINAL

Please take the time to answer each questions as honestly as possible. This data will be kept confidential and anonymous.

GENERAL	1-Strongly Disagree	2-Disagree	3-Neutral	4- Agree	5-Strongly Agree
1 I understand the importance of Key Performance Indicators (KPI's)					
2 I feel my opinion counts concerning the use of the KPI's					
3 I feel that all distribution terminals have equal operational conditions					
4 I believe all terminals report KPI information fairly					
5 There is no problem collecting data for the KPI sheet at my terminal					
6 I trust the accuracy of the KPI data					
7 I think the KPI information is useful in its current format					
8 I believe the KPI tracking database will be around a long time					
9 I would like to discuss the use of KPI data with my peers and management					
10 I feel other reports, like VPM, 14 column, greenbar and monthly financials already provide enough information					

DATA ENTRY	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11 It is clear to me where to gather data from for the KPI data entry form					
12 I understand what data to use from the monthly financial reports					
13 I have a system for collecting truck load time data					
14 I understand how to access my production data in Metric tons					
15 My utility bills arrive in time to be entered into the KPI entry form					
16 My monthly maintenance costs are correct on the financial reports					
17 My labor costs are accurate on the monthly financials					

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
18	My terminal does not track overtime costs separately					
19	Entering the required data is not a problem at my terminal					
20	I would like to discuss the data entry process my peers and management					

	PROCESS IMPROVEMENT	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
21	I spend too much time entering data into the various databases like safety, KPI, 14 column					
22	I would like one entry point for all this data					
23	I feel that KPI's can be used to improve operations at my terminal					
24	I use the KPI data on an ongoing basis to measure my terminals performance					
25	I have suggestions that could improve the usefulness of the KPI data					

YOUR TERMINAL	**Yes**	**No**
Are you the terminal manager		

YOUR THROUGHPUT	**0k-100k Short tons**	**100k-200k Short tons**	**200k-300k Short tons**	**300k-400k Short tons**	**Over 400K Short tons**
Your Annual throughput					

NUMBER OF EMPLOYEES	**1-5 Employees**	**5-10 Employees**	**Over 10**
Your Annual throughput			

ADDITIONAL COMMENTS:

Appendix B

Entry sheet of gate-to-gate times.

February-05

	Front End Time	Loading Time	Post Loading Time	Total Time
Truck 1	3	45	3	51
Truck 2	3	27	3	33
Truck 3	4	16	4	24
Truck 4	4	93	3	100
Truck 5	3	67	3	73
Truck 6	4	22	4	30
Truck 7	5	32	4	41

Appendix C

Maintenance Labor cost collection sheet

Employee 2	*1*	12.7	9	33.92	88.72	83.61
	1.5			4	1.75	7.34
Employee 3	*1*	4.87	0	30.9	81.63	45.25
	1.5					
Employee 4	*1*	11	5.25	20.3	18	107.2
	1.5					
Employee 5	*1*	6.8	17.35	15.57	9.5	2.79
	1.5					
Employee 6	*1*	0	0	4.55	6.02	4.62
	1.5					
Employee 7	*1*	0.5	10.05	32.34	41	47.75
	1.5					8
Employee 8	*1*	2.4	15.6	42.82	68.6	55.92
	1.5				1.75	
Employee 9	*1*					
	1.5					
1		**48**	**70.25**	**205.7**	**344.56**	**397.42**
1.5		**0**	**0**	**8**	**3.5**	**15.34**